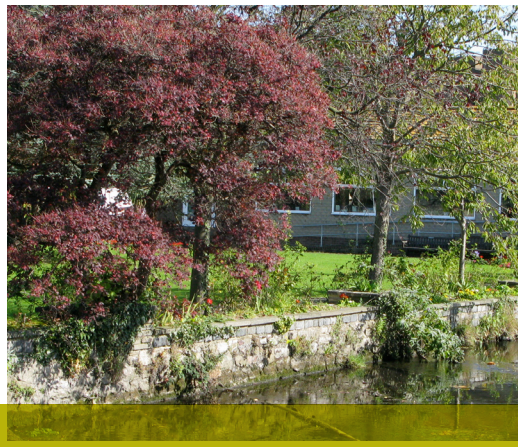






# Dover Core Strategy Evidence Base - Sustainable Construction and Renewable Energy

JANUARY 2009

Evidence base for sustainable construction policies and testing of renewable energy capacity and feasibility for the Dover District Council Core Strategy 2006-2026

EDAW
FABER MAUNSELL

# Summary of Recommendations

EDAW and Faber Maunsell have considered the feasibility of and justification for sustainable construction policies for Dover District Council's Core Strategy. These findings apply to the draft Core Strategy focussing on growth scenarios 3 and 4.

## POLICY RECOMMENDATIONS:

### 1. Core Strategy – Policy DM3 changed to;

"All new developments are required to meet Code for Sustainable Homes standards or equivalent. New developments are required to meet Code level 3 with immediate effect (from granting of permission), at least Code level 4 from 1st April 2013 and at least Code level 5 from 1st April 2016.

All new non-residential developments over 1000m$^2$ gross are required to meet BREEAM Very Good or equivalent with immediate effect (relevant versions cover offices, retail, industrial, education and healthcare).

More information and supporting guidance will be provided with the Development Contributions SPD.

### *Notes for accompanying planning documents and tools:*

Planning applications will require credit scoring strategies and pre-assessments for the required Code for Sustainable Homes or BREEAM levels. Planning conditions will be set to require interim and final Code certificates and post-construction BREEAM certificates as appropriate.

The 1000m2 gross threshold is derived from Government guidance on the scale of major development. Non-residential development below the threshold is expected to face significantly higher unit costs to achieve BREEAM ratings.

### Development Contributions SPD (or future Community Infrastructure Levy)

For new developments that cannot meet the carbon and water reduction targets in DM3 onsite and for new non-residential developments of less than 1000m$^2$ gross, applicants must achieve commensurate energy and water savings elsewhere in Dover District.

The actions or sums paid must achieve the difference between the onsite performance of the development and the immediate, 2013 and 2016 energy and water standards expected for developments. Dover District will publish updates concerning details of the energy and water efficiency schemes that will be eligible and the cost per tonne of $CO_2$ and per m$^3$ of water saved.

Applicants must prove they cannot meet requirements onsite through an open book accounting approach to show the development would not go ahead.

### Funding Model

Funding levels will need to be set to reflect District needs and priorities to reduce energy and water use. This will be informed by Regional renewable energy targets; the Government definition of zero carbon and related list of allowable solutions; and local initiatives to improve existing residential and non-residential buildings.

## 2. Core Strategy – new policy;

"Planning conditions will be applied to all domestic and commercial extensions and conversions to require cost effective energy and water efficiency measures to be included, aiming for no net increase in energy or water demand from the property."

### *Notes for accompanying planning documents and tools*

An updateable list of 'cost-effective' measures that can reasonably be included in standard buildings should be available from the Council.

## 3. Strategic Allocation Policies;

### *Whitfield*

**New policy:**

a) Whitfield will achieve at least Code for Sustainable Homes level 4, aspiring towards level 5 with immediate effect.
b) Schools within Whitfield will be zero carbon and meet BREEAM Excellent.

**Revisions to existing policy:**

Policy (i) should now read: 'A comprehensive Masterplan, energy strategy and water strategy is agreed by the Council in advance of the determination of any planning applications and all applications accord with it. The Masterplan/SPD will test and define exact levels of achievement, particularly with regard to the delivery of heat and water recycling requirements and the balance between onsite and offsite provision of carbon savings.'

Consider revising existing policy (ix) reference to impact on skyline which may conflict with some energy solutions.

### *Wellington Dock*

**New policy:**

a) Wellington Dock will include a district heating system.
b) Non-residential buildings will meet BREEAM Excellent.
c) At least 75% of the sound insulation credits must be achieved using the Code for Sustainable Homes.

**Revisions to existing policy:**

- Policy (i) should now read: 'A comprehensive Masterplan, energy strategy and water strategy is agreed by the Council in advance of the

determination of any planning applications and all applications accord with it;'

### *Connaught Barracks*

**New policy:**

a) Connaught Barracks will include a district heating system, which must be sensitively integrated within the site.
b) At least 80% of the ecology credits will be achieved using the Code for Sustainable Homes and BREEAM assessments.

**Revisions to existing policy:**

- Policy (i) should now read: 'A comprehensive Masterplan, energy strategy and water strategy is agreed by the Council in advance of the determination of any planning applications and all applications accord with it;'

### *Mid Town*

**New policy:**

a) Mid Town will include a district heating system and individual buildings will provide heat network connections.
b) Non-residential buildings will meet BREEAM Excellent.
c) At least 75% of the sound insulation credits must be achieved using the Code for Sustainable Homes.

**Revisions to existing policy:**

- Policy (i) should now read: 'A comprehensive Masterplan, energy strategy and water strategy is agreed by the Council in advance of the determination of any planning applications and all applications accord with it;'

## JUSTIFICATIONS:

### Policy

There is a clear framework throughout national and regional policy for inclusion of carbon dioxide targets, renewable energy targets and higher energy and carbon performance standards than Building Regulations (PPS1, PPS3, PPS22, South East Plan (CC2, CC4, NRM11, NRM13, NRM14 and NRM16)). Due to their size, strategic sites have a particular role to play in meeting renewable energy targets, potentially through CHP (South East Plan NRM12).

Furthermore recent announcements about 80% carbon reduction targets for 2050, the Climate Change Bill, the Energy Bill and the UK's share of the EU Renewable Energy Target (suggesting 30-35% renewable electricity by 2020) all provide justification of higher renewable energy targets and higher sustainable construction standards.

Changes to the building regulations in 2010, 2013 and 2016 are expected to bring in tough dwelling (carbon dioxide) emissions rate targets and renewable energy targets for residential development and for commercial development by 2019. This means that to meet the 80% targets and EU targets to reduce all

energy including transport energy, the planning system needs to go beyond the traditional policies on dwelling emissions rate and proportions of renewable energy. The Code for Sustainable Homes and BREEAM provide clear national standards that cover other measures that can reduce carbon dioxide emissions, such as the inclusion of bicycle parking and a home office.

The South East Plan also provides a clear policy hook for requiring:

- Water efficiency targets above Building Regulations (NRM1) and requiring SUDS (NRM4).
- Protection of biodiversity, particularly woodland, and making green links (NRM5, NRM7, CC8)
- Adequate space for waste and recycling storage, reduction of construction waste and increasing use of recycled and secondary aggregate (W1, M1)
- Sustainable design and construction targets in the existing stock (CC4, NRM11, NRM12)

Therefore suggested policy baseline and contents are:

- Awareness of imminent Building Regulations for carbon emissions (25% better than 2006 DER in 2010, 44% better in 2013, zero carbon homes in 2016, zero carbon non-residential in 2019) and water efficiency (125litres per person per day).
- Policy framework to set higher targets than this, particularly regarding water efficiency and earlier uptake of renewable energy technologies (the regional baseline is 10% of site energy demand from onsite renewable energy) due to local opportunities and threats.
- Use of the Code and BREEAM to cover the breadth of topics in one independently assessed standard.

Circular 05/2005 explains that conditions can be set to mitigate damage from a development. As developments can be expected to increase baseline carbon dioxide emissions and water use, which would damage Dover District's ability to cost effectively provide water services to residents, a contribution to reduce carbon emissions and water use, either on-site or off-site, can be sought.

### Physical

Dover District will be disproportionately affected by climate change, particularly with regards to water scarcity. Climate change is already destabilising the economy and food production and will continue to kill people directly both at a local level through heat exhaustion and at a global level through increasing numbers of extreme weather events. The World Health Organisation estimates that 150,000 people are already dying each year due to climate change. Dover District has both a global responsibility and a local vulnerability.

This means actions must be taken to prevent climate change by reducing carbon dioxide emissions, and also that water efficiency measures must be taken to reduce water consumption. Therefore setting Code levels that include various measures to reduce carbon emissions, including dwelling emission rate targets and renewable energy targets, and also other measures such as A rated appliances and bicycle storage, are justified across the District.

As it is already the most water scarce area of the UK, Dover District must require higher standards than Building Regulations on carbon emissions and water efficiency.

The justification for the highest level of water efficiency (80 litres per day) contained within Code level 5 is also supported by the fact that to meet future demand carbon-intensive water treatment infrastructure is planned, further undermining the District's efforts to reduce emissions.

The age profile of the existing stock, and the fact that most of the current stock will still be in use in 2050 means that Dover District will not achieve significant reductions in carbon emissions and water use unless the existing stock is transformed. Therefore policies are required that have an impact on the existing stock through extension applications.

The waste storage section of the Code is particularly justified as current recycling rates are 40% below the Government target.

### Economic

The current costs for achieving Code levels 3, 4 and 5 and BREEAM Very Good and Excellent are significant and are expected to reduce as Building Regulations require improvements in carbon emissions and water efficiency. The benefits of stopping climate change and reducing water vulnerability are difficult to quantify: the Stern Review suggested that the costs of stopping climate change were approximately 1% of global GDP per year, whereas the costs of doing nothing could be 20% of global GDP per year by 2050.

However, to take account of recent Government consultation on the definition of zero carbon, local aspirations for the scale of housing and commercial development delivery and to ensure that requirements for affordable housing are met, a policy allowing funding for off-site improvements in carbon emissions and water efficiency is justified. This will also take into account the difficulties of smaller sites in meeting Code and BREEAM requirements.

### OTHER RECOMMENDATIONS:

Dover District could seek to develop policy to cover the provision of land and facilities for domestic food production, as current provision is not meeting current demand.

Dover District could seek to update housing quality policies to include the Lifetime Homes standard, or a sub-set of the most relevant criteria within Lifetime Homes.

# Contents

# 1. Introduction

EDAW and Faber Maunsell were appointed by Dover District Council to develop an evidence base for sustainable construction and renewable energy policy integration in the Dover District, especially for the Core Strategy. The draft Core Strategy and the preferred growth options, Option 3 and Option 4, have informed the assumptions made within the study. The parameters of Option 3 and 4 are shown below in Table 1 and Figure 1. The resulting policy suggestions are based upon the Preferred Options Document.

The major objective of this study is to clarify and justify the Core Strategy's policy regarding sustainable design and construction, currently set out in policy DM3 of the draft Core Strategy. Related objectives have been to analyse the potential of the strategic sites to deliver improved environmental performance and to ascertain through modelling the potential of the whole District to meet regional renewable energy targets.

**Table 1: Summary of Core Strategy growth options 3 & 4.**

| | Option 3 | Option 4 |
|---|---|---|
| Descriptor | Based upon the Dover Pride Regeneration Strategy recommendation to encourage the population of Dover town. Provides scope for additional (modest) levels of growth at Deal, Sandwich and some villages. | A high level of growth and change based upon the ultimate ambitions of the Dover Pride Regeneration Strategy |
| Population | Population increase: around 6,700.<br>People over 65: increase by c.11,500<br>Children: decline by 3,100<br>Working age: decline by 1,700 | Population increase: around 15,600.<br>People over 65: increase by c.12,600, Children: decline by 1,200<br>Working age: increase by 4,300 |
| Employment | Employment needs capable of being met from the existing land supply.<br><br>Labour shortage: between 3,700 and 6,700 people. | Existing land supply may not be sufficient to sustain the employment needs.<br><br>Growth in people of working age would support forecast labour needs. |
| Homes | See Figure 1 | See Figure 1 |
| Spending | Predicted 46,000$m^2$ square metres of additional shopping floorspace. | Predicted 51,000$m^2$ square metres of additional shopping floorspace. |

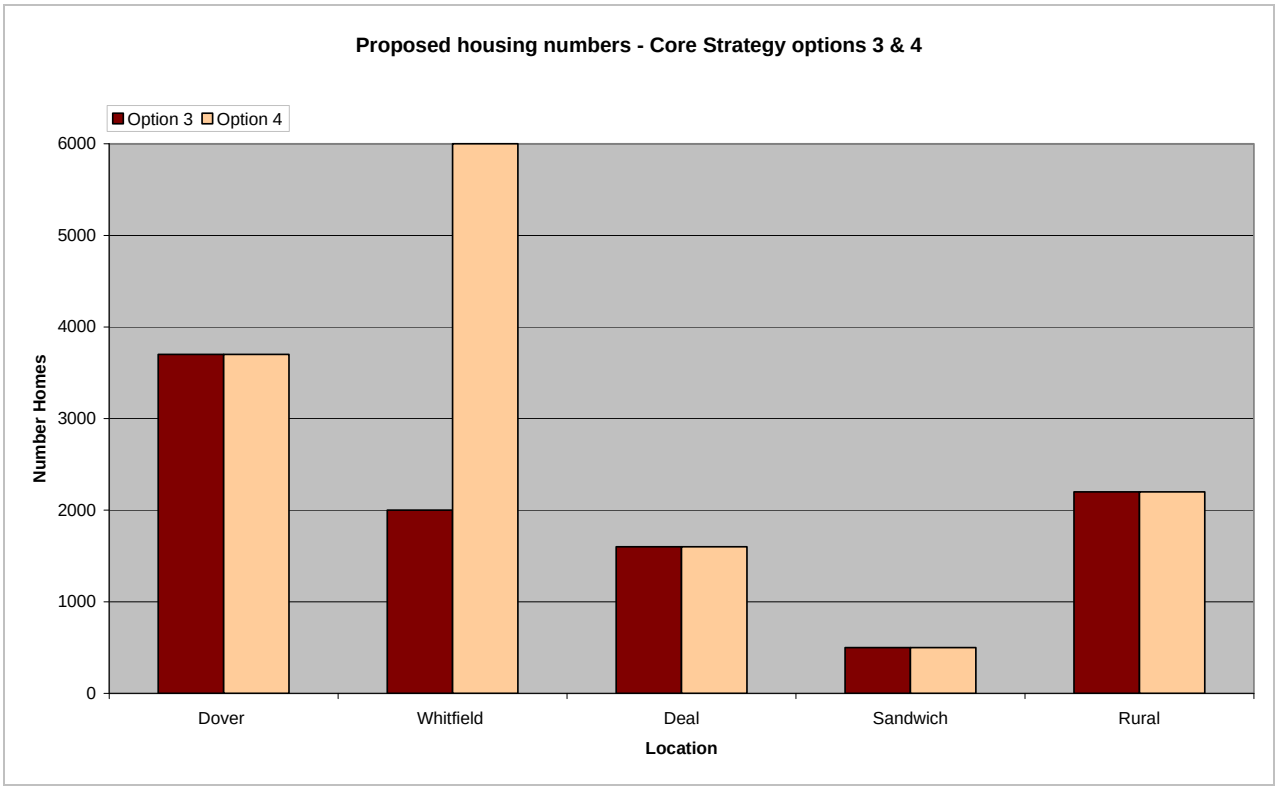



**Figure 1: Proposed locations for new housing - Core Strategy growth options 3 & 4.**

It is important to note that national level regulation and guidance in the area of sustainable construction and renewable energy integration is continually evolving and changing. The next set of high level guidance is expected to be published by Communities Local Government (CLG) in spring 2009. Although there have already been Government policy statements outlining a route map to zero carbon for residential and some types of non-residential buildings, and consultation on the definition for zero carbon has been published, exactly how it will be adopted by the building regulations is still unclear. It is also unclear if, or how the Code for Sustainable Homes will be updated in light of the expected updates to Part L of the building regulations. We have tried throughout to highlight areas of uncertainty, and to adopt policy wording with longevity, but there is a risk that future changes to building regulations or the Code could impact on proposed Core Strategy policies.

### Future energy targets for new build residential development

The Government has set out in its policy statement entitled 'Towards a greener future' (July 2007) a route map towards zero carbon homes. The Government hopes to introduce these tougher standards through changes to Part L of the building regulations, which deals with the conservation of fuel and power from buildings. Since the 2006 Part L revision, compliance with this part of building regulations has been based on meeting $CO_2$ emissions targets[1]. For homes, the dwelling emission rate (DER) must be lower than the target emission rate (TER). The TER is based on applying a set of notional performance standards to the proposed building geometry. Setting $CO_2$ as the single denominator allows performance standards to be 'ramped up' over time simply by improving

[1] For this reason, Merton-style policies such as percentage of electricity from renewables are now out-dated.

the target. The current route map states that in 2010 the DER will need to exceed the TER by 25%, rising to 44% in 2013 and zero carbon by 2016. The exact definition of zero carbon for the purposes of building regulations compliance is not yet agreed, although a consultation on the definition of zero carbon, including offsite solutions, has been published recently and it seems likely that the proposed targets for 2010 and 2013 will be written into regulation.

### The Code for Sustainable Homes

The Code for Sustainable Homes (the Code) was introduced in April 2006 and has 6 performance levels (1-6). It is a voluntary standard for developers: though a rating has been mandatory since April 2008, developers can simply use an 'unrated' rating. Government-funded housing, through English Partnerships and the Housing Corporation, is currently expected to achieve Code level 3.

Ratings under the Code are awarded to each dwelling type within the development, depending on whether the dwellings meets a set of mandatory standards for each level, as well as an overall points score out of 100.

**Table 2: Performance required to meet Code levels.**

| | Minimum entry requirements | | |
|---|---|---|---|
| **Code Levels** | **Energy** Improvement over TER | **Water** litres/person/day | **Total points** score out of 100 |
| Level 1 (★) | 10% | 120 | 36 |
| Level 2 (★★) | 18% | 120 | 48 |
| Level 3 (★★★) | 25% | 105 | 57 |
| Level 4 (★★★★) | 44% | 105 | 68 |
| Level 5 (★★★★★) | 100% | 80 | 84 |
| Level 6 (★★★★★★) | Zero Carbon | 80 | 90 |

In the energy section of the Code, mandatory targets are set (for $CO_2$ reduction) that mirror the proposed Part L improvements. The expected 2010 minimum standard for energy is equivalent to the mandatory performance for level 3; level 4 is the 44% reduction which seems likely to be the minimum standard for 2013. Currently level 6 'zero carbon' in the Code equates to offsetting all the associated $CO_2$ from Part L regulated energy uses and the $CO_2$ emissions associated with energy use from non-regulated energy sources, such as from household appliances and cooking (see Figure 2). Achieving level 6 under the Code equates to a reduction on the TER of somewhere between 140 – 160% depending on the house type.

The definition of a zero carbon home under the Code includes two further requirements:

- A maximum heat loss parameter (HLP) of 0.8$Wm^2K$, which relates to the integrity of the building envelope;

- Low and Zero Carbon energy generation sources must be either located on the development site or be physically connected to the homes by private wire or district heating mains.

It is not clear whether Part L will use the same definition of zero carbon as has been adopted by the Code. A consultation paper on this was released by Communities Local Government on 17 December 2008. This consultation proposes an onsite 'carbon compliance level', achievable through energy efficiency measures, onsite renewable electricity and/or connections to low carbon heat. This carbon compliance level is expected to somewhere between 44% and 100%. The remaining emissions would need to be reduced via a list of allowable solutions, which includes further onsite reductions, exporting heat or cooling to neighbouring buildings, S106 credits for local low and zero carbon infrastructure, retrofitting works to existing stock and investment in UK renewables such as wind farms.

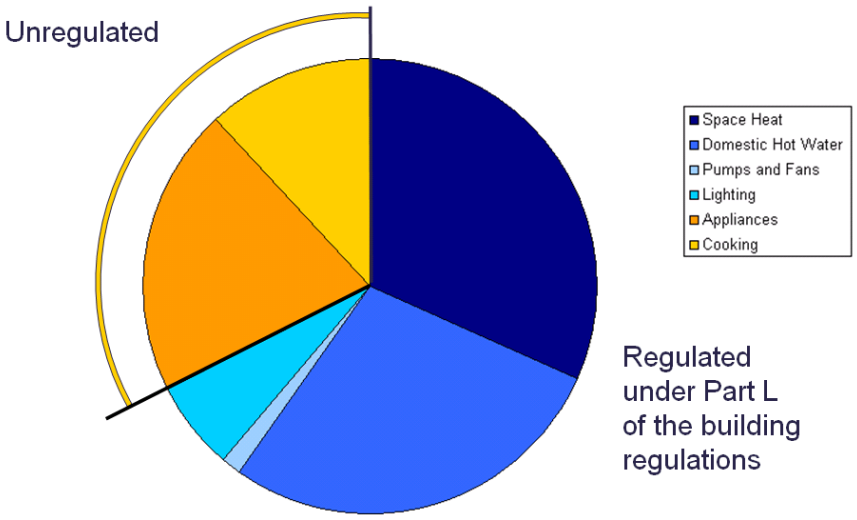



**Figure 2: Unregulated demands left, Part L regulated demands right.**

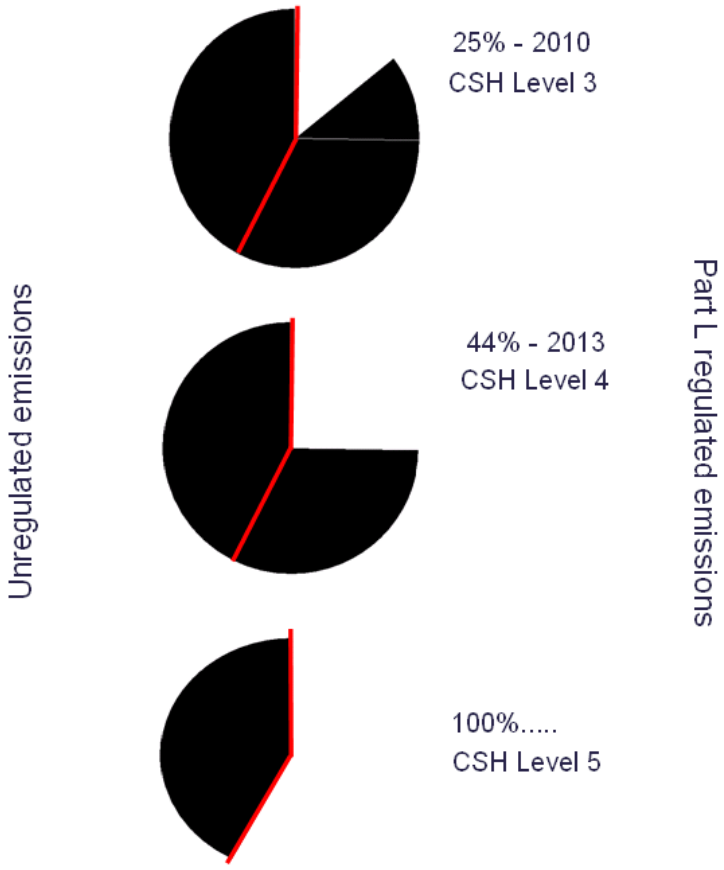



**Figure 3: Energy (kWh) converted to $CO_2$ emissions (kg) showing the proposed Part L targets and corresponding Code mandatory standards. Note: Code level 6 is equivalent to offsetting 'all' of the predicted $CO_2$ emissions.**

In policy terms it is extremely important to recognise that energy targets are only one part of the Code. The Code also contains credits on water conservation, materials use, surface waste run-off, waste management, pollution, health and wellbeing and management. Given that such rapid improvement in energy performance is being driven by regulation the Code may be a more useful standard in the future for ensuring other areas of sustainable construction are properly addressed by developers.

Mandatory requirements exist for 6 credits including energy ($CO_2$ reduction), water use, embodied energy of construction materials, surface water run-off and construction site waste management.

Although a significant proportion of the additional costs of delivering Code targets are typically associated with delivering the energy targets, the other credit criteria should not be overlooked. Delivering the overall points required can be challenging and needs to be considered throughout the development planning process.

Further detail on each section of the Code is provided in the following policy context. Some routes to delivering various Code ratings, with a basic summary of the compliance requirements is included as Appendix E. Graphs showing

the cost (over base construction cost) associated with meeting Code levels in each of the category areas are also included in section 7.

### Future energy targets for new build non-residential development

Much of the initial zero carbon policy focus has been on the residential sector. Subsequent policy announcements have also set out end dates by which non residential buildings should be zero carbon. The June 2008 Sustainable Construction Strategy summarises as follows; new schools, public sector non-domestic buildings and other non-domestic buildings will be zero carbon from 2016, 2018 and 2019 respectively.

Despite these announcements the route map for moving towards zero carbon non-domestic buildings through regulation is unclear. Non residential buildings can vary in their systems complexity and can have hugely variable fixed energy demands. In many cases buildings (such as retail and offices) have a much greater demand for electricity, which is harder to generate from renewable sources. Setting regulation in this sector is therefore much more complex.

It is assumed at this stage that regulation will follow the same pattern as for homes up until 2013, requiring on 25% onsite reduction over TER in 2010 and 44% in 2013. After this, due to the significant electrical requirements of some non-residential buildings, and taking proposals from the recent zero carbon consultation, it seems likely that developers of commercial buildings will be able to utilise offsite renewable energy generation or purchase $CO_2$ offsets to deliver any further required $CO_2$ saving.

### Other key sustainable construction standards and targets

BREEAM (Building Research Establishment Environmental Assessment Method) is a voluntary assessment scheme which aims to help developers minimise the adverse effects of new non-residential buildings on the environment. Like the Code, BREEAM allows the environmental implications of a new building to be assessed at the design stage by independent assessors to provide an easy to understand comparison with other similar buildings. An overall rating of the building's performance is given using the terms Pass, Good, Very Good, Excellent, or – new for BREEAM 2008 - Outstanding. The rating is determined from the total number of BREEAM criteria met, multiplied by their respective environmental weighting.

BREEAM was initially launched in 1990 as an environmental assessment methodology aimed specifically at office buildings (BREEAM Offices). Since then versions of the assessment have been developed for numerous other building types including schools, industrial, retail and healthcare. At the basic level the schemes for non domestic buildings are all fairly similar in their approach and contain similar credit compliance criteria. Credits are typically grouped in to the following categories:

- Management
- Health and Well Being
- Energy
- Transport

- Water
- Materials and Waste
- Land Use and Ecology
- Pollution

Buildings which do not fall neatly under one of the established BREEAM schemes are able to be assessed using a bespoke methodology. In policy terms BREEAM is useful as it provides a single assessment method which covers a number of key topics relating to sustainable construction.

A properly conducted BREEAM assessment can influence design both in terms of the masterplanning process and detailed architectural and mechanical and electrical specifications.

#### The scope of sustainable construction

For the purposes of this report, sustainable design and construction is defined as the topics and criteria covered by the Code and versions of BREEAM.

This report is focussing on the building and site measures that a developer has control over. It is assumed that off-site elements of sustainable transport, ecology and provision of and access to community facilities and jobs are covered in other documents supporting the Core Strategy.

### 1.1 HOW THIS REPORT IS STRUCTURED

- Chapter 2 explains and analyses the policy context, nationally, regionally and locally for Dover District. The resulting justifications are described;
- Chapter 3 explains and analyses the relevant physical context for Dover District, with resulting justifications;
- Chapter 4 explains the financial context for achieving standards within the Code and BREEAM;
- Chapter 5 outlines the policy recommendations that result from the analysis in chapters 2-4;
- The rest of the report tests the policy recommendations against the following criteria:
  - District-wide capacity for renewable energy (chapter 6);
  - Strategic site capacity (chapter 7);
  - Masterplanning and urban design (chapter 8).

The main findings of the report are summarised in chapter 9 and the implications for the Council and its partners are briefly discussed.

# 2. Policy context

## 2.1 OVERARCHING

### National

**Securing the Future**: UK Sustainable Development Strategy (March 2005) sets out five principles for sustainable development with a focus on environmental limits. It also identifies four priority areas: sustainable consumption and production, climate change, natural resource protection and sustainable communities.

Planning Policy Statement 1: **Delivering Sustainable Development** (PPS1) (2005) places an emphasis on promoting more sustainable development. The **supplement to PPS1 on climate change** was released in December 2007. It advised planning authorities to provide a framework to encourage low carbon and renewable energy generation in their local development documents and confirmed that there are situations where it is appropriate for LPA to expect higher standards than building regulations. Paragraphs 31-33 explain that the local circumstances that warrant higher standards must be clearly demonstrated, such that there are clear opportunities for low carbon developments or that without requirements development would be unacceptable for the proposed location. Paragraph 32 suggests that local requirements should focus on the development area or site-specific opportunities and that the requirement should be in terms of achievement of nationally described standards such as the Code for Sustainable Homes. Paragraph 33 requires that decentralised energy or other sustainable requirements should be set out in a DPD. Care must also be taken to demonstrate that the requirements are viable, will not impact on the supply and pace of housing development and will not inhibit the provision of affordable housing. .

**Planning Policy Statement 3** on housing has ‘Designing for Quality’ as one of its key objectives. It also advocates energy efficiency in new housing developments, stating: “Local planning authorities should adopt policies which promote the energy efficiency of new housing where possible." (Para 56)

At the international level, the **Kyoto Agreement** is currently being updated (using the “Bali Roadmap”) and will be agreed in Copenhagen is December 2009. This will commit the UK to an updated carbon dioxide reduction path, as well as technology development and transfer and financial investment, which will need to be reflected in planning policy.

### Regional

The Secretary of State has published Proposed Changes to the **Draft South East Plan** (Regional Spatial Strategy). The Government's changes are used here, as it is expected that their document is close to what will be adopted.

The cross-cutting policies include CC1 on sustainable development, CC2 on climate change and CC4 on sustainable design and construction. Policy CC1 states "the principal objective of the Plan is to achieve and to maintain sustainable development in the region. All authorities shall ensure their actions contribute to meeting the objectives set out in the Regional Sustainability Framework." Policy CC2 makes it clear that planning policy is expected to address climate change: "Measures to mitigate and adapt to the current and forecast effects of climate change will be implemented through application of local planning policy". It then sets the following carbon dioxide targets: "Local authorities … shall include policies and proposals in their plans, strategies and investment programmes to help reduce the region's carbon dioxide emissions by at least 20% below 1990 levels by 2010 and by at least 25% below 1990 levels by 2015."

Policy CC4 sets a number of parameters for local policy:

- "consideration of how all aspects of development form can contribute to securing high standards of energy and water efficiency"
- "increase the use of natural lighting, heat and ventilation"
- "for a proportion of the energy supply of new development to be secured from decentralised and renewable or low carbon sources"
- "promote best practice in sustainable construction and help to achieve the national timetable for reducing carbon emissions"
- "it could be appropriate for the LPA to anticipate levels of building sustainability in advance of those set out nationally"

### Local

Dover District's **Draft Core Strategy** was published for public participation in March 2008. It contains six Core Policies, policies regarding each of the strategic allocations and development management policies. Particularly relevant policies to this study are:

- Policy DM 3 which states "planning permission will only be granted for new residential and non-residential buildings if they would reach standards of sustainable construction that significantly exceed the Building Regulations until the Regulations achieve zero carbon development."
- Policy DM 21 on pollution. Controls on pollution may have an impact on biomass-powered schemes.
- Policy DM 24 protects the character, features, setting and views from historic parks and gardens. This could have an impact on the location of renewable energy applications including large scale wind turbine and district energy centres.

Policy DM3's supporting justification states that: ' the Council will seek all applications for new homes, whether from new build or conversion, to meet

Code level 4 by 2010, level 5 by 2013 and level 6 by 2016. From 2010 non-residential buildings should reach BREEAM good and from 2013 very good.'

Each of the strategic sites has a set of policies. A later section of this document considers the strategic site policies and what aspects of sustainable design and construction may fit better as a sub-section of each strategic allocation policy box, rather than as general Development Management policies.

The Council is also preparing a Site Allocations Document and a Development Contributions SPD. In order to achieve timely market delivery that meets Council aspirations, these documents may need to mention aspects of sustainable design and construction.

### 2.2 BUILDING-RELATED ENERGY AND CARBON

#### National

As explained above, Government has announced its intention for **Building Regulations** to cover new residential development's dwelling emission rate (DER) being 25% better than TER in 2010, 44% better in 2013 and meeting a zero carbon target by 2016, with non-residential development expected to meet the zero carbon target by 2019.

The proposed residential Building Regulations correspond to the DER targets set out in the Code, for levels 3, 4 and 6. Level 5 of the Code is a 100% reduction in the DER, meaning that all energy required for lighting, heating, cooling and ventilating the home produces net zero emissions over a year. The DER target is a mandatory element within the Code. The Code additionally seeks to reduce energy use and carbon dioxide emissions through non-mandatory elements covering building fabric, internal and external lighting, drying space, energy labelled white goods, low or zero carbon technologies, cycle storage and provision for a home office. Furthermore the 'pollution' section of the Code covers two more issues that have a climate change impact: reducing the global warming potential of insulation and the NOx emissions from boilers. Versions of BREEAM cover similar topics relevant to non-residential buildings.

The UK Government is committed to reduce carbon dioxide emissions by 60% from 1990 levels by 2050, and at least 26% by 2020, as outlined in the **Climate Change Bill**, which is due to receive Royal Assent in autumn 2008. Targets in this area are fast moving. The Committee on Climate Change has advised Government that the cut needs to be at least 80% (7th October 2008) and Government has announced its intention to meet it (DECC press release 15th October 2008).

The **EU Renewable Energy Target** is that by 2020, 20% of total energy consumption needs to come from renewable sources. The UK's target will probably be 15% of energy from renewable sources. This target includes transport energy as well as heating and electricity. BERR have produced a Renewable Energy Strategy for Consultation (June 2008) that shows that to meet the 15% energy targets, 30-35% of electricity will need to come from renewable sources by 2020 and renewable sources of heat will also need to

be utilised. Regional research recognised some of these drivers in SEEDA's 2008 report "Progressing Renewable Energy in the SE of England".

This means **PPS22 on Renewable Energy** (2004) and the 2007 **Energy White Paper** are somewhat outdated, but they are currently the UK's adopted policy, both containing a 20% renewable energy by 2020 target.

The **Planning Bill** is currently progressing through Parliament, based on 2007's Planning White Paper. The White Paper described climate change as a key challenge facing our generation and stated that local planning authorities have a crucial role to play in tackling climate change. The Bill proposes an Infrastructure Planning Committee to streamline the decision-making process for large infrastructure projects, including renewable energy. The Bill also proposes a Community Infrastructure Levy, a new system for raising funds for communal infrastructure.

Alongside the Planning and Climate Change Bills, the **Energy Bill** is expected to strengthen the Renewables Obligation, to drive a larger and more rapid deployment of renewable energy technologies.

Finally, the Government has recently released **Definition of Zero Carbon Homes and Non-Domestic Buildings**, a consultation that proposes meeting part of the zero carbon requirement through offsite measures. The document suggests that between 44 and 100% of the carbon emissions reduction must be met onsite, and that for the remaining emissions a range of onsite and offsite solutions are possible. The consultation also proposes a maximum cost per tonne of carbon for offsite measures, which will be published in 2009 and updated in 2012, to give developers some certainty over the costs they face.

### Regional

The **draft South East Plan** has a number of policies specifically addressing energy:

- NRM11 (formerly EN1): **Development Design for Energy Efficiency and Renewable Energy**. Local Authorities should: i) promote and secure greater use of decentralised and renewable or low carbon energy in new development, including through setting ambitious but viable proportions of the energy supply for new development to come from such sources. In advance of local targets being set in LDDs, new developments of more than 10 dwellings or 1000m2 of non-residential floorspace should secure at least 10% of their energy from decentralised and renewable or low carbon sources ii) use design briefs and SPD to promote development design for energy efficiency, low carbon and renewable energy iii) work towards incorporation of renewable energy sources including passive solar design, solar water heating, photovoltaics, ground source heat pumps and in larger scale development wind and biomass generated energy iv) actively promote energy efficiency and use of renewable and low carbon energy sources where opportunities arise by virtue of the scale of new development including growth points.
- NRM 12 (formerly EN2): **Combined Heat and Power**. LDD should encourage the integration of CHP including mini and micro-CHP, in all

development and district heating infrastructure in large scale mixed use. The use of biomass fuel should be investigated and promoted where possible. Local authorities using their wider powers should promote awareness of the benefits of mini and micro-CHP in the existing built stock.

- NRM 13 (formerly EN3): **Regional Renewable Energy Targets**. Minimum regional targets for electricity generation from renewable sources are shown in the table below.

**Table 3: NRM 13 Policy in RSS**

| | Regional target NRM 13 (formerly EN3) | | Kent target NRM 14 (formerly EN4) |
|---|---|---|---|
| Year | Installed capacity (MW) | % Electricity Generation Capacity | Installed capacity (MW) |
| 2010 | 620 | 5.5 | 111 |
| 2016 | 895 | 8.0 | 154 |
| 2020 | 1130 | 10.0 | - |
| 2026 | 1750 | 16.0 | - |

- NRM14 (formerly EN4): **Sub-Regional Targets**. LDD should include policies … to contribute to the achievement of the targets (see table above) for land-based renewable energy. Local authorities should collaborate and engage … to assist in the achievement of the targets through: i) undertaking more detailed assessments of local potential, ii) encouraging small scale community based schemes; iii) encouraging development of local supply chains, especially for biomass; iv) raising awareness, ownership and understanding of renewable energy.
- NRM15 (formerly EN5): **Location of Renewable Energy Development**. LDFs should encourage the development of renewable energy in order to achieve the regional and sub-regional targets. Renewable energy development, particularly wind and biomass, should be located and designed to minimise adverse impacts on landscape, wildlife and amenity. Outside urban areas, priority should be given to development in less sensitive parts of the countryside and coast, including on previously developed land and in major transport areas. The location and design of all renewable energy proposals should be informed by landscape character assessment where available. Within areas of protected and sensitive landscapes, including AONBs or national parks, development should generally be of a small scale or community-based. Proposals within or close to the boundaries of designated areas should demonstrate that development will not undermine the objectives that underpin the purposes of designation.
- NRM 16 (formerly EN6): **Development Criteria**. LDD should include criteria-based policies that consider: i) the contribution the development will make towards achieving national, regional and sub-regional renewable energy targets and carbon dioxide savings; … iv) the proximity of biomass combustion plant to fuel source and the adequacy of local transport networks.

The latest draft of the **AONB management plan** (October 2008) states a 2029 vision for the AONB that includes: "sustainably managed woodlands supply buoyant local markets for timber, coppice products and wood fuel" and "many communities, both inside and outside the AONB have reduced their ecological footprint and have energy fuelled by products from the Kent Downs"

The Kent Downs Management Trust has produced a **renewables position statement** for the AONB. It supports the provision of renewable energy within the AONB, but advises that large-scale and micro wind and large scale biomass are generally inappropriate, but welcomes other forms of renewable energy production.

It is also worthwhile considering the measures that other local authorities are taking in their LDDs. Since 2005 Uttlesford District Council has required domestic extension applications to incorporate **cost effective energy efficiency** measures. This measure has been promoted by the Energy Saving Trust and applauded by the CLG Parliamentary Select Committee, the LGA's Climate Change Commission and the Federation of Master Builders. The requirement is in the domestic extension SPD and all approvals carry the energy efficiency condition. The work has been incorporated into the regular visits by the Council's Building Surveyors. The measures that can be required are: cavity wall insulation, loft insulation, floor insulation, replacement condensing boiler, heating controls upgrade, hot water tank insulation, draught-stripping and energy-efficient lighting. Uttlesford have found it to be a popular condition with no appeals. In 2007 a study estimated that the condition results in savings of 160 tonnes of $CO_2$ per year.

Brighton and Hove Council has also taken this approach and supplemented it with an option for applicants to provide **funds for energy efficiency** improvements. This applies to all applicants, and requires applicants to provide S106 funds for the Council's portfolio of energy efficiency and renewables grants and discounts. To comply with Circular 05/2005 the Council's grants and discounts now need to be available to all residents.

**Circular 05/2005** (Planning Obligations) states that the objective of the planning system is to deliver sustainable development and that obligations are intended, among other things, to secure a contribution from a developer to compensate for loss or damage created by a development or to mitigate a development's impact.

### 2.3 WATER

**Future Water**, the Government's water strategy for England (February 2008) sets out expectations for water supply, water efficiency and water treatment to 2030. It set out proposals to achieve an average water consumption of 120 litres per person per day, down from the current average of 150 litres. It also addresses water charging, surface water management and water pollution.

Defra is leading a cross-Government programme of work under the headline **Making Space for Water**, which is developing a strategy to flood and coastal erosion. This programme has more relevance to flood and erosion management infrastructure projects. **PPS25: Development and Flood Risk**

advocates the use of sustainable drainage systems in new development proposals to reduce the risk of flooding, add biodiversity and amenity benefits to developments and to aid in pollution prevention and aquifer re-charge.

Defra and DCLG made a joint policy statement in July 2007 called **Water efficiency and new buildings** that made clear their intention to legislate on water efficiency through Building Regulations. It proposed a residential minimum standard of 125 litres per person per day (equivalent to the Code level 1-2, plus 4% to allow for external water use) and also fittings performance efficiency regulations for toilets, urinals and taps to have an impact on the non-residential stock and an indirect effect on existing stock. The timescale of this legislation was proposed to be during 2008. Local authorities can choose to go beyond building regulation on water efficiency if the local context supports it.

The **Code** uses litres per person per day standards for internal water use as a mandatory element. To achieve Code level 1 or 2, the home must achieve 120 litres. To achieve Code level 3 or 4, the maximum is 105 litres and for level 5 or 6 it is 80 litres. More credits can be achieved if these maxima are improved upon within Code levels 1-4. A further credit is available for external rainwater collection systems. The Code also covers surface water management, and there are mandatory standards for peak flow and volume of runoff to be able to achieve any Code level. A further two credits are available for using Sustainable Urban Drainage Systems (SUDS) and for managing flood risk. Versions of BREEAM cover similar topics relevant to non-residential buildings.

Regional policy, in the shape of the draft South East Plan has a number of relevant policies:

- NRM1: Sustainable Water Resources and Groundwater. In preparing LDDs, LPA will: … ii) identify any circumstances under which new development will need to be supported by water efficiency standards exceeding extant Building Regulations…
- NRM3: Strategic Water Resources Development. …In considering applications for new water resources schemes, consideration should be given to …ii) presence of alternative options and environmental impact including water efficiency in new and existing properties.
- NRM4: Sustainable Flood Risk Management. In the preparation of LDDs … LPA should … iii) require incorporation and management of SUDS, other water retention and flood storage measures to minimise direct surface run-off, unless there are practical or environmental reasons for not doing so.
- Cross cutting policies CC1, CC2 and CC4 explained in the overarching section above.

The policy of the local water companies is explored in the following section, which concentrates on the physical context.

### 2.4 BIODIVERSITY

At the national level **PPS9: Biodiversity and Geological Conservation** sets out the main approach to ensure that the potential impacts of planning decisions on biodiversity and geological conservation are fully considered. Para14 ‘Biodiversity within Developments’ states, “Development proposals

provide many opportunities for building-in beneficial biodiversity or geological features as apart of good design. When considering proposals, LPA should maximise such opportunities in and around developments, using planning obligations where appropriate".

The region has defined some strategic opportunities for biodiversity improvement in the **Draft South East Plan**. As this study is focussing on development site-specific opportunities, the relevant policies are:

- NRM5: Conservation and improvement of biodiversity. … LPA shall avoid a net loss of biodiversity and actively pursue opportunities to achieve a net gain …by … iii) ensuring that unavoidable damage to wildlife interest is minimised through mitigation, that any damage is compensated for and that such measures are monitored; … vii) requiring green infrastructure to be identified, developed and implemented in conjunction with new development.
- NRM7: Woodlands. … LDDs … will … i) protect ancient woodland from damaging development; ii) promote the effective management and where appropriate extend and create new woodland areas including, in association with major development, where this helps restore and enhance degraded landscapes, screen noise and pollution, provide recreational opportunities, helps mitigate climate change and contributes to floodplain management; iii) replace woodland unavoidably lost through development with new woodland on at least the same scale; iv) promote and encourage the economic use of woodlands and wood resources, including wood fuel as a renewable energy source…
- CC8: Green infrastructure promotes substantial networks of accessible multi-functional green space. The policy specifies this will be particularly important in areas close to sites of international ecological importance and in areas identified for significant growth.

At the habitat and species level, the **Kent Biodiversity Action Plan** sets out what needs to be achieved in order to safeguard biodiversity in the County. A series of 28 Kent Habitat Action Plans denote the importance of conserving, enhancing and restoring the natural condition of each. The Core Strategy emphasises the need to meet this strategic objective.

The **Code** offers credits that reward use of a site with low ecological value, protection and enhancement of site ecology, careful planning of the building footprint and the overall change in the ecological value of the site. Versions of BREEAM cover similar topics relevant to non-residential buildings.

### 2.5 MATERIALS AND WASTE

**PPS10: Planning for Sustainable Waste Management** promotes the principles of the waste hierarchy of reduction, re-use, recycling and composting, energy recovery and disposal.

The **Waste Strategy for England** (May 2007) set the following headline targets:

- Household waste recycling to 40% by 2010, 45% by 2015, 50% by 2020;

- Household residual waste reduced 29% by 2010, 35% by 2015 and 45% by 2020 from 2000 levels;
- Municipal waste recovery of 53% by 2010, 67% by 2015, 75% by 2020;
- Commercial and industrial waste landfilled reduced 20% by 2010 from 2004 levels.

The **Draft South East Plan** supports these targets through a number of policies, the most relevant being:

- W2: Sustainable Design, Construction and Demolition. LDDs will require development design, construction and demolition which minimises waste production and associated impacts through: the re-use of construction and demolition materials; and the promotion of layouts and designs that provide adequate space to facilitate storage, re-use, recycling and composting.
- M1: Sustainable Construction. LDDs should promote the use of construction materials that reduce the demand for primary minerals, by requiring new projects to include a proportion of recycled and secondary aggregates wherever practicable.

The **Code** has three mandatory issues relating to waste and materials that have to be achieved for any Code level: ratings of the environmental impacts of construction materials, provision of storage for non-recyclable waste and recyclable household waste, and construction site waste management by using site waste management plans. Credits can be achieved, once the minimum performance is met, by improving performance in each of these areas, such as by providing space for composting and using responsible sources of timber. Versions of BREEAM cover similar topics relevant to non-residential buildings.

### 2.6 POLLUTION

A wide range of policy covers pollution, including the surface water management and water quality policies quoted above. Air quality is the other major issue relevant to sustainable design and construction at a site level. Obviously a crucial factor within air quality is transport management, which this study is leaving to the transport policies of the Core Strategy and beyond. Focusing of non-transport related issues, the **draft South East Plan** features the following policy:

- NRM9 (formerly NRM7): Air Quality. LDDs can help to achieve improvements in local air quality through i) ensuring consistency with AQMP; … iii) mitigating the impact of development and reduce exposure to poor air quality through design; iv) encouraging the use of best practice during construction activities to reduce the levels of dust and other pollutants.

The **Code** uses credits to reward the use of the Considerate Constructors Scheme and other mitigation of construction site impacts, which aim to reduce dust and other pollution among other outcomes. Versions of BREEAM include the same credits.

### 2.7 QUALITY OF LIFE

**PPS1** explains that planning should be used to deliver: "a just society that promotes social inclusion, sustainable communities and personal well being" and "safe, sustainable, liveable and mixed communities with good access to jobs and key services for all members". The Sustainable Communities Plan (February 2003) highlighted similar aims.

However further detailed planning policy is scant on issues about quality of life. The **Eco-Towns Prospectus** (July 2007) and draft Eco-Town PPS (November 2008) have sections on health and community empowerment through ownership and participation. The topics surrounding community empowerment have been taken further by **Communities in control**: real people, real power (July 2008) which proposes changes to democratic decision-making at the most local level. Taken to a more physical level, quality of life as mediated by perceptions of local spaces feeling safe and attractive is dealt with by the Government's **'Cleaner, Safer, Greener'** programme.

The **draft South East Plan** has a core objective of achieving "the right balance between planning for economic, environmental and social benefits to help improve quality of life for everyone in the South East". Policy BE1: Management for an urban renaissance states "LDF should set out an overall strategy for enhancing quality of life in each urban area." On a physical level, it covers noise as part of air pollution, and as stated above, NRM9 includes "reduce exposure to poor air quality through design".

Taking just this directly physical expression of measures to improve quality of life or well being within the home, the **Code** covers the level of daylighting, sound insulation, provision of private outdoor space, provision of a home user guide and Secured by Design status. A final standard is Lifetime Homes, a set of measures to ensure homes are adaptable to the changing needs of people during their life and in times of ill-health. Achieving Lifetime Homes is a mandatory element to achieving Code level 6. Considering Dover District's aging population, a Lifetime Homes requirement as part of the housing quality and density policies is recommended. Versions of BREEAM also cover heath and wellbeing and management topics relevant to non-residential buildings.

### 2.8 EXISTING STOCK

The draft South East Plan contains three policies that encourage energy efficiency and other measures in the existing stock of buildings:

- NRM11 "Local authorities should seek to achieve high levels of energy efficiency when refurbishing their existing stock."
- CC4 "The design and construction of … the redevelopment and refurbishment of existing building stock will be expected to adopt and incorporate sustainable construction standards and techniques. This will include: i) consideration of how all aspects of development form can contribute to securing high standards of energy and water efficiency; ii) designing to increase the use of natural lighting, heat and ventilation …"
- NRM12 "Local authorities using their wider powers should promote awareness of the benefits of mini and micro-CHP in the existing built stock."

### 2.9 RESULTING POLICY JUSTIFICATIONS

There is a clear framework throughout national and regional policy for inclusion of carbon dioxide targets, renewable energy targets and higher energy and carbon performance standards than Building Regulations (PPS1, PPS3, PPS22, South East Plan (CC2, CC4, NRM11, NRM13, NRM14 and NRM16)). Due to their size, strategic sites have a particular role to play in meeting renewable energy targets, potentially through CHP (South East Plan NRM12). This study considers the potential of four strategic sites to meet higher targets in section 7.

Furthermore recent announcements about 80% carbon reduction targets for 2050, the Climate Change Bill, the Energy Bill and the UK's share of the EU Renewable Energy Target (suggesting 30-35% renewable electricity by 2020) all provide justification of higher renewable energy targets and higher sustainable construction standards, and give a sense of how quickly targets are moving and how ambitious Dover District needs to be. There is an urgent need to reduce carbon dioxide emissions as quickly as possible.

Changes to the building regulations in 2010, 2013 and 2016 are expected to bring in tough dwelling (carbon dioxide) emissions rate targets and renewable energy targets for residential development and for commercial development by 2019. This means that to meet the 80% targets and EU targets to reduce all energy including transport energy, the planning system needs to go beyond the traditional policies on dwelling emissions rate and proportions of renewable energy. The Code for Sustainable Homes and BREEAM provide clear national standards that cover other measures that can reduce carbon dioxide emissions, such as the inclusion of bicycle parking and a home office.

The South East Plan also provides a clear policy hook for requiring:

- Water efficiency targets above Building Regulations (NRM1) and requiring SUDS (NRM4).
- Protection of biodiversity, particularly woodland, and making green links (NRM5, NRM7, CC8)
- Adequate space for waste and recycling storage, reduction of construction waste and increasing use of recycled and secondary aggregate (W1, M1)
- Sustainable design and construction targets in the existing stock (CC4, NRM11, NRM12)

Therefore suggested policy baseline and contents are:

- Awareness of imminent Building Regulations for carbon emissions (25% better than 2006 DER in 2010, 44% better in 2013, zero carbon homes in 2016, zero carbon non-residential in 2019) and water efficiency (125litres per person per day).
- Potential to set higher targets than this, particularly regarding water efficiency and earlier uptake of renewable energy technologies (the regional baseline is 10% of site energy demand from onsite renewables).
- Measures to support household recycling of 50% (Waste Strategy for 2020) and adding Lifetime Homes to housing quality policies.
- Use of the Code and BREEAM to cover the breadth of topics in one independently assessed standard.

Circular 05/2005 explains that conditions can be set to mitigate damage from a development. As developments can be expected to increase baseline carbon dioxide emissions and water use, which would damage Dover District's ability to cost effectively provide water services to residents, a contribution to reduce carbon emissions and water use, either on-site or off-site, can be sought.

# 3. Physical context

Dover District's aspirations are to achieve a step change in the quality of residential development and employment offer. This section focuses on the quality of the existing stock in Dover District, to help formulate a Dover district-specific justification for policy that reflects aspirations.

There has been a strong regional drive to measure and assess the current status of the region and its capacity for more sustainable development. The Environment Agency's State of the Environment Report (2007) and SEERA's Reducing the South East's Ecological Footprint and carbon emissions (August 2008) all highlight the urgency with which water efficiency must be improved and carbon emissions reduced. Along with local Landscape Character Assessments, it is clear that Kent has unique natural heritage and landscapes. The regional and local reporting is also clear about the social and economic challenges, particularly facing Kent, and Dover District within it. The Council has an aspiration to make an impact on 'branding' housing developments, so they have unique selling points to attract highly-skilled and professional residents. A key aspect of this is provision of super-fast broadband. The physical context for this specific technical issue is in Appendix C.

The rest of this section considers the current physical context and the predicted changes in the physical context of Dover District.

## 3.1 THE EXISTING STOCK

### Renewable energy

SEEDA's report on "Progressing Renewable Energy" found that current (2007) renewable energy generation in Kent was 41MWe of installed electricity generation and 1.38 MWth of renewable heat generation. The electricity comes from biomass co-firing at Kingsnorth in north Kent. The heat comes from biomass projects with a small input from Ground Source Heat Pumps and solar hot water panels. Kent lags behind Thames Valley both in renewable electricity and heat generation.

Guidance from SEERA will be forthcoming in early 2009, in the shape of advice on the approach to renewables and a regional CHP study. In the interim, this study has been advised by SEERA that a focus will be made on the existing stock, and how consequential improvement and developer contributions to a retrofitting fund are expected to make a significant difference to the performance of the existing stock and the energy efficiency and carbon emissions of the District as a whole.

### Energy and carbon

In the South East, domestic and transport carbon dioxide emissions are above the England average, and the third highest overall. Dover District has average gas kWh consumption per domestic consumer of 16615, 10% below the

average for the South East which is 18322. The only region that has an average lower than Dover District's performance is the South West. Average electricity consumption is 4164 kWh, 13% lower than the South East's average of 4780. Only the North East's regional average is lower than Dover District's performance (source: BERR 2008, 2006 results). A map of 2004 results is on the next page, to show similar results graphically. The detailed results within East Kent are also shown in Table 3.1, showing that Dover District's building energy consumption is generally below that of neighbouring Council's.

**Table 4: East Kent local authority energy consumption per consumer (BERR, 2006)**

| | Average electricity sale per consumer | | Average gas sale per consumer | |
|---|---|---|---|---|
| | Domestic kWh | Commercial and industrial kWh | Domestic kWh | Commercial and industrial kWh |
| Ashford | 4936 | 53922 | 16803 | 487269 |
| Canterbury | 4367 | 52785 | 17720 | 431994 |
| **Dover District** | **4164** | **52839** | **16615** | **1164962** |
| Shepway | 4453 | 91743 | 16871 | 269007 |
| Swale | 4577 | 154415 | 16744 | 1621577 |
| Thanet | 4161 | 43776 | 16624 | 271819 |

Despite this positive performance, Dover has the highest percentage of homes built pre-1919 in Kent. Homes built pre-1919 almost always have solid walls and are more difficult and costly to insulate than newer stock (Housing Condition Survey 2001).

The Council has been part-funding improvements through Coldbusters, Warm Front and KASH. The Regional Housing Board has a programme of action for social housing, but the energy efficiency standards within Decent Homes are limited compared to current aspirations. Some urban wards, particularly Priory, St Radigunds, Tower Hamlets and Castle wards have been targeted as they suffer from relatively high levels of deprivation and have limited ability or willingness to pay for improvements. Future action is being organised around the Kent Health and Affordable Warmth Strategy and the Dover Carbon Management Action Plan.

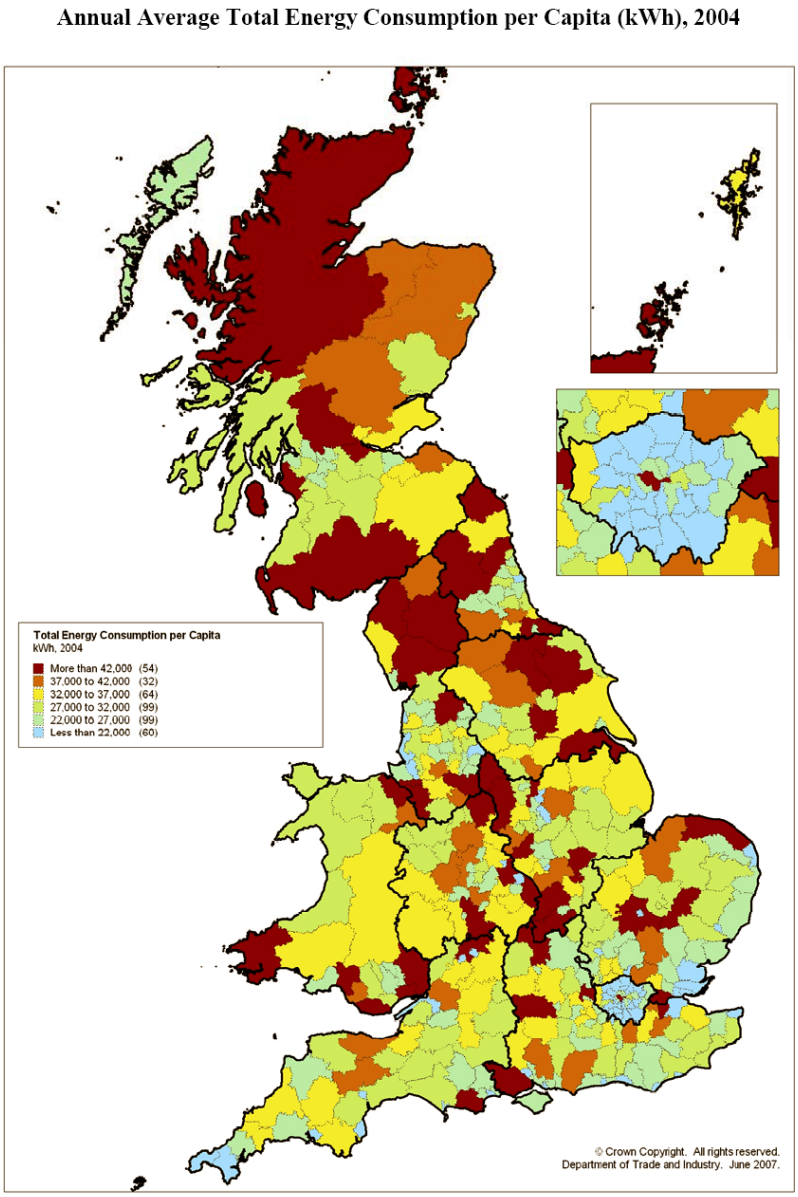



Figure 4: Annual average total energy consumption per capita

## Water

The South East's high population and low average rainfall means that the region has less water available per head than anywhere in the UK. The South East's State of the Environment Report 2007 found there was a 6% reduction in water used per person, and 4% reductions in the two preceding years. Despite the decrease in water use per person, the volume of water abstracted for public water supply increased. Four drought permits and three drought orders were issued in 2006.

Dover District is over-abstracted and dependent on aquifer supplies from boreholes. Folkestone and Dover Water Services (FDWS) has official water scarcity status and current abstraction rates are harming wildlife. FDWS has prepared a Draft Water Resources Management Plan (2008) that states that the Environment Agency could remove abstraction licenses in order to meet the Habitats Directive, resulting in a reduction of 11.7Mlitres/day of water

supply. Further reductions in supply are expected from predicted climate change, which are explained more fully in the next section.

Metering and standard water efficiency measures are being rolled out across the District. FDWS has set itself the target of achieving average daily consumption below 120 litres by 2015. Currently metered households consume 131 litres per day and unmetered consume 150 litres – the national average. 50% of FDWS customers are metered. The Water Cycle Study has recommended the 105 litres target for Dover District and encouraged the retrofitting of water efficient fittings in existing homes.

FDWS' draft Water Resources Management Plan considers that even with metering and reduced average consumption of 120 litres, from 2015 the company will need to invest in desalination plants, expected to be operational from 2026. Desalination plants are highly energy intensive and FWDS expect them to triple their current carbon emissions from water supply.

Reducing average personal water consumption to 80 litres per day generally requires some of the water demand to be met from rainwater and/or greywater sources. Rainwater and greywater can be used for external purposes such as irrigation and internal uses such as toilet flushing. As rainwater is in short supply in Dover District, greywater has the greatest potential as a future resource. Local companies have the opportunity to develop a leading edge in the provision of greywater services.

### Waste and recycling

Dover District as a waste collection authority achieved recycling rates of 8% in 2002/03, 8.5% 2003/04 and 10.5% 2004/05. Although it is encouraging to see improvements, these rates are far below the regional and national averages. 2006-07 recycling rates for Kent County Council, the disposal authority for Dover District, achieved a household recycling rate of 32%. The highest in England is Cambridgeshire at 49%, and Kent is 41st out of 121 waste disposal authorities.

The South East State of the Environment Report (2007) found that recycling rates rose 10% from 2005-06 and the amount of waste produced by households had increased by only 1% since 2000. However landfill is still the biggest method of waste disposal. Lack of landfill space and European Regulations mean this must change. The State of the Environment also reported that fly-tipping is on the increase with a 2% rise over 2006-07.

### Food production

Kent is famous for being the 'garden of England' and agricultural production remains an important economic activity within Dover District. Domestic food production, either in back gardens or allotments is difficult to monitor, but is an important part of reducing the environmental impact and improving the quality of life of the District. Parish Council's have responsibility for allotments in Dover District. In terms of physical provision, Dover has only 160 plots (for a population of approximately 28,150) and there are waiting lists for both the allotment sites at Sandwich. This is unsurprising considering that the majority of residents have access to a back garden. However, as interest in domestic food production increases, along with the scale and density of residential

development, increased provision of allotment sites is a valid matter for planning.

### 3.2 CLIMATE CHANGE IMPACTS

A vital part of the physical context for Dover District is how climate change is already affecting the district and will continue to impact on the people and natural systems of the district if it is not abated.

The Intergovernmental Panel on Climate Change (IPCC) was established by the United Nations to collate and digest the scientific consensus on climate change. A summary of their fourth report for policy makers was published in May 2007 and the final report was published in November 2007.

The report states that "Most of the observed increase in globally average temperatures since the mid-twentieth century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations." The current global average temperature rise is 0.5°C and this is due to the greenhouse gas emissions of our parents, mainly from the burning of oil, coal and gas. Global average temperatures are predicted to increase further by 1.7 – 4.2°C by 2100. There is a scientific consensus that average temperature rise of more than 2°C constitutes a dangerous level of climate change. Dover, as a coastal District and port, will be disproportionately affected by global impacts such as mass immigration and food shortages, and local impacts such as sea level rise, storms and lower rainfall.

#### Global impacts

The "Stern Review: Economic Impacts of Climate Change" was commissioned by HM Treasury and published in October 2006. It was the first substantial assessment of the effects of climate change from an economic perspective. Some of the key conclusions are:

> The "With 5-6°C warming … models estimate an average 5-10% loss in global GDP, rising to 20% of GDP or more if a wider range of risks and impacts are taken into account…"

impacts on global freshwater availability and temperatures are expected to have a significant impact on food production. Currently the UK is 60% food self-sufficient ('Ensuring the UK's Food Security in a Changing World, Defra 2008). Rising food prices and decreasing food quality and quantity are all concerns for the UK.

As an international port, Dover has a role to play in dealing with immigration. Climate change is predicted to create 150 million 'environmental refugees' by 2050, which is 1.5% of the global population. The current estimate of environmental refugees is 10 million people, or 0.2% of the global population.

Climate change is already happening, increasing the frequency of extreme weather events and reducing food availability in some areas. The World Health Organisation estimates that climate change is already causing 150,000 deaths per year.

#### Local impacts

The UK Climate Impacts Programme most recent publication, UKCIP08, has been delayed to Spring 2009. However in the meantime UKCIP02 showed that if emissions followed the IPCC high emissions scenario (current emissions growth is above this high scenario) the South East of England can expect sea level rise of 74 cm by the 2080s, summer temperatures increasing by more than 3°C by the 2050s and 30 more extremely warm summer days by the 2080s. Sea level rise may infiltrate fresh water supplies. The unusually hot summer of 2003 is estimated to have caused 2000 extra deaths in the UK, a scenario which is expected to become a normal summer within 30 years. UKCIP08 is expected to update these scenarios with impacts of greater magnitude than previously predicted.

FDWS draft Water Resources Management Plan estimates the impact of predicted climate change. The increase in drought conditions is predicted to cause an average reduction of 10.1Mlitres/day and a peak reduction of 19.2Mlitres/day. The company's assessment of 2007's deployable output was 51Mlitres/day, so the average reduction due to climate change is 20% of current supply. The company also predicted that demand would increase by 1.45% because of higher temperatures due to climate change.

#### Carbon reduction

As the Fourth IPCC Assessment Report states: "deep cuts in global [carbon dioxide] emissions will be required". The Tyndall Centre has estimated that to stop the globe from exceeding the 2°C limit, above which we can expect dangerous climate change, carbon emissions need to be reduced by 90% by 2050 from 1990 levels.

#### Adaptation

Adaptation is also important, and as part of the 'espace' project, the Environment Agency produced 'Climate Change Impacts and Spatial Planning Decision Support Guidance' (June 2008) and EDAW recommend this tool is utilised as the Core Strategy and its sister documents are developed.

### 3.3 RESULTING PHYSICAL CONTEXT JUSTIFICATIONS

Dover District will be disproportionately affected by climate change, particularly with regards to water scarcity. Climate change is already destabilising the economy and food production and will continue to kill people directly both at a local level through heat exhaustion and at a global level through increasing numbers of extreme weather events. Dover District has both a global responsibility and a local vulnerability.

This means actions must be taken to prevent climate change by reducing carbon dioxide emissions, and also that water efficiency measures must be taken to reduce water consumption. Therefore setting Code levels that include various measures to reduce carbon emissions, including dwelling emission rate targets and renewable energy targets, and also other measures such as A rated appliances and bicycle storage, are justified across the District.

As it is already the most water scarce area of the UK, Dover District must require higher standards than Building Regulations on carbon emissions and

water efficiency, and higher than national and regional standards on renewables.

The justification for the highest level of water efficiency (80 litres per day) contained within Code level 5 is also supported by the fact that to meet future demand carbon-intensive water treatment infrastructure is planned, further undermining the District's efforts to reduce emissions.

The difficulty of achieving the Code's various levels, and particularly the energy and water requirements is recognised. Therefore flexibility will be designed in to enable developers who cannot develop to the required Code level to make contributions to achieving the same carbon emissions and water savings off-site.

The age profile of the existing stock, and the fact that most of the current stock will still be in use in 2050 means that Dover District will not achieve significant reductions in carbon emissions and water use unless the existing stock is transformed. Therefore policies are required that have an impact on the existing stock through extension applications.

Dover District could seek to develop policy to cover domestic and commercial storage to encourage recycling, as the most recent published recycling rates (2004-05) are 40% below the Government target.

Dover District could seek to develop policy to cover the provision of land and facilities for domestic food production, as current provision is not meeting current demand.

# 4. Financial implications

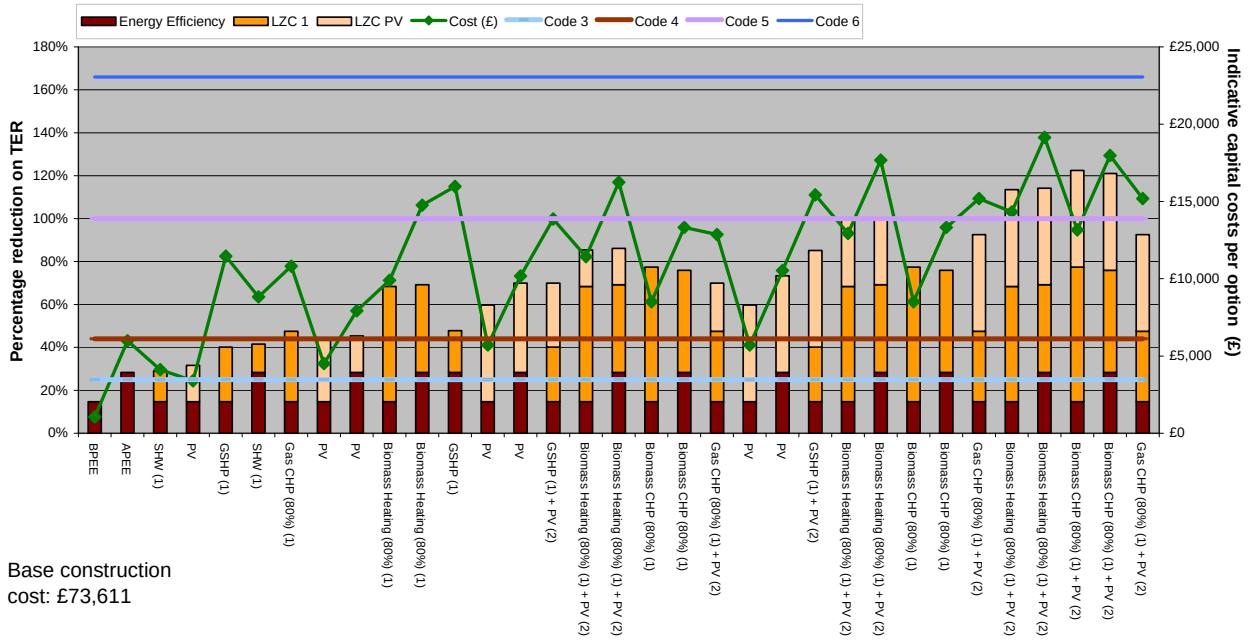
### Introduction

The recommended policy wording means that from now (2008) until 2010 the proposed policy exceeds Part L Building Regulations requirements ($CO_2$ reduction), while between 2010 and 2016 the policy requirement will be in line with the Part L Building Regulations. From 2016 Part L Building Regulations would require a higher energy performance than stated in the policy, as both regulated and unregulated emissions would have to be zero and not just regulated emissions as required by Code Level 5. Tougher Code targets are proposed for some of the strategic sites.

The ballpark costs per dwelling to achieve the mandatory energy targets aligned with Code levels are outlined in Figure 5 (multiple graphs). Costs have been split between costs for delivering the energy strategy, and costs for delivering the other required Code credits. Energy costs typically range from between 65% & 75% of the total costs of hitting the Code targets for level 4 rising to between 75 & 85% for Code level 6. This applies for flats and houses.

## 4.1 COSTS AND DELIVERY OPTIONS – FUTURE RESIDENTIAL ENERGY TARGETS

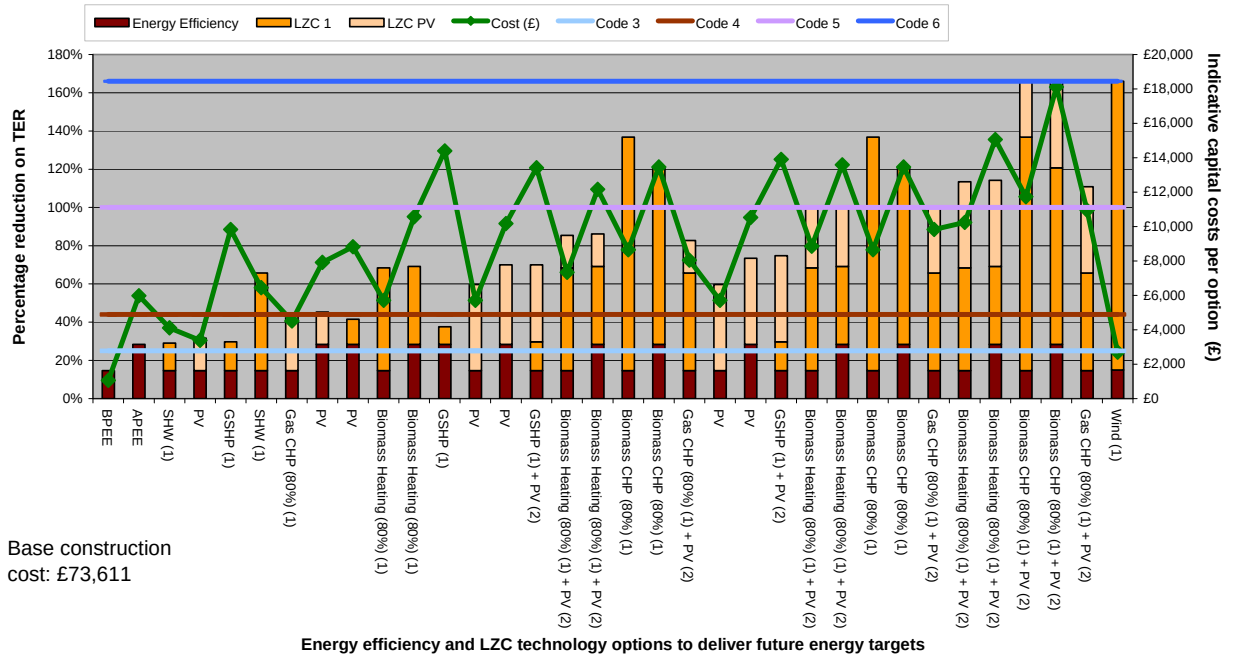
**Carbon reduction and costs of alternative energy startegy options - for a flat in a high density development.**




Base construction cost: £73,611

**Energy efficiency and LZC technology options to deliver future energy targets**

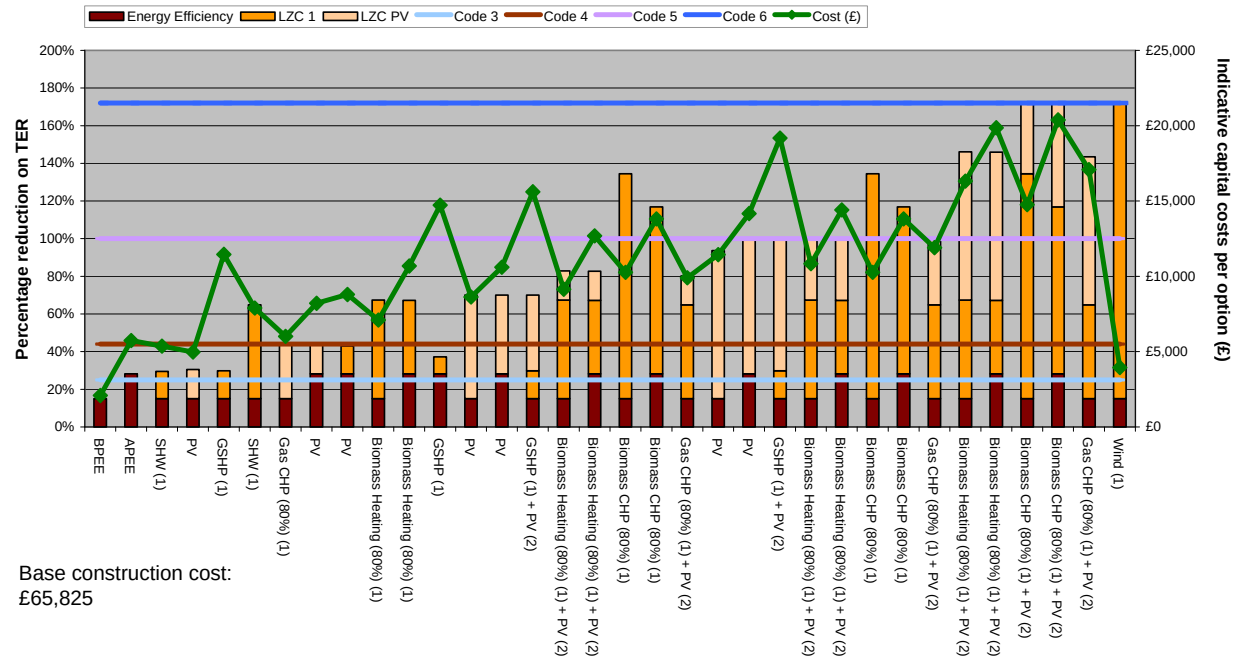
**Carbon reduction and costs of alternative energy startegy options - for a flat in a low density development.**




Base construction cost: £73,611

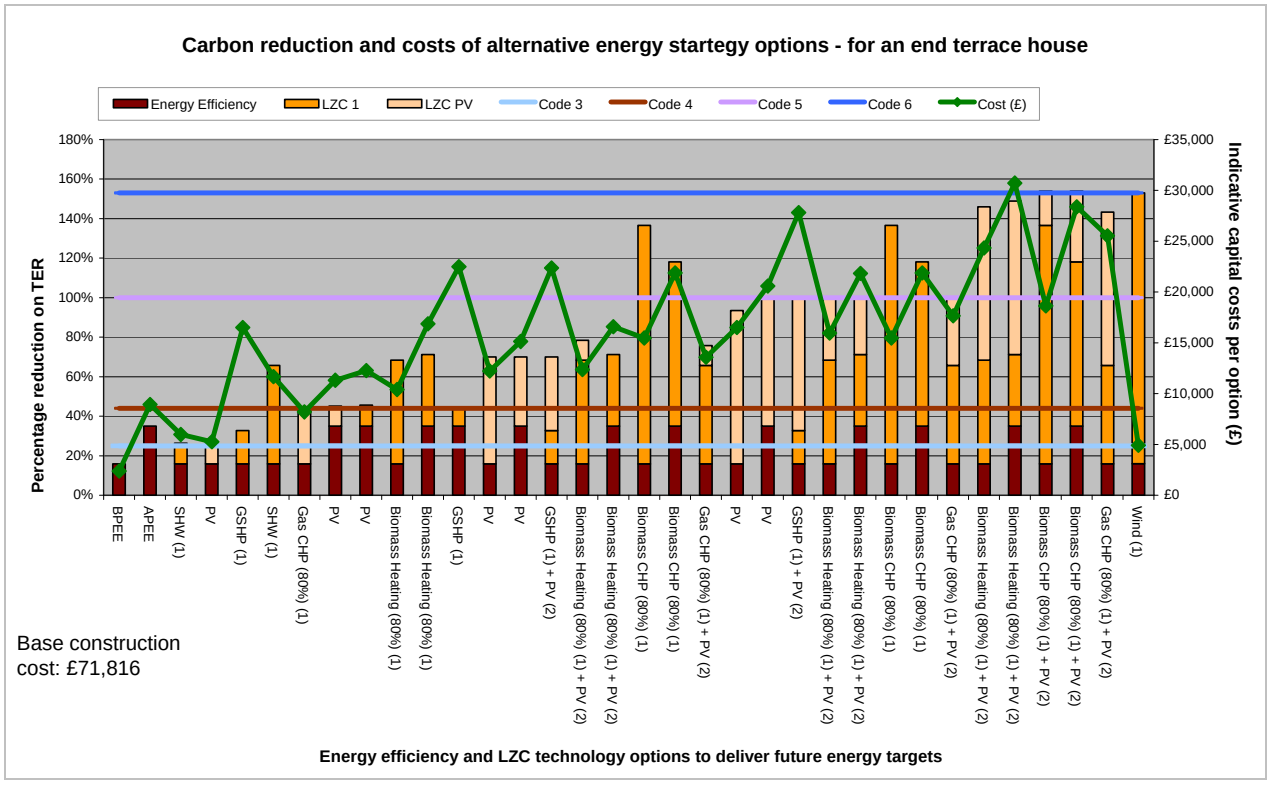
**Energy efficiency and LZC technology options to deliver future energy targets**

**Carbon reduction and costs of alternative energy startegy options - for a mid terrace house.**




Base construction cost: £65,825

**Energy efficiency and LZC technology options to deliver future energy targets**



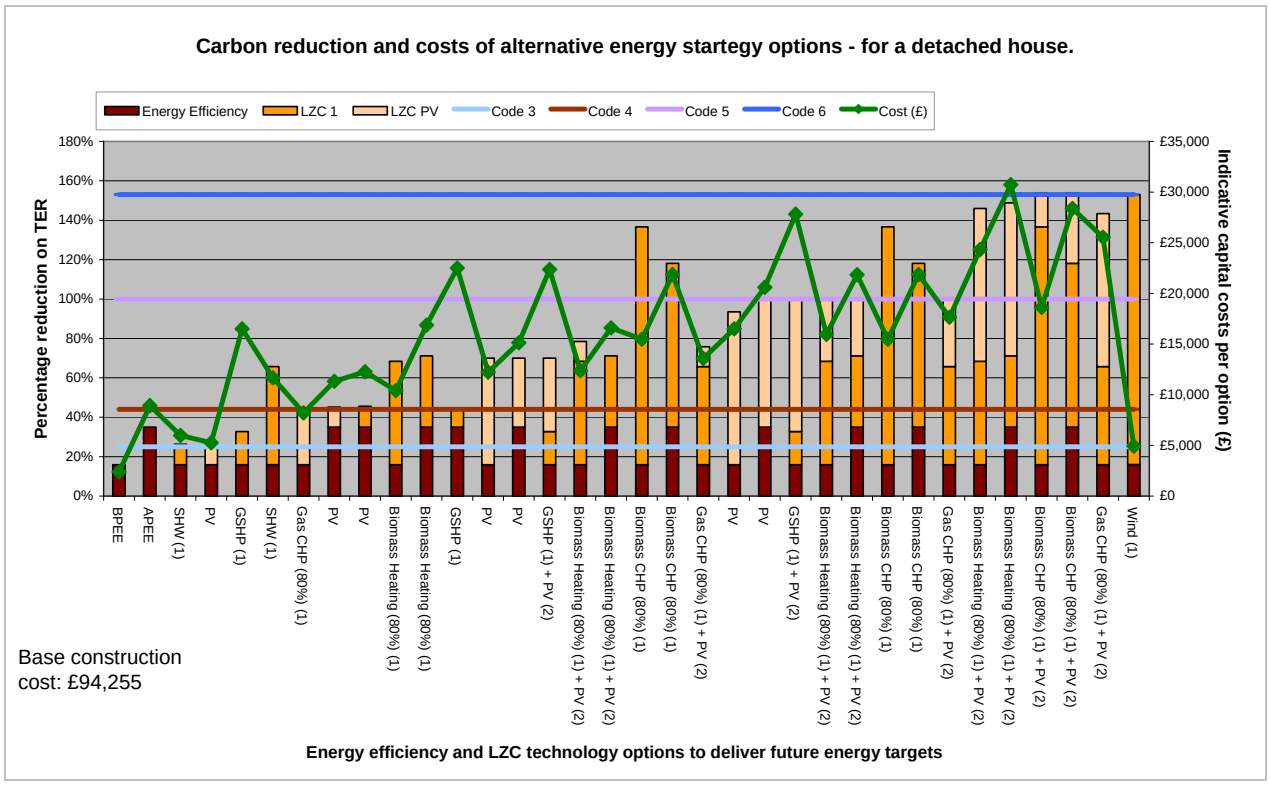




Figure 5: Possible $CO_2$ reduction and additional cost (i.e. over base construction cost) for a range of energy strategy options on 5 different housetypes. Housetypes include flat (high and low density), mid terrace, end terrace and detached.

The cost information outlined above is taken from research jointly undertaken by Faber Maunsell, Cyril Sweett and Europe Economics for Communities, Local Government. The costs were predicted, as there is no robust database of real costs available to allow benchmarks to be established. True cost information will be 'firmed up' over time, as greater numbers of projects are designed and constructed to meet these energy targets.

One very important finding from the research is that some flats in high density development (e.g. town/city centre development) are not able to meet the Code 6 targets for $CO_2$ reduction. Where these developments cannot be connected to wind turbines they rely on photovoltaics (PV) to 'top up' $CO_2$ savings from technologies such as biomass combined heat and power. In some high rise dense developments the ratio of roof area for mounting PV, relative to the floor area (number of flats) is insufficient to deliver the targets.

The proposed changes to the zero carbon definition provide a route to a lower cost solution to reducing carbon emissions, through funding retrofitting or large-scale, offsite renewable energy installations. It also improves the viability of district heating schemes, as the proposed definition will cover the export of heat to surrounding development, improving the viability of heat production. All these measures are expected to reduce the cost of meeting zero carbon targets. The Government has announced it will publish a maximum cost per tonne of carbon for these sort of solutions in 2009.

### Costs – delivering Code targets

Figure 5 and 6 below shows the % increase over the base build cost to deliver Code targets 4, 5 and 6, broken down by the assessment category areas for a flat and a house. Costs are based on the route assumed to delivering the levels as set out in Appendix D of this report. The graphs exclude the costs associated with credits ENE 1, 2 and 7 which are assumed to be covered in the costs shown above to deliver the mandatory energy requirements.

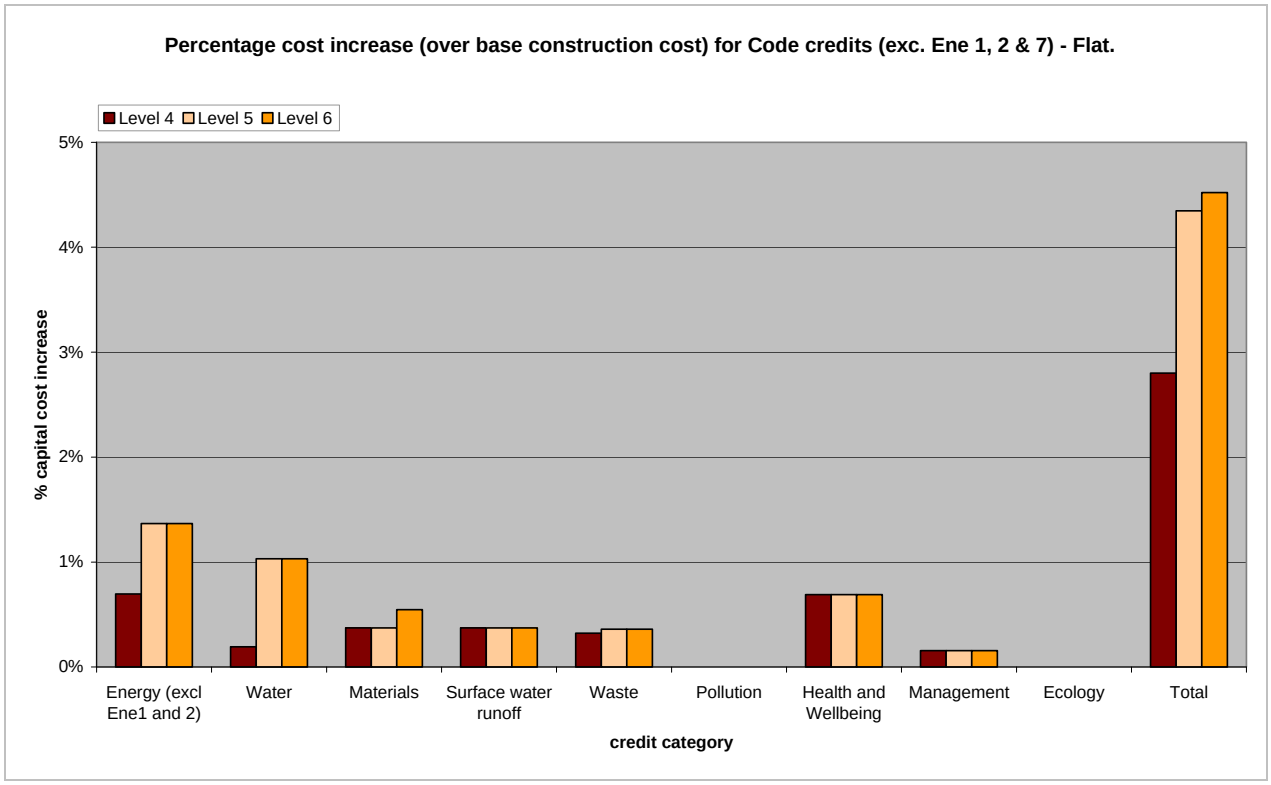



Figure 6: Costs (over base construction cost) for delivering Code credits as required to levels 4, 5 & 6 for a flat. The routes to delivering the ratings are set out in Appendix D of this report.

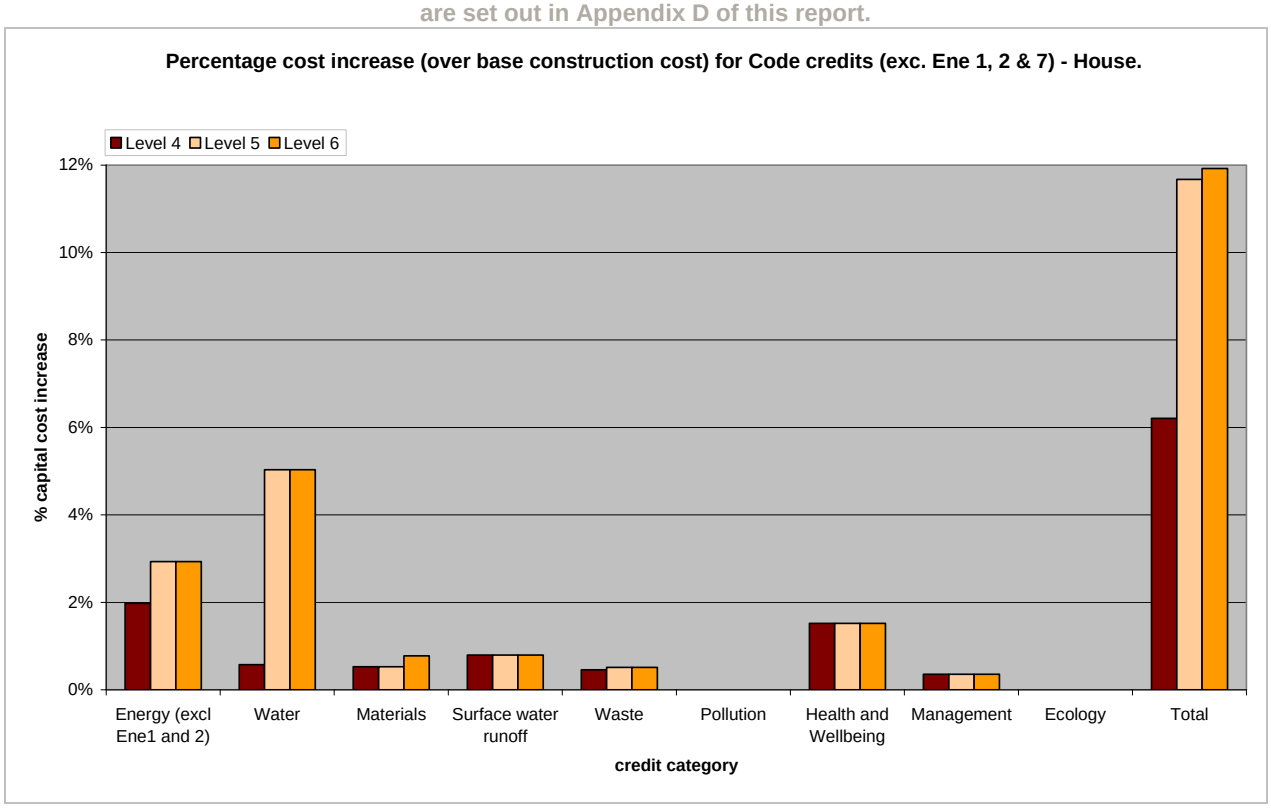



Figure 7: Costs (over base construction cost) for delivering Code credits as required to levels 4, 5 & 6 for a house. The routes to delivering the ratings are set out in Appendix D of this report.

Costs are taken from a Cyril Sweett report produced for Communities Local Government (CLG) entitled: Cost analysis of the Code for Sustainable Homes, November 2007. These costs were predicted, and are not yet fully supported by the development industry. Only a *'hand full'* of real Code assessments have been completed so there is not yet sufficient final cost data to establish robust cost benchmarks.

#### Costs and delivery options – future non - residential energy targets

There is very little published information providing costs to deliver future energy targets in non-residential buildings. A number of research projects are ongoing to establish likely energy strategies and costs to meet energy targets in various different types of non-residential building.

A limited amount of information is available providing high level costs to deliver zero carbon schools. The report: Putting a price on sustainable schools, BRE Trust and Faithful & Gould, 2008 suggests an uplift of between 2.7 and 15.3% to deliver a zero carbon schools (secondary) and 2.1 – 9.8% for primary schools. Some costs are also provided for alternative low and zero carbon technologies (specifically biomass heating) used in schools in work produced by Faber Maunsell for DfES (now DCSF)[2] although these costs are not set within the context of overall construction cost.

In the case of district heating Combined Heat and Power options there can be advantages in serving both residential and non residential buildings as their different load profiles can increase run time and therefore system efficiency. Costs efficiencies could also potentially be realised by serving a number of buildings or developments.

### 4.2 COSTS OF DELIVERING BREEAM TARGETS

Figure 8 below shows the % increase on the base build cost to deliver Good, Very Good and Excellent ratings under BREEAM Offices (2004) and BREEAM Schools. Both costing exercises were led by the BRE Trust. They were supported by Cyril Sweet for the Office costing exercise (Putting a price on sustainability, BRE Trust and Cyrill Sweett, 2005) and Faithful & Gould for the Schools work (Putting a price on sustainable schools, BRE Trust and Faithful & Gould, 2008). The costs shown in Figure 8 under 'school' are for a secondary school block of 3,116m$^2$.

We are not aware of any published cost data on meeting BREEAM office targets since 2004, certainly none is yet available showing the costs of delivering BREEAM Offices 2008, which contains a number of fairly significant changes, compared with earlier BREEAM versions.

Companies can claim both Enhanced Capital Allowances (ECA) and Carbon Trust grants to help them invest in Combined Heat and Power, renewables and other low and zero carbon technologies.

2 www.teachernet.gov.uk/management/resourcesfinanceandbuilding/schoolbuildings/sustainability/renewableenergy/carbontargets/

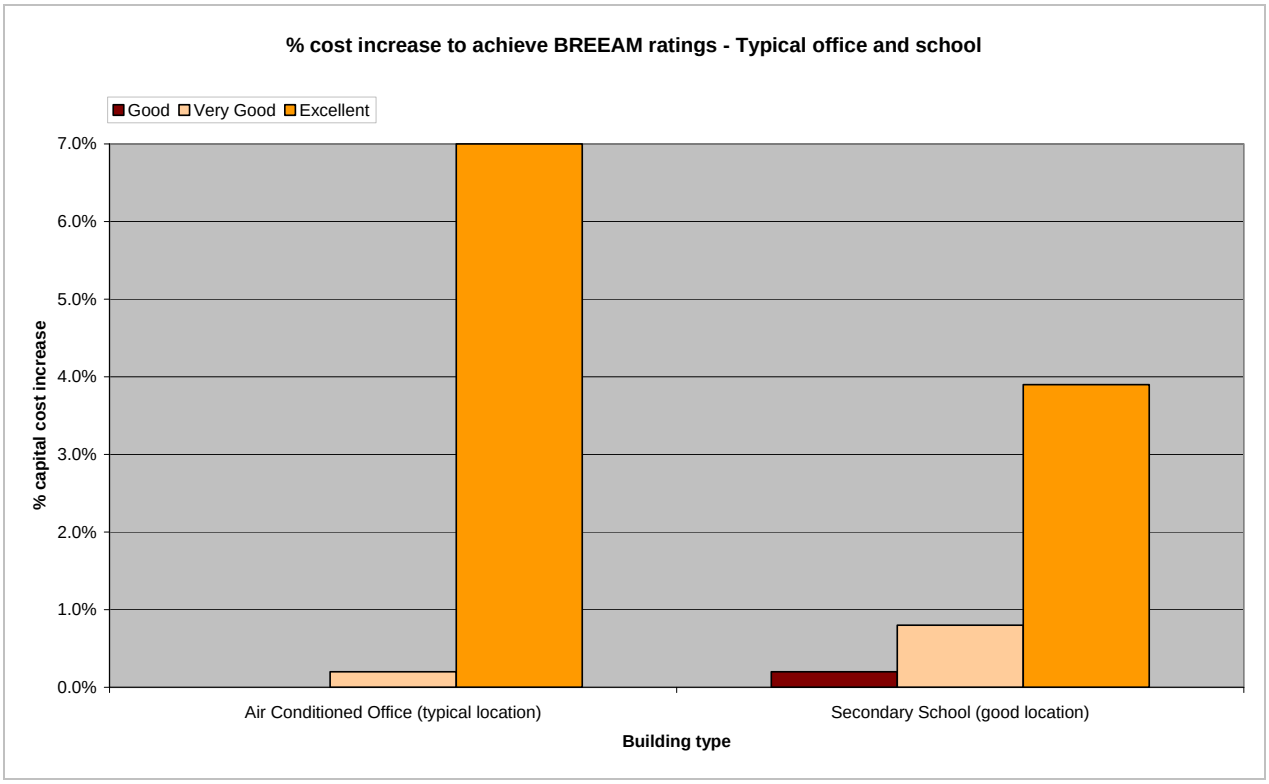



**Figure 8: Costs (over base construction cost) for delivering BREEAM Offices (2004) and BREEAM schools ratings.**

### 4.3 DELIVERY, PARTNERING ARRANGEMENTS, TECHNOLOGY LEARNING AND ECONOMIC BENEFITS

There is the potential for third party contributions towards the energy infrastructure required to deliver low and zero carbon development. Developers should be encouraged to partner with a utility or Energy Services Company ESCO at the earliest stages of project development. These companies (in some instances) may be willing to invest capital for long term returns from utility bill income.

Often ESCO models can become more financially attractive where other services such as water and telecoms are grouped in, in what is known as a multi utility service company (MUSCO). In the past some ESCO financial models have relied on exemptions from energy market licensing. Developers should be aware that market regulators are currently reviewing the licensing regime which applies to distributed electricity generation.

Utility companies may also be interested in possible revenue from Renewables Obligations (RO), although care needs to be taken not to 'double count' the potential carbon savings from installed renewables. In theory the RO's from renewables used to deliver $CO_2$ reductions to meet Code targets should be retired.

As housing across England will be required to meet building regulations, the costs of meeting requirements can be expected to reduce as an economy of scale is achieved. This is known as 'technology learning'. The theory is that for every doubling of manufacturing capacity, end costs are reduced by 50%.

Learning applies at global and local scales, the UK's zero carbon policy is expected to have an impact on local learning for renewable and low carbon technologies.

Linked to technology learning, there is the potential for significant economic and employment growth due to developing water efficiency and renewable energy goods and services within the District. The European Union has estimated that the 15 core European countries could see 2 million jobs created in renewable energy by 2020. SEEDA has estimated this could mean 10,000 jobs for the South East. Further jobs could be created through Dover District becoming a centre of excellence in water efficiency.

### 4.4 RESULTING POLICY JUSTIFICATIONS

The current costs for achieving Code levels 3, 4, 5 and 6 and BREEAM Very Good and Excellent are significant. However costs can be reduced by using ECA and grants, and costs are also expected to reduce as Building Regulations require improvements in carbon emissions and water efficiency. The benefits of stopping climate change and reducing water vulnerability are difficult to quantify: the Stern Review suggested that the costs of stopping climate change were approximately 1% of global GDP per year, whereas the costs of doing nothing could be 20% of global GDP per year by 2050.

However, deliverability is key, so to take account of recent Government consultation on the definition of zero carbon, local aspirations for the scale of housing and commercial development delivery and to ensure that requirements for affordable housing are met, a policy allowing funding for off-site improvements in carbon emissions and water efficiency is justified. This will also take into account the difficulties of smaller sites in meeting Code and BREEAM requirements.

# 5. Proposed policies

### 5.1 POLICY RECOMMENDATIONS:

**1. Core Strategy – Policy DM 3 changed to;**

"All new developments are required to meet Code for Sustainable Homes standards or equivalent. New developments are required to meet Code level 3 with immediate effect (from granting of permission), at least Code level 4 from 1st April 2013 and at least Code level 5 from 1st April 2016.

All new non-residential developments over 1000m2 gross are required to meet BREEAM Very Good or equivalent with immediate effect (relevant versions cover offices, retail, industrial, education and healthcare).

More information and supporting guidance will be provided with the Development Contributions SPD.

***Notes for accompanying planning documents and tools:***

Planning applications will require credit scoring strategies and pre-assessments for the required Code for Sustainable Homes or BREEAM levels. Planning conditions will be set to require interim and final Code certificates and post-construction BREEAM certificates as appropriate.

The 1000m2 gross threshold is derived from Government guidance on the scale of major development. Non-residential development below the threshold is expected to face significantly higher unit costs to achieve BREEAM ratings.

**Development Contributions SPD (or future Community Infrastructure Levy)**

For new developments that cannot meet the carbon and water reduction targets in DM3 onsite and for new non-residential developments of less than 1000m2 gross, applicants must achieve commensurate energy and water savings elsewhere in Dover District.

The actions or sums paid must achieve the difference between the onsite performance of the development and the immediate, 2013 and 2016 energy and water standards expected for developments. Dover District will publish updates concerning details of the energy and water efficiency schemes that will be eligible and the cost per tonne of CO2 and per m3 of water saved.

Applicants must prove they cannot meet requirements onsite through an open book accounting approach to show the development would not go ahead.

**Funding Model**

Funding levels will need to be set to reflect District needs and priorities to reduce energy and water use. This will be informed by Regional renewable

energy targets; the Government definition of zero carbon and the related list of allowable solutions; and local initiatives to improve existing residential and non-residential buildings.

### 2. Core Strategy – new policy;

"Planning conditions will be applied to all domestic and commercial extensions and conversions to require cost effective energy and water efficiency measures to be included, aiming for no net increase in energy or water demand from the property."

#### *Notes for accompanying planning documents and tools*

An updateable list of 'cost-effective' measures that can reasonably be included in standard buildings should be available from the Council.

This policy does not mean that the Code for Sustainable Homes will be applied to the existing stock: the Code applies only to new build.

# 6. Delivery of policy requirements: District-wide implications for renewable energy provision and energy related carbon reduction

To test and monitor the effects of the proposed policy requirements targets on district wide infrastructure and funding needs as well as contribution to wider regional and national targets related to energy specifically, EDAW and Faber Maunsell have developed a modelling base for the Dover District covering the core strategy period from 2006-2026. Energy and carbon reduction are key issues in the UK policy environment, and as such, the proposed policies are tested here to demonstrate the effect that requirements for new development will have on wider energy/carbon targets, and the residual needs for energy infrastructure that Dover District will need to meet those targets. The modelling has tested various policy and development scenarios to demonstrate the effects that the proposed policies may have spatially and on a district-wide scale. The modelling considers the impact of sustainable construction initiatives against regional targets for carbon reduction and renewable energy provision to inform the targeting of the most beneficial initiatives for funding. The methodology that was adopted in the modelling is discussed in the sections below.

## 6.1 SCENARIOS FOR FUTURE DEMANDS OF EXISTING BUILDINGS

The energy demand across the Dover District at the beginning of the Core Strategy period (2006) and its spatial distribution has been established using energy use data for existing residential and non-residential development from the Department for Business, Enterprise & Regulatory Reform (BERR)[3]. This data provides a starting point for the modelling and the prediction of the effects of core strategy policies for sustainable construction on energy demand and renewable energy provision. The figure below demonstrates the scale of energy use, divided into electricity and gas demand, across the district and the division by sector (residential or non-residential).

[3] BERR Regional Energy Statistics (http://www.berr.gov.uk/whatwedo/energy/statistics/regional/index.html)

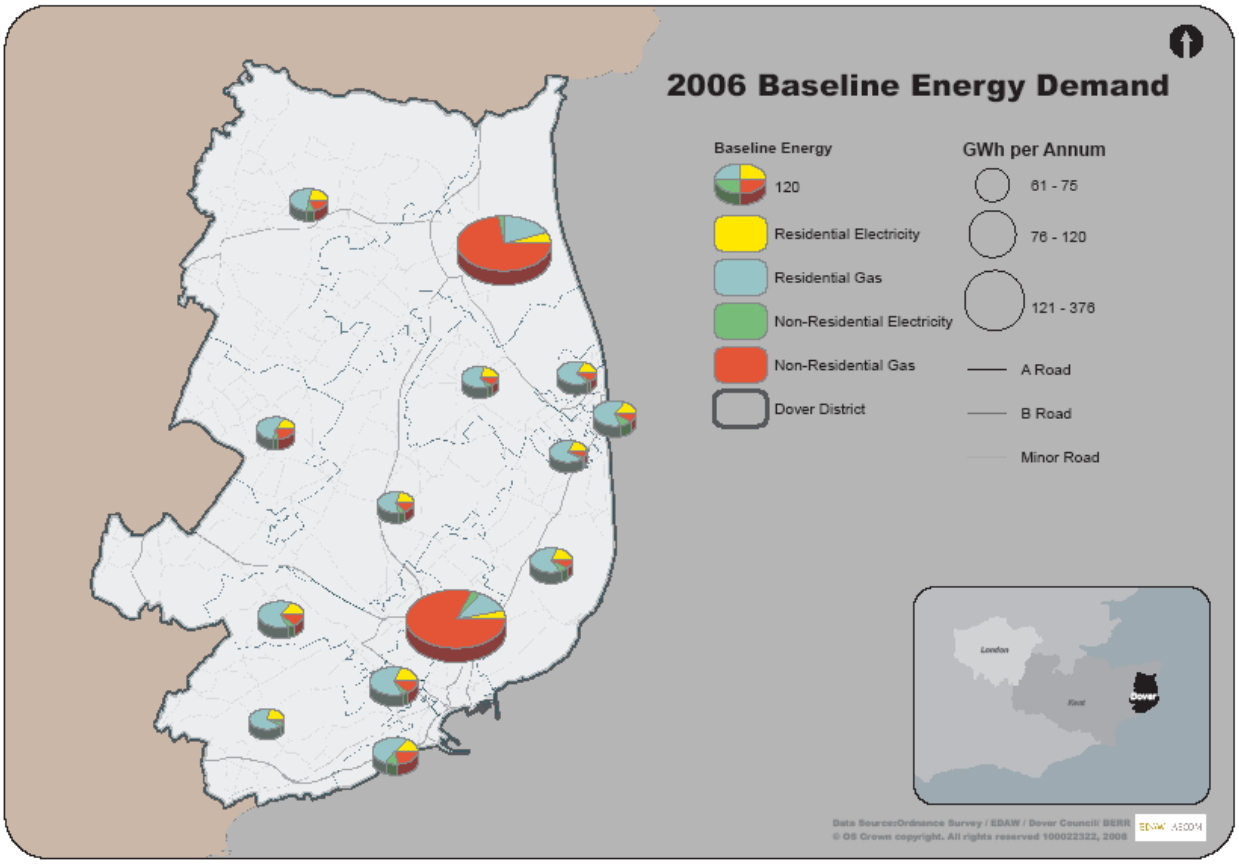



Figure 9: Baseline energy demand across the District in 2006

The distribution of energy use in Dover District shows two large areas of energy use; the area around Dover and the Sandwich area where industrial energy uses dominate. The BERR statistics have been utilised here as they are most comprehensive data set available on a defined locational level and they provide a comparison between residential and non-residential demand. However as a rule of thumb, one would expect gas demand and electricity demand to be similar, and hence the data is surprisingly skewed towards gas use. Hence there is a level of uncertainty associated with the data.

### Expected improvement of existing buildings

Independent of the introduction of core strategy policies, under The Home Energy Conservation Act 1995 (HECA) requires every UK local authority with housing responsibilities to prepare, publish and submit to the Secretary of State an energy conservation report identifying:

- practicable and cost-effective measures to significantly improve the energy efficiency of all residential accommodation in their area; and
- progress made in implementing the measures.

Dover District has actively recognised these commitments since the introduction of HECA in 1995, and annually reports on residential energy demand and reductions that have been achieved. Over the period from 1996 to 2006, Dover District had achieved over a 20% saving on energy demand in the District compared to the 1996 baseline demand (see graph below), which is on target with the national requirements. The majority of these energy

savings has been made through reduction of heating demand through improvements to the built form. Based on energy survey data in Dover District (local HECA report), the model assumes 25% electricity and 75% gas in the reductions made to existing homes.

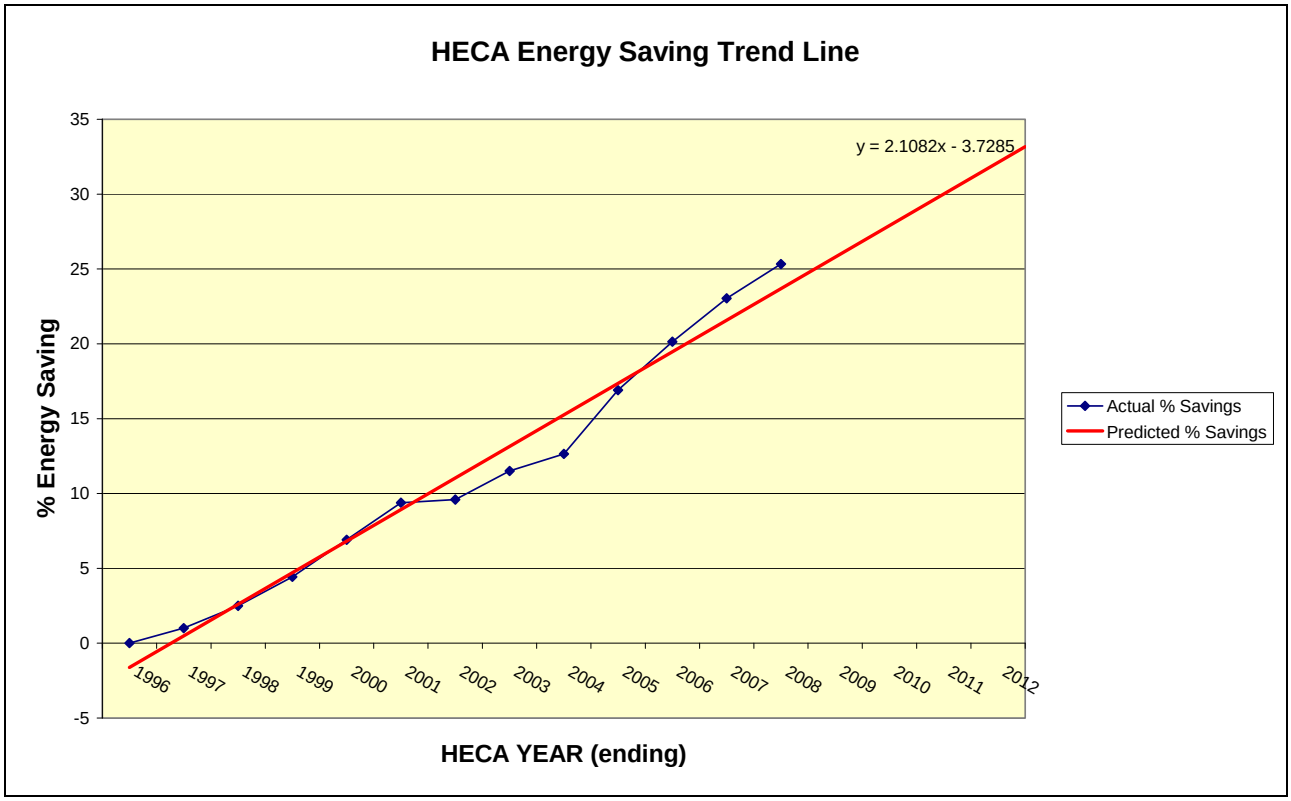



**Figure 10: Predicted % Energy Savings and Actual % Energy Savings for Dover District against 1996 baseline**[4]

Information from Dover District Council's Energy Efficiency Officer suggests that simple and relatively cheap insulation improvements to existing stock will be complete by 2015. Following that, a funding injection will be needed to encourage the reduction of energy demands through replacement of inefficient boilers and addition of micro generation.

The energy efficiency of existing non-residential buildings is not monitored to the same degree in the UK, and similarly initiatives to reduce energy demand are not coordinated or dictated by targets and regulation. The Carbon Trust[5] aims to decrease existing non-residential energy demand by 20% by 2020.

### Policy Scenario Modelling

Following the policy recommendations, if a fund is collected to reduce energy use in the district as a whole, a component of that may include improvement of the existing stock. Here, we test two scenarios, to test the expected improvement without funding, and an increased improvement if additional

[4] Information sourced from Dover District Council Energy Efficiency Officer
[5] Carbon Trust has released a guide 'Low Carbon Refurbishment of Buildings' to enable reduction of energy use in existing non-commercial buildings

funding became available. The modelling has been used to test two scenarios as follows.

### Scenario E1: Business as usual

This scenario assumes continued initiatives under HECA to improve insulation of existing residential stock until 2015, where thereafter improvements become more costly, and % improvements decrease. Improvements to existing non-residential buildings are assumed to be limited, reducing by 10% over the Plan Period.

### Scenario E2: Targeted funding through development policy

This scenario assumes targeted funding enables improvement to existing homes to continue at the current rate until the end of the plan period, and assumes that non-residential stock is targeted, and that the Carbon Trust's target of a 20% reduction is achieved around 2020.

#### Commentary of results

Existing buildings use a very large amount of energy compared with the energy demand that will come forward through new development over the Plan period. Improvement of existing stock is arguably more cost-effective to reduce carbon emissions, at least in the short term. Dover District has consistently been improving existing residential stock since 1995 (while also improving thermal comfort and reducing costs to residents), and therefore the cheapest and easiest methods for reducing carbon emissions from existing stock have to some extent already been achieved. Dover District Council predicts that simple insulation measures will be exhausted in existing homes by 2015, and then more expensive boiler improvements and energy generation will be needed to maintain energy use reduction levels. Even so, improvements to existing homes are still likely to be more cost and carbon effective than additional requirements on new stock built under more stringent regulation. Improvements to non-residential uses are much more varied in scope and current initiatives are unmonitored and not coordinated by a central body. Large gains in energy efficiency in the District could potentially be made through targeted improvements of commercial and industrial buildings and processes. Therefore, funding of additional and more challenging improvements to existing buildings should be a key target of funding gained through policy requirements.

**Scenario E1** | **Scenario E2**

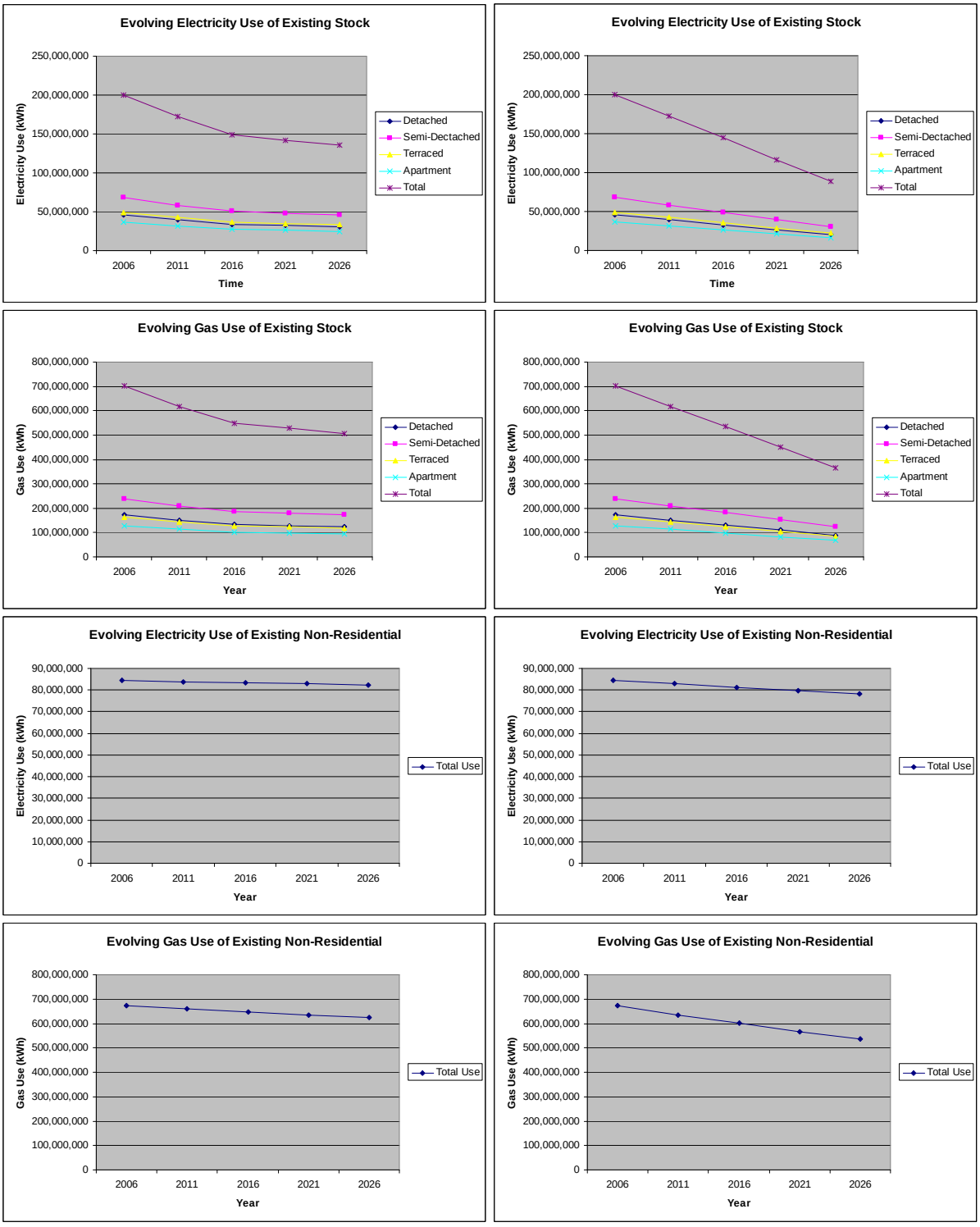



Figure 11: Graphical demonstration of E1 and E2

Table 5: Comparison of Scenario E1 and E2 results

| Scenario E1 | 2006 | 2011 | 2016 | 2021 | 2026 |
|---|---|---|---|---|---|
| Electricity Demand (GWh) | 284 | 256 | 232 | 225 | 218 |
| Gas Demand (GWh) | 1,374 | 1,278 | 1,195 | 1,163 | 1,131 |
| Total CO2 Emissions (tonnes) | 386,524 | 355,946 | 329,675 | 320,494 | 311,358 |
| Carbon Saving against 2006 Baseline | 0 | 30,578 | 56,849 | 66,030 | 75,166 |
| Scenario E2 | 2006 | 2011 | 2016 | 2021 | 2026 |
| Electricity Demand (GWh) | 284 | 255 | 226 | 197 | 167 |
| Gas Demand (GWh) | 1,374 | 1,254 | 1,135 | 1,018 | 903 |
| Total CO2 Emissions (tonnes) | 386,524 | 350,760 | 315,402 | 280,430 | 245,821 |
| Carbon Saving against 2006 Baseline | 0 | 35,764 | 71,122 | 106,094 | 140,703 |

### 6.2 SCENARIOS FOR FUTURE DEMANDS OF NEW DEVELOPMENT

The energy demand of future development will depend on the energy efficiency of the build. Code for Sustainable Homes' increasing levels require an increasing standard of energy efficiency. In a typical energy strategy, demand reduction is addressed first, and then energy generation on-site is supplied after that to supplement the carbon reduction. It is possible to meet Code Level 3 on energy efficiency improvements alone, but higher code levels require some level of on-site energy generation.

Faber Maunsell have recently undertaken detailed modelling of the expected demand of new development built to differing standards of energy efficiency.[6] These energy use profiles have been used within the modelling. There are three energy profiles for residential housing: standard (current building regulation compliant), best practice and advanced. There are a further set of dual profiles, standard and best practice, for each of the non-residential building types tested in this model: Office, Retail, Education and Healthcare. These types of non-residential development mirror those that are expected alongside the growth strategies for Dover District.

The evidence base within this report concluded that there is no unique basis for Dover District to require energy standards in advance of the proposed and challenging changes to building regulations, except on strategic exemplar sites where there is the opportunity to have large-scale impact. Therefore the scenarios tested here assume that the changes to building regulations that have been indicated by government will be enforced: 25% carbon reduction by 2010, 44% by 2014 and zero carbon by 2016. The vision for the requirements for non-residential development is less clear, with an overall target of zero carbon by 2019 expected, but no intermediate milestones known. As energy

[6] Based on research jointly undertaken by Faber Maunsell, Cyril Sweett and Europe Economics for Communities, Local Government.

efficiency is likely to be improved in advance of reaching zero carbon (where energy generation will also be required), both scenarios assume that the non-residential built form will match a standard energy profile until 2016, and thereafter it will match a best practice profile.

The expected range of housetypes to be delivered will greatly affect the energy demand of new development. This is because the energy profile changes in different housetypes due to a range of factors. One of the key reasons is that houses with detached walls lose more much more heat. The difference in heat loss by housetype is demonstrated in the Figure below.

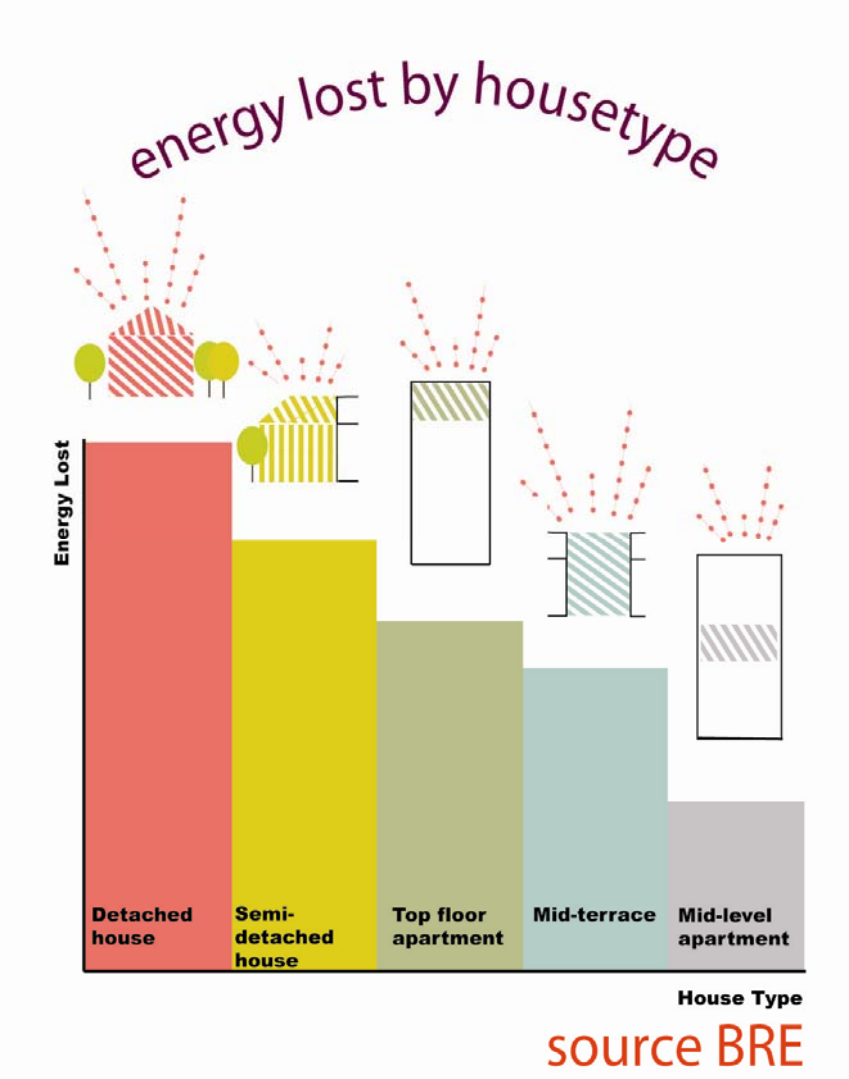



Figure 12: Energy lost according to housetype

The mix of housetypes is related to an overall density of development; lower density development has a greater number of detached or semi-detached housetypes, while higher densities will have a greater proportion of terraced houses and apartments in order to increase the number of units in an area. The quality and character of a place is affected by density to some extent, though good design is needed to deliver good place-making at any density. To remain in keeping with the character of an area, and also to respond to

differing land demands, it is likely that higher densities will be delivered in more urban areas, while rural developments are likely to be of a lower density.

### Policy Scenario Modelling

The policy scenarios test both growth option 3 and growth option 4 as defined by the Core Strategy. All scenarios assume that the anticipated changes in building regulations will come into place, meaning that higher performing build types will be expected over time. The scenarios test the difference in energy demand through the provision of different housetype densities as controlled by density. Two density scenarios are tested:

*A market derived mix*: where housing delivery follows the desired housetype mix resulting from a survey of the South Kent area[7]

*A character derived mix*: where a slightly higher density is assumed to be delivered in the more urban wards surrounding the three main centres (Dover, Sandwich and Deal) where a higher density would fit with character. See the figure below for the classification of more urban and less urban wards assumed in this analysis.

The table below shows the assumed housetype mixes.

**Table 6: Comparison of Scenario E1 and E2 results**

| Housetype Mix | | Detached | Semi-detached | Terraced | Apartments | Equivalent Density |
|---|---|---|---|---|---|---|
| Market Derived Mix | All Wards | 31.90% | 36.80% | 20.20% | 11.10% | 43 |
| Character Derived Mix | More Urban Wards | 10.00% | 25.00% | 50.00% | 15.00% | 55 |
| | Less Urban Wards | 31.90% | 36.80% | 20.20% | 11.10% | 43 |

[7] 'A strategic Housing Market Assessment for the East Kent Sub Region', Ecotech, August 2008

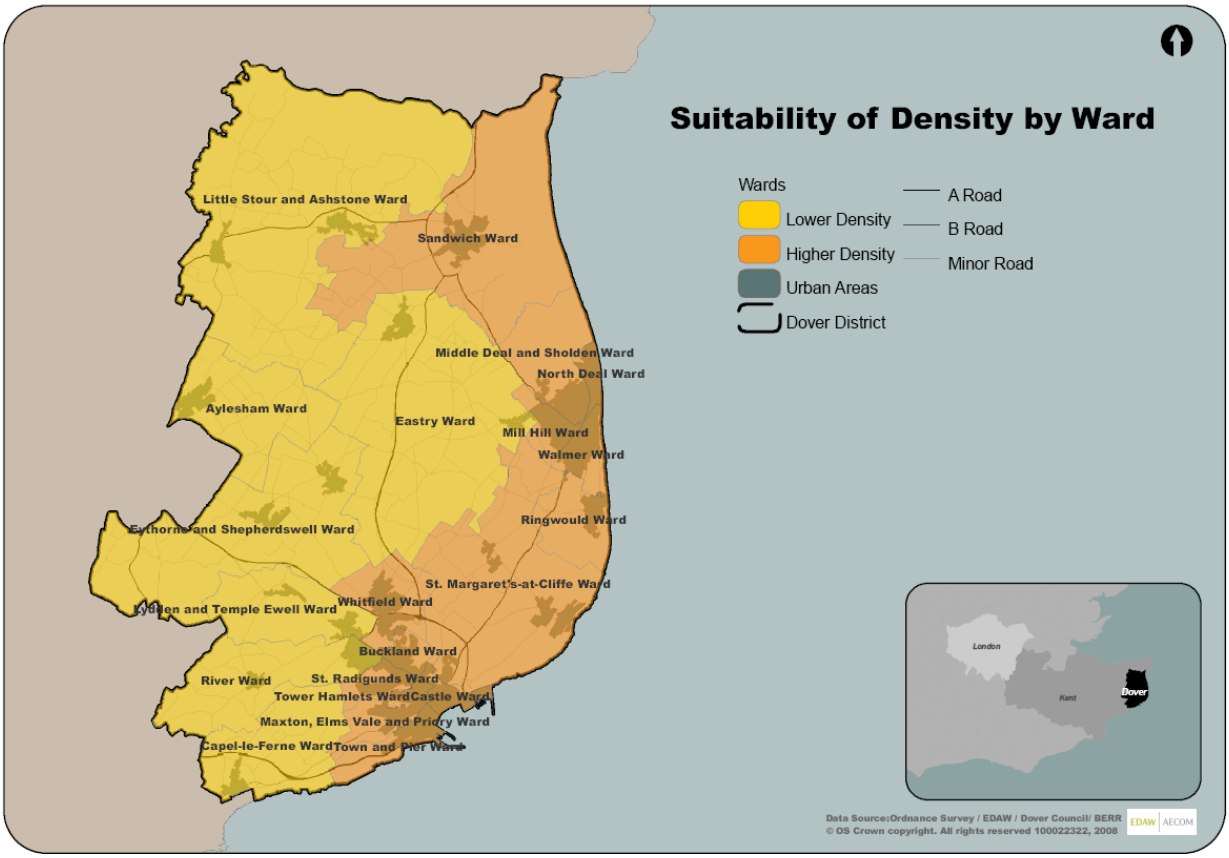



Figure 13: Assumed character classifications of more urban and less urban wards suitable for different levels of density

Using these housetype mixes, the following scenarios have been tested:

### Scenario N1: Option 3 Growth with market-driven densities

With the above assumptions, this growth option tests the expected energy demand and location of that demand for growth Option 3 of the draft core strategy. This Option expects 10,000 new homes over the Plan period. An average density is assumed in every ward, matching current market aspirations for housetypes.

### Scenario N2: Option 3 Growth with character-driven densities

This scenario tests Option 3 growth, with higher average densities enforced in the more urban wards, which changes the house type mix.

### Scenario N3: Option 4 Growth with market-driven densities

With the above assumptions, this growth option tests the expected energy demand and location of that demand for growth Option 4 of the draft core strategy. This Option expects 14,000 new homes over the Plan period. The housetype profile matches market drivers.

### Scenario N4: Option 4 Growth with character-driven densities

This scenario tests Option 4 growth, with higher average densities enforced in the more urban wards, which changes the house type mix.

### Commentary of results

The market-driven density mix has an effect on the energy demand of future development, especially the heat demand (equivalent to the gas demand). This is due to the increased energy efficiency of housetypes with a greater number of adjoining walls. Under the scenarios where the mix of housetypes is changed in more urban areas where larger scales of development are expected that could deliver a higher density mix, energy demands are expected to decrease. Density requirements should be considered, particularly for large-scale developments, to ensure an efficient energy strategy for the district is achieved.

The effects on energy and carbon emissions are shown in the table below. Note that energy demand is given here in Mega-Watthours rather than Giga-Watthours as in the above existing demand analysis. This is because the energy demand from new development over the Core Strategy period is considerably less than the total energy demand of existing buildings in Dover District.

**Table 7: Comparison of Scenario N1, N2, N3 and N4 results**

| Scenario N1 | 2006 | 2011 | 2016 | 2021 | 2026 |
|---|---|---|---|---|---|
| Electricity Demand (MWh) | 0 | 13,797 | 39,365 | 55,915 | 65,411 |
| Gas Demand (MWh) | 0 | 37,426 | 109,390 | 127,432 | 136,720 |
| Total CO2 Emissions (tonnes) | 0 | 13,083 | 37,834 | 48,318 | 54,127 |
| Scenario N2 | 2006 | 2011 | 2016 | 2021 | 2026 |
| Electricity Demand (MWh) | 0 | 13,486 | 38,669 | 54,827 | 64,018 |
| Gas Demand (MWh) | 0 | 35,930 | 106,472 | 123,780 | 132,499 |
| Total CO2 Emissions (tonnes) | 0 | 12,661 | 36,974 | 47,150 | 52,720 |
| Carbon Saving due to Higher Density | 0 | 422 | 859 | 1,168 | 1,407 |
| Scenario N1 | 2006 | 2011 | 2016 | 2021 | 2026 |
| Electricity Demand (MWh) | 0 | 13,797 | 39,740 | 61,282 | 82,008 |
| Gas Demand (MWh) | 0 | 37,426 | 109,955 | 132,922 | 153,293 |
| Total CO2 Emissions (tonnes) | 0 | 13,083 | 38,102 | 51,648 | 64,346 |
| Scenario N2 | 2006 | 2011 | 2016 | 2021 | 2026 |
| Electricity Demand (MWh) | 0 | 13,486 | 39,029 | 59,944 | 79,837 |
| Gas Demand (MWh) | 0 | 35,930 | 106,976 | 128,772 | 147,589 |
| Total CO2 Emissions (tonnes) | 0 | 12,661 | 37,224 | 50,278 | 62,324 |
| Carbon Saving due to Higher Density | 0 | 422 | 878 | 1,370 | 2,023 |

Higher density areas will also have the benefit of making more energy solutions possible through the introduction of an area-wide heating network. As a rule of thumb a density of at least 50 – 60 dwellings per hectare is needed to

ensure a heating network is cost-effective. The effects of density on the viability of district heating or combined heat and power plants are discussed in more detail in the sections below.

### 6.3 DISTRICT-WIDE RENEWABLE ENERGY POTENTIAL

Before estimating the potential for the delivery of low carbon and renewable energy associated with future development, it is important to understand the opportunities and constraints around the use of different generation technologies in the District. A renewable energy potential study was conducted for the whole of the South-East Region in 2001[8] as part of the evidence base for the renewable energy targets and policies within the RSS. This strategy builds on that analysis, and looks at the specific potential within Dover District. As identified in the 2001 study and consequently in the RSS, the greatest opportunities for renewable energy in the Region are large (i.e. at least 80m tall turbines) onshore wind power, biomass, and solar technologies. Consequently, this study focuses on those three areas. Other renewable energy sources can be delivered within the Dover District, but these are not seen as key technologies with large-scale potential or their delivery is not within the influence of Dover District Council and development planning. The following renewable technologies are excluded from the district-wide analysis for reasoning as follows:

- Energy from waste: The 2001 study identified potential for energy from waste in Kent as a county, though any such initiative is likely to be undertaken on a county-wide scale due to governance arrangements. It is unclear where in Kent an energy from waste plant would be located.
- Energy from sewage: Similarly, energy from sewage needs to be taken forward at a wider-scale and is very dependant on existing infrastructure. Opportunities for this could be explored in partnership with other neighbouring districts.
- Energy from non-wood biomass: Biomass can come from multiple sources, including forestry waste, dedicated crops, straw, poultry litter and livestock manures. This Dover District-wide study only considers forestry waste and dedicated crop potential within Dover District. The 2001 study highlighted that the arisings from other sources of biomass in Kent were limited in comparison and may not be easily available. Where initiatives are taken the capture these sources of biomass they would be best decided strategically on a county or region-wide scale.
- Off-shore wind power: Off-shore wind installations have not been considered within this study as the surrounding sea does not fall directly within the jurisdiction of Dover District Council, and a number of other stakeholders would have to come together to deliver off-shore wind. Funding arising from new development in Dover District could however may be able to be used to fund off-shore wind power if considered more deliverable than on-shore installations.
- Hydropower: Hydropower has been excluded from this study as there are no significant sources of hydropower in the Dover District. Some micro-hydro sites may be deliverable but these are unlikely to make a significant contribution to energy generation.

[8] 'Development of a Renewable Energy Assessment and Targets for the South East', ETSU/AEA Technology and Terence O'Rourke, 2001.

- Wave energy and tidal power: The 2001 study concluded that the installation of such technologies in the South-East region is unlikely in the near future. This is due to the unfavourability of conditions compared with elsewhere in the UK.
- Geothermal energy: There is an existing geothermal plant in the Southeast region, located in Southampton. However, studies into potential elsewhere in Southern England have yet not identified sites with high potential, and it isn't expected that geothermal will be implemented in Dover District within the Core Strategy Plan period.

### Wind Energy Potential Analysis

Wind energy is currently one of a major energy generation options for Dover District, and is likely to be one of the most cost efficient compared to the current array of renewable energy generation technologies available. This study considers the wind energy potential of Dover District specifically from a desk-top study based on GIS modelling using data available. **It should be noted that this study is not a sufficient evidence base for the actual siting and delivery of wind turbines, but it gives a high level assessment of promising areas to look into further and undertake more detailed feasibility assumptions.**

Firstly it is important to understand the wind resource across Dover District. The figure below shows the range of wind speeds across the District at 45m above ground level. Generally, the wind speeds are high enough to ensure that wind power is efficient and feasible and thus worth detailed consideration. The wind power potential estimations in this study consider all areas highlighted in the figure below as having an average wind speed of 6m/s or above at (45m). From industry knowledge, this scale of wind speed is likely to be commercially viable. Higher wind speeds, above 7m/s at 45m, are likely to be more desirable, and the potential of these sites should be investigated first.

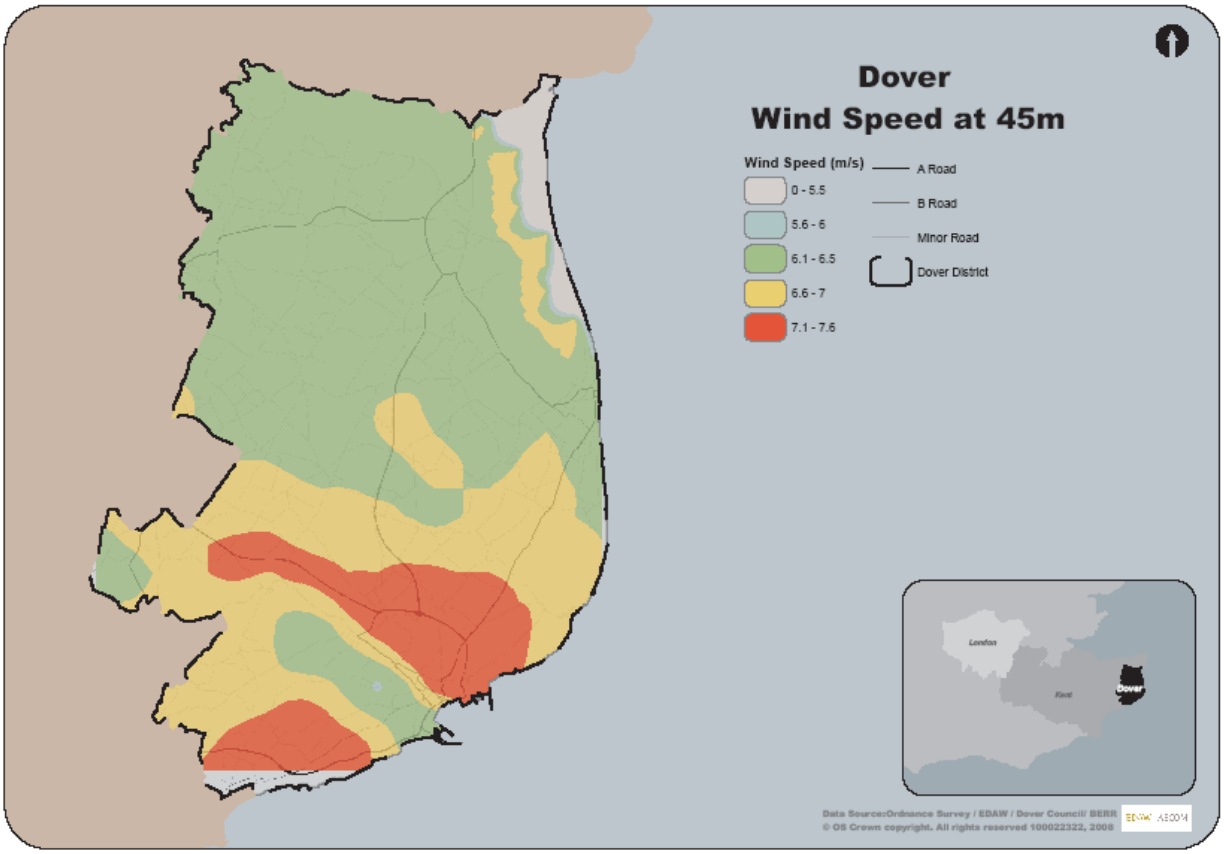



Figure 14: Wind speed distribution across the Dover District at 45m

A process of constraint mapping has been used to identify which sites are likely to have potential for wind power. Through GIS analysis, the following constraints have been included:

- Toppling Safety Buffer of 100m from roads, rail and major overhead transmission lines (approximate for a large turbine);
- 400m noise buffer from urban settlements;
- 400m buffer from designated sites of ecological or landscape significance; and
- 100m buffer from un-designated woodland and forest.

These constraints and buffers represent the industry standard and highest level of analysis for potential wind turbine siting.

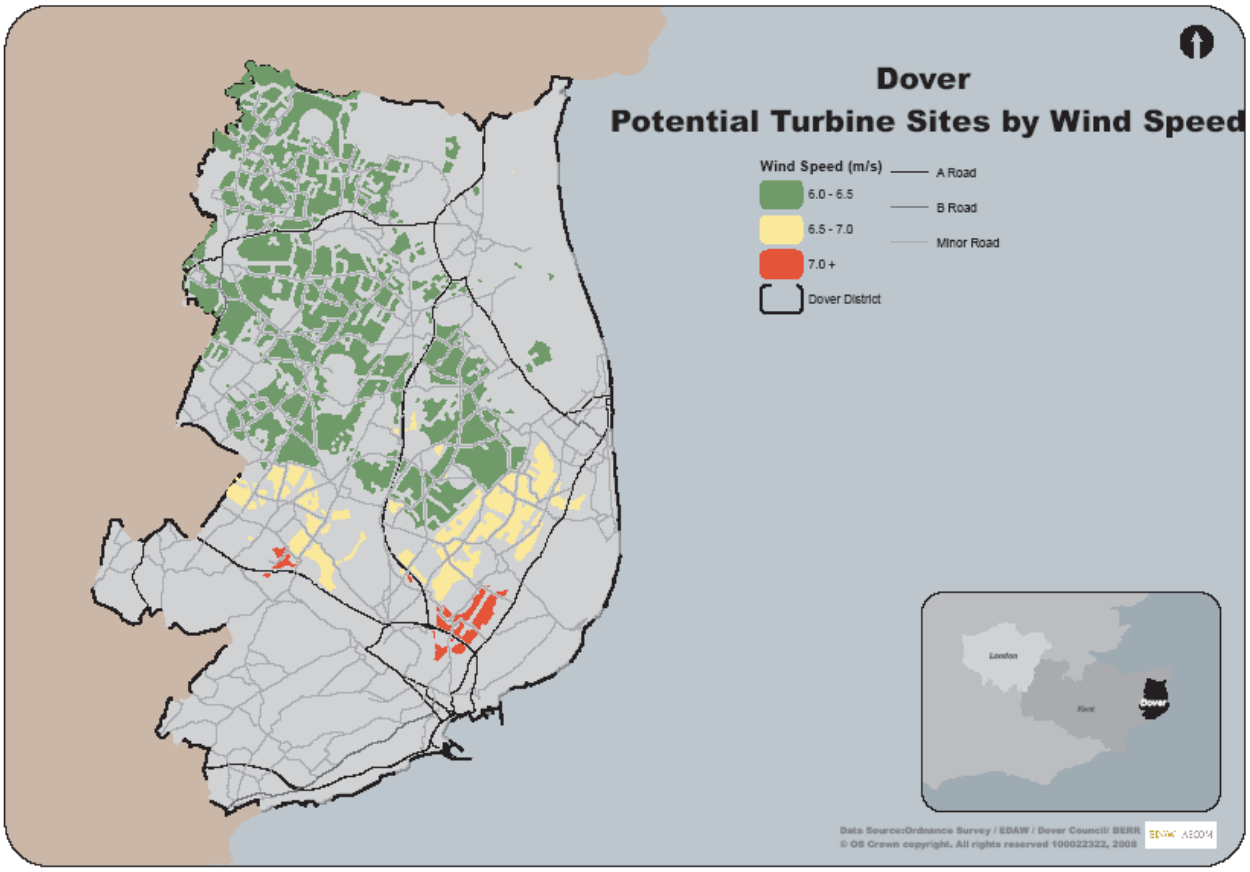



Figure 15: Areas for further investigation of wind power potential, which would need to take into account on-site constraints (see bullets below) and stakeholder consultation

The areas which have potential for further investigation are highlighted in the figure above. Further detailed feasibility studies would have to consider a number of additional siting constraints in addition to these before any site could be confirmed, including:

- Local Wind Resource Survey - Wind speeds of 5.5m/s or above at turbine hub level are needed to operate a large scale wind turbine efficiently. The national dataset for wind speeds at a height of 45m above ground level was used to examine wind speeds across Dover District. The energy output of wind turbines is extremely sensitive to the wind speed and therefore a measurement campaign should take place to ascertain exact wind speeds in the area.
- Bird Migration - An important element that will need consideration is the annual migration of birds, particularly due to the presence of important environmental sites in the area. A detailed migration survey must be conducted over a year period.
- Ecological implications – While all known sensitive ecological sites within Dover District have been mapped and considered in the assessment of potential wind turbine zones, there are other undesignated habitats, and the possible impact of wind turbines on these would have to be given careful consideration in further studies.

- Aeronautical and Defence Impacts - Radar systems associated with airports are a significant issue. Consultation will have to be undertaken with MOD and nearby airports to determine particular constraints in the area and possible mitigation strategies. Dover District is within the range of major flight paths from the UK to Europe which may impact on radar systems, and this has been highlighted as a significant issue in past wind turbine applications. Software upgrades are likely to be required to radar monitoring systems to enable wind power development in the area (and in much of the UK).
- Noise implications - Concerns over noise are usually related to perception rather than actual experience. There are no required distances between wind turbines and residences, but 400m is a rough guideline that is often used and has been adopted within this assessment. The noise impact of large scale wind turbines in Dover District will however be reduced to a large extent by the other noise emissions in the urban area from major roads, rail lines, industrial areas etc. The RSS favours sites for renewable energy development that are near major roadways or development areas. More detailed studies could produce a locally appropriate distance to manage noise effects.
- Shadow Flicker Modelling - This can be an issue at certain times of day when the wind is blowing, but effects can usually be mitigated against and has not been specifically considered at this stage. This would need to include driver distraction issues, in partnership with the Highways Agency and Kent Highways Services.
- Telecommunication Impacts - Wind turbines can interfere with radio signals, television reception and telecommunications systems. This has not been specifically assessed at this stage, but with consultation measures can be put in place to mitigate these effects.
- Landscape and Visual Impact - A detailed visual and landscape impact assessment has not been conducted at this stage. The specific sites of the turbines would have to be carefully considered to ensure that they do not detrimentally impact key view corridors and that they are well integrated into the surrounding landscape.
- Listed Building and Conservation Area impact – a detailed impact assessment has not been conducted at this stage and would be required for any further study.
- Archaeological Constraints - Any impacts on archaeology in the area will have to be assessed in more detailed studies.
- Grid connection and Sub Station Requirements – It will be necessary to carry out a detailed assessment of the opportunities and constraints presented by this existing infrastructure in relation to each turbine site.
- Gas pipelines and other sub terrain analysis - The current assessment has not assessed the presence of utility pipelines beneath the sites which would have considerable impact on the ability to site turbines.
- Transport Access Assessment per turbine - Blade section is the longest/largest full section to be delivered on site. Could be delivered by road or rail. Low access sites would require crane to assist.
- Additional losses to turbine energy output - A more detailed analysis would be required into the effect of local topography, clustering effects, hysteresis and local climatic conditions on the energy yield of the turbines.
- Impact upon land use and land management - The amount of land consumed by wind turbines is relatively small. Nevertheless, further study

should be carried out to ensure that the turbines do not have a negative footprint upon the land.

- Ground Condition Survey – The feasibility of the construction of a large turbine would have to be supported by geotechnical investigations.

The most favourable sites for further investigations in terms of wind speed are in the southern half of the District. Site-specific studies, Environmental Impact Assessments and stakeholder consultation would have to be undertaken to identify which areas are the most favoured locationally. In addition to these considerations, the Regional Spatial Strategy states that sites for the installation of renewable energy should be sited near major transport corridors or previously developed land where possible. Hence, the most favoured sites are likely to be clustered around the arterial roads and near urban areas.

### Scale of Potential

Comparatively, Dover District has a good potential for wind power as identified by the large coverage of 'unconstrained' areas in Figure 15 above. In reality, the suitability of wind power in these locations will depend on context and key issues including land ownership and ability to connect to the grid at low cost.
The wind resource potential map has been analysed assuming that 2MW turbines are distributed across Dover District to give an indication of the maximum wind energy capacity of the district. Large wind turbines require a buffer distance between them to avoid significant turbulence effects (a distance of 400m is assumed here). In theory, the sites with potential and in district combine to accommodate over 700 2MW turbines. Obviously it is not practicable to deliver this scale of wind power in tandem with other land uses, but here a percentage of site delivery has been used to test the likely scale of delivery.

Higher wind areas will be able to produce larger amount of electricity annually, and therefore these sites are favoured in the analysis. The table below gives an indicative scenario to demonstrate of the scale of effect of wind power on electricity needs in new development. Taking the broad assumption that 100% of electricity demands from all new housing in Dover District under Option 4 were to be met by off-site wind power alone, a total of 12 large turbines (2MW rating) would service the demand, utilising 7.5% of the theoretical sites available on the land in the figure 15 above. Wind power is a very effective renewable source of electricity, and while there are likely to be significant constraints on a large proportion of sites, the delivery of a limited number of turbines has the potential to provide a large amount of renewable energy. Other permutations of smaller and more numerous turbines could also be explored.

Table 8: Illustrative demonstration of wind power scale of potential

| Number of new homes to be provided with 100% renewable electricity | 14,000 | |
|---|---|---|
| Average electricity demand of new housing under scenario N3 (kWh) | 3,984 | |
| Wind energy delivery need to meet demand | % of potential sites utilised | Number of turbines |
| Wind power to be delivered in low wind areas (6-6.5 m/s) | 0.5% | 3 |
| Wind power to be delivered in low wind areas (6.5-7 m/s) | 2.0% | 3 |
| Wind power to be delivered in low wind areas (7m/s and above) | 5.0% | 6 |

The above analysis assumes the delivery of large 2MW turbines, where the height of the hub of the turbine is approximately 80m above ground level. If large turbines were undesirable on some sites, a larger number of smaller turbines could be utilised instead. The efficiency and power output of turbines decreases dramatically with reduction in size and hub height. Also costs increase as the number of turbines increases. Figure 16 below gives an indication of the various scales of turbines and the relative outputs.

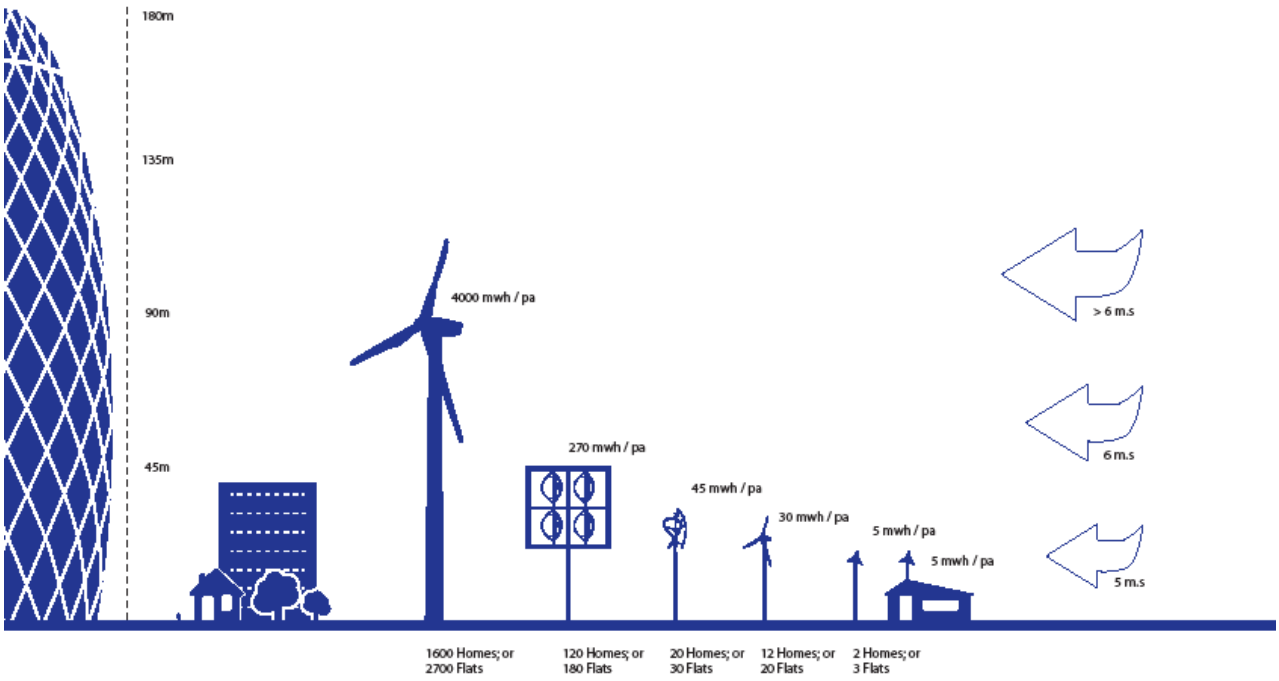


Figure 16: Scale of energy produced depending on the height of turbine (from large scale to small scale)

### Delivery Considerations for Wind Power in Dover District

The conversion of potential to delivery requires consideration of a number of factors including:

- Thorough engagement and investigations – While there is a great impetus to deliver renewable energy, and wind power has strong potential, engagement with stakeholders and thorough investigation of all effects of wind power development needs to be undertaken to locate feasible sites.
- Partnerships with electricity providers – To finance the capital investment and collect revenue, wind projects would have to partner with an electricity provider.
- Delivery mechanisms – The most efficient way of providing electricity is most likely connection to the grid rather than individual developments. A clear funding scheme would have to be put in place to establish which developments are 'offset' by this investment in electricity generation and how they contribute to that investment.

## Biomass Sourcing Potential Analysis

Biomass will be increasingly in demand for local energy generation under the proposed energy standards. Biomass from renewable sources can contribute to generation of heat through either individual biomass boilers in homes or district heating systems, and it can contribute to the generation of both heat and power through the use of a combined heat and power system (CHP). The use of CHP requires a higher tonnage of biomass fuel to produce the same amount of heat, though it also produces electricity.

There is concern in the industry that excessive specification of biomass technologies on a site-by-site basis will lead to either long-distance import of biomass material or the sacrifice of food-producing arable land to grow dedicated biomass crops. There is a need to take a district-wide approach to biomass sourcing and supply to ensure that biomass is both available for energy use, but that its use is managed and sustainable.

Consequently, the modelling within this project has tested the availability of wood-based biomass locally. Two sources of biomass have been explored:

1) Predicted arisings of waste wood from management of forestry in the Dover District area. Currently these arisings are not collected in a coordinated manner as a biomass source and most likely disposed to landfill as waste.

2) Potential contribution of dedicated biomass crops such as willow, grown in short rotation on agricultural land in the area. It is unknown how much biomass is grown in the District currently, though it is assumed to be limited.

### Scale of Potential

The figure below shows all woodland in the Dover District that will produce biomass arisings, and the various grades of agricultural land which could be used to produce dedicated biomass crops. Comparative to other parts of the

UK, Dover District has very low forest coverage, with a total of 1800 hectares of forest in the District.

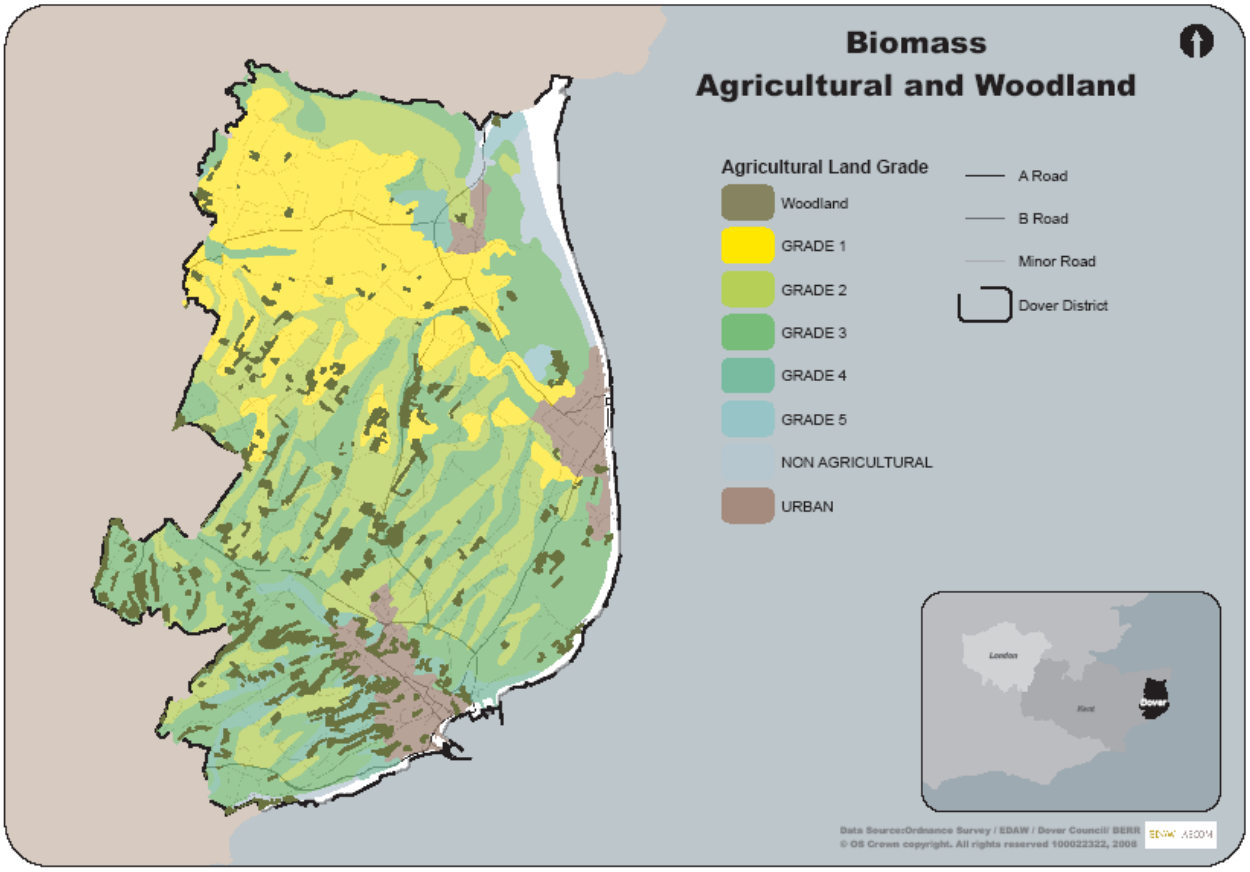



Figure 17: Woodland and agricultural land of differing qualities in the Dover District that may be utilised for biomass supply

From the quantum of forestry, average levels of biomass arisings were assumed through dedicated forest management (3.5 oven dried tonnes per hectare). In practice, the level of arisings varies according to the type of forest and management practices. If all predicted arisings from forestry waste were gathered, 6315 tonnes (oven dried) would be available for energy generation. If utilised using a CHP plant, this would provide power to meet the electricity demand of approximately 2800 homes, and the heat demand of approximately 4000 homes. If instead the biomass resource was use directly for heating, it would meet the heat demand of approximately 8400 homes (assuming 80% of load is met by biomass with a gas top-up).

Biomass from forestry arisings is a significant energy source that should be utilised as part of the energy mix. However, the resource is limited in the Dover District itself. It is recommended that Biomass resource is managed on a larger Regional scale, and it may be argued that a greater resource is available nearby in adjoining districts. Nevertheless, biomass is likely to be in great demand for energy generation based on current renewable cost models in future years. Therefore, the district cannot be over-reliant on sources from

elsewhere, and should consider limitations in local biomass sources in energy planning.

Aside from biomass arisings from forestry, dedicated biomass crops can be grown on arable land in the district. This would however involve a change in land crop, and potentially the sacrifice of food-producing land. To give an indication of scale, if 20% of arable land in Dover District was utilised for short-rotation biomass crops, enough biomass would be available to heat and power approximately 4000 new homes or heat (and not power) new 11,500 homes. While biomass is a very useful part of a renewable energy mix, large quantise of biomass growth are likely to detrimental effects on other industries.

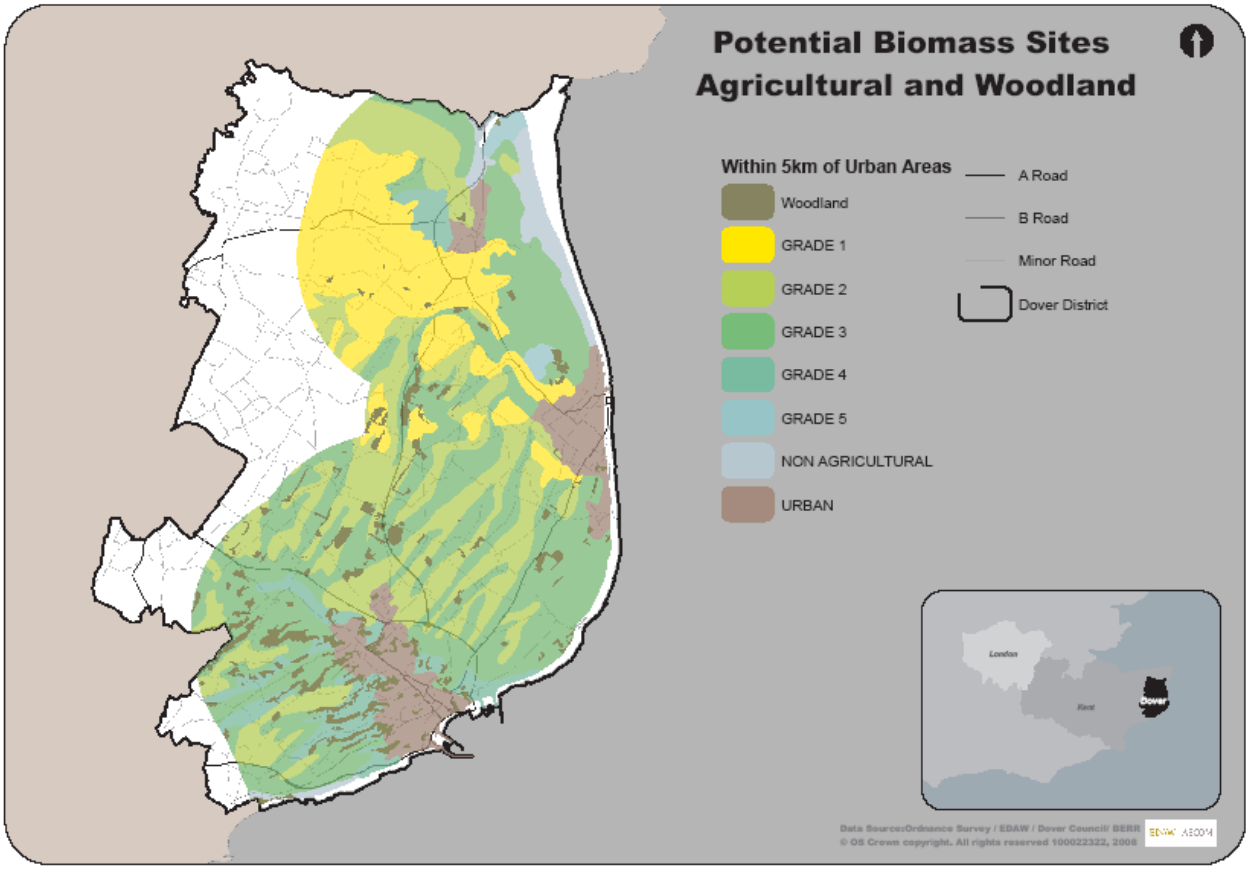



Figure 18: Woodland and agricultural land of differing qualities within 5km of the three urban centres

### Delivery Considerations for Biomass Fuel in Dover District

It is important to consider the transport of biomass to the sites where energy is needed due to both traffic congestion and transport emission effects. The figure above shows the amount of biomass resource within 5km of the three urban centres to demonstrate the locational attributes of the resource. Dover District is well positioned with a higher amount of forest and lower grades of agricultural (less valuable) land which could be used to grow crops. Sandwich and Deal have a very limited biomass resource within 5km.

Some work is already underway to delivery biomass resource in the area. The Kent Downs Management Trust has been promoting woodland management and the link to renewable heat in growth areas. This is particularly pertinent in Kent and the Kent Downs AONB because of the large amount of woodland resource (particularly coppice) that provides a very effective fuel source for low carbon heating. Kent Downs Management Trust and Kent County Council are working together on projects to promote wood fuel. A meeting is planned with the Forestry Commission and the Ministry of Defence is another potential supplier. Support will be available to Dover District to support them in delivering policy and grants are available for capital costs. Two installations in the Kent Downs AONB are available for site visits and inspection should prospective commissioning bodies be interested. One supplies the Bore Place conference centre, the other a series of holiday cottages and pool on a heat main.

In addition, SEERA plan to undertake a delivery study considering the potential of biomass fuelled combined heat and power in the Region. It is expected that this study will be available in early 2009. Dover District Council should actively support biomass investigations in the area to enable supply to new and existing development in Dover District.

### Solar Technology Potential

Solar technologies were identified in the evidence base for the RSS as a key opportunity for the Southeast region. Compared with the rest of the UK, the solar potential in Dover District is good. However, on a global scale, solar technologies do not perform at high efficiencies in the UK.

There are two main types of solar technology that are generally delivered alongside built development. Photovoltaic panels produce renewable electricity can be mounted on structures or used in stand-alone installations. Solar thermal panels are commonly used to directly heat hot water in homes, but can also be used to assist heating and cooling.

Photovoltaics are currently expensive in comparison to other renewable energy options, but they are one of the few options available for renewable electricity production and are often one of the only on-site options to assist in carbon reduction associated with electricity use. Solar thermal panels are more space and cost effective and are well utilised technology for heating hot water.

### Scale of Potential

Despite the relatively slightly higher solar efficiencies in Dover District compared to the UK average, the feasibility of take up of solar technologies is likely to be the same as most sites around the UK on a cost basis. Solar technologies will have a role to play in renewable energy delivery in Dover District, but this is likely to be restricted to small-scale on-site development. Off-site photovoltaic installations could be considered, but these would be very cost and land inefficient under current conditions.

To give an indication of the relative effectiveness of photovoltaics, to provide 100% of the electricity needed for the 14,000 new homes proposed under Option 4, an area of 42 hectares of photovoltaics would be needed (equivalent to covering the roofs of 9000 homes).

### Delivery Considerations for solar technologies in Dover District

Solar technologies are widely available and will have a role to play in energy generation, especially on low density development with a substantial amount of exposed roof space. To ensure that solar technologies are effective, south facing roof space should be favoured in building design and masterplanning (through street orientation).

## 6.4 SCENARIOS FOR DEVELOPMENT DRIVEN ENERGY GENERATION

Energy and carbon requirements associated with building regulation changes and Code level and BREEAM requirements, will not only influence the energy efficiency of buildings, but will also drive the provision of local energy generation from low or zero carbon technologies. A certain proportion of this energy generation will be achieved 'on-site', within the boundaries of new development. However, economic or physical restraints are likely to limit the amount of energy generation that can be achieved on site. This is especially true in some particular situations, including:

- low density developments where communal heating arrangements are not viable as the current cost of large amounts of microgeneration is restrictive;
- small developments without the effects of economies of scale to deliver energy infrastructure; and
- very high density or constrained sites where there is a lack of space for energy infrastructure.

Higher levels of the Code for Sustainable Homes, level 5 and 6 in particular, require a high level of integration of low or zero carbon technologies and in some cases it is not feasible to deliver these on-site. Therefore, off-site or near-site generation of energy or other carbon reduction methods are necessary to achieve the carbon reduction requirements. The definition of zero carbon currently requires all energy generation to be delivered on-site, however the definition is currently under discussion and is expected to be revised. Following precedent policy, this study recommends the use of a funding mechanism to allow developments to contribute to carbon reductions in the district as a whole once reasonable measures to reduce carbon emissions from energy on-site have been exhausted. One of the methods to reduce carbon emissions on a district level may be through funding of off-site installations of renewable energy generation.

### Policy Scenario Modelling

Modelling has been undertaken to predict the demand for on-site and off-site energy generation based on the current cost and technical feasibility data outlined in Section 4 of this report[9]. In addition to residential energy delivery under Code levels, a stepped increase in expectations for non-residential development to provide energy generation is assumed responding to the government's aspiration to reach zero carbon by 2019. The mix of low and zero carbon technologies utilised by non-residential development has been estimated from industry experience of the ability of offices, schools and other commercial types to integrate energy generation.

[9] Based on research jointly undertaken by Faber Maunsell, Cyril Sweett and Europe Economics for Communities, Local Government.

The carbon reduction to be achieved through the use of renewable energy generation relative to the regulated energy use (under building regulations) changes with Code level, but as a rule of thumb, approximately half of the carbon reduction would generally come from renewable energy. Of that carbon reduction, the table below outlines the expected split between on-site and off-site implications produced by the model.

Density assumptions have been used to predict the uptake of CHP and district heating (which is encouraged through the RSS). The two density scenarios used in earlier analysis are also used here (market-driven density and character-driven density). The development density for both scenarios is based on Option 4 to give an upper limit.

### Scenario R1: Current technology mix with market-driven densities

This scenario tests the market-driven densities and how they are likely to affect technology up-take, particularly implying lower uptake of CHP and district heating systems.

### Scenario R2: Current technology mix with character-driven densities

This scenario tests the character-driven densities and how they are likely to affect technology up-take, particularly implying higher up-take of CHP and district heating systems.

The table below considers the split between four key aspects which have district-wide implications:

- % inclusion of biomass CHP: This will require biomass fuel from nearby (ideally)
- % inclusion of biomass heating: This will require biomass fuel from nearby (ideally)
- % demand for off-site carbon reduction: This is the portion of carbon reductions that cannot be achieved on-site due to cost or technical constraints, where district-wide initiatives are needed.

The residual percentage of energy generation will be made through on-site generation that does not have district-wide implications (e.g. photovoltaics, solar thermal, microgeneration, gas CHP).

**Table 9: Assumed % split of total low and zero carbon energy generation technologies used in developments coming forward**

| Market-Driven Densities | | Biomass Fuelled CHP | Biomass Fuelled Heating | Off-site Carbon Reduction Demand | Other Site Contained Energy Generation |
|---|---|---|---|---|---|
| Residential Energy Delivery | Code 3 | 0% | 5.00% | 0.00% | 95% |
| | Code 4 | 0.4% | 5.00% | 0.00% | 94.6% |
| | Code 5 | 4.8% | 5.00% | 26.24% | 63.96% |
| | Code 6 | 6% | 5.00% | 45.81% | 43.19% |
| Non-Residential Energy Delivery | Very Good | 0% | 0% | 0% | 100% |
| | Excellent | 0% | 10% | 15% | 75% |
| | Outstanding | 10% | 10% | 40% | 40% |
| **Character Driven Densities** | | **Biomass Fuelled CHP** | **Biomass Fuelled Heating** | **Off-site Carbon Reduction Demand** | **Other Site Contained Energy Generation** |
| Residential Energy Delivery | Code 3 | 0% | 5.00% | 0.00% | 95% |
| | Code 4 | 2% | 5.00% | 0.00% | 93% |
| | Code 5 | 24% | 2.50% | 16.64% | 56.86% |
| | Code 6 | 30% | 2.50% | 36.21% | 31.29% |
| Non-Residential Energy Delivery | Very Good | 0% | 0% | 0% | 100% |
| | Excellent | 0% | 10% | 15% | 75% |
| | Outstanding | 10% | 10% | 40% | 40% |

### Commentary on Results

Using these modelling assumptions, an estimation can be gained of the carbon reduction that will have to be achieved 'off-site' or through district-wide carbon reductions to satisfy carbon reduction requirements driven by new development. It should be noted that the modelling takes into account a number of assumptions, and that these results should only be regarded as indicative. True demand will of course depend on delivery of new development and the individual energy strategies employed by those developers.

The table below summaries the expected demand for off-site carbon reduction to meet expected policy demands. For sake of comparison, this off-site carbon reduction demand is also quantified in terms of how many large wind turbines would be needed to provide that carbon offset

Table 10: Comparison of Scenario R1 and R2 results

| Scenario R1 | 2006 | 2011 | 2016 | 2021 | 2026 |
|---|---|---|---|---|---|
| Off-site Carbon Reduction Demand (tonnes) | 0 | 0 | 1,186 | 5,952 | 10,589 |
| Equivalent Number of 2MW Turbines to deliver carbon reduction through renewable energy | 0 | 0 | 1 | 3 | 6 |
| Scenario R2 | 2006 | 2011 | 2016 | 2021 | 2026 |
| Off-site Carbon Reduction Demand (tonnes) | 0 | 0 | 1,046 | 5,095 | 8,900 |
| Equivalent Number of 2MW Turbines to deliver carbon reduction through renewable energy | 0 | 0 | 1 | 3 | 5 |

## 6.5 DELIVERY OF A DISTRICT-WIDE APPROACH

The results above demonstrate that under current conditions and expectations, to enable new development to meet the government's aspirations for carbon reduction for new development (i.e. zero carbon by 2016), a very significant demand for off-site carbon reduction will be experienced. This demand will be realised through the funding system in the proposed policies. These funds could be used to achieve carbon reductions in a number of ways, and the methods selected are likely to change over time according to a number of factors:

- The definition of zero carbon will determine if and how carbon reductions can be achieved off-site
- Carbon reductions may be able to be achieved through improvements to existing stock, though this may be restrained by government initiatives to fund that carbon reduction separately and count those carbon reductions separately from development driven reductions
- Regional and national targets for renewable energy supply may change over time, providing additional emphasis to fund off-site renewable energy.

Dover District Council should seek to structure their funding system to target the where funding is needed according to both physical and policy drivers.

### Contribution of development-driven renewable energy to regional targets

The proposed policies will drive both the provision of renewable energy in the district and carbon reduction. Consequently, development site requirements will contribute directly towards regional and national targets for carbon reduction. To coordinate carbon reduction efforts, and to realise the gap between development-driven renewable energy installations and renewable energy targets, it is essential that expected policy impacts over the Core Strategy period are quantified.

The following targets have been set for the South-East Region for the percentage of electricity demand to be provided from renewable sources:

**Table 11: NRM 13 targets for the South East**

| Year | % Electricity Generation Capacity |
|---|---|
| 2010 | 5.5 |
| 2016 | 8.0 |
| 2020 | 10.0 |
| 2026 | 16.0 |

The following table examines the expected contribution of development-driven renewable electricity towards the regional target. It is assumed that 1% of the electricity demand in Dover District was met by renewable technologies in 2006 as a baseline. The character-driven density mix is assumed in this calculation.

**Table 12: Gap between expected on-site renewable electricity delivery and regional target**

| | 2006 | 2011 | 2016 | 2021 | 2026 |
|---|---|---|---|---|---|
| Expected development-driven renewable electricity generation on-site (expressed as CO2 reduction in tonnes) | 0 | 1,109 | 4,223 | 7,308 | 10,230 |
| Residual renewable electricity to be delivered to achieved in Dover District to meet Regional targets (expressed as CO2 reduction in tonnes) | 3,597 | 4,487 | 3,517 | 3,401 | 5,270 |
| Residual renewable electricity expressed as 2MW turbine equivalent | 2 | 2 | 2 | 2 | 3 |

The table above demonstrates that based on expected on-site delivery of renewable electricity, there will be a significant shortfall in Dover District in comparison to the Regional targets for renewable electricity. Adding to this, renewable energy targets on a National level are increasing as carbon reduction pressures escalate (currently 30-35% renewable electricity is needed to meet government aspirations), and therefore Dover District should be aiming to exceed Regional targets to keep in line with National targets.

As demonstrated by a comparison between the above table and the results of the previous section, if 100% of funding for district-wide carbon reduction was used to generate renewable electricity off-site, the renewable electricity targets would be met by the end of the Core Strategy period (but would still fall short until 2021).

### Contribution of development-driven carbon reduction to National targets

The proposed policies enable government aspirations for carbon reduction from new development to be delivered (leading to zero carbon by 2016). If these aspirations are not delivered as expected through the building regulations, the policy allows flexibility through the specification of Code levels for levels of provision to change based on nation-wide industry response. As new development is an additional carbon load, any reductions made here will not act to reduce baseline carbon emissions (they will only strive to make net carbon additions nil).

Additional improvements to existing buildings will however act to reduce carbon emissions and contribute towards the government's targets under the Kyoto Protocol obligation. As demonstrated through scenario E2 in the previous section, targeted improvements to existing stock could save very large amounts of carbon. The carbon savings through on-site development-driven reductions are small in comparison.

Dover District Council should investigate possibilities to either fund additional improvement of existing buildings or other carbon reduction methods to contribute towards the overall UK carbon reduction targets and timeline.

## 6.6 RESULTING PLANNING RECOMMENDATIONS

The modelling results suggest that the policies proposed could lead to a significant portion of the Dover District proportion of Kent's renewable electricity target being achieved through on-site renewable energy development. In addition, if funding arising from development contributions where a portion of carbon reduction required cannot be met on-site is used towards renewable electricity, Dover District's proportion of regional targets will be met by 2021. The most common technologies that will be used to contribute towards the renewable electricity target are large wind turbines (2MW and above), biomass CHP and some photovoltaics. It should be noted that the renewable energy target in the RSS does not cover renewable heat sources, and this contribution of renewable heat energy is not measured by a regional target. Additional generation of renewable electricity will be required in the area separate from contributions related to new development to meet the short-term targets set out in the RSS. A coordinated approach with energy providers and the wider Kent county is needed to ensure these targets are delivered.

In terms of a district-wide approach to carbon reduction, funding gained through development contributions should be targeted where the greatest carbon reductions can be made, and also to contribute to district renewable energy targets. From initial analysis, based on the current delivery environment and technology capability, It is expected that funding should be targeted towards a combination of:

- Additional improvement of residential stock;
- Targeted improvement of existing non-residential buildings and processes;
- Delivery of large-scale renewable electricity installations in the district, where the most promising solution is currently large wind turbines;

- Creation of local biomass sourcing schemes – firstly from forestry arisings, and then from limited dedicated crop production to enable the use of biomass for both heat and power to be realised through local supply.

To enable a sustainable renewable energy strategy for the District, Dover District Council will need to take a key and active role in the coordination and enforcement of renewable energy provision. This role will involve:

- Monitoring and coordinating district renewable energy resources;
- Managing funding contributions and targeting those most desirable under carbon reduction and renewable energy targets; and
- Assessing development schemes to ensure the individual energy strategies are in keeping with the evolving vision for the District.

A funding model to target contributions towards the desirable carbon reduction methods will need to be developed and updated over time. This funding model and supporting policies would be best described in the Development Contributions SPD which can be updated more regularly than the Core Strategy.

# 7. Delivery of policy requirements: strategic site analysis

### Introduction

The Strategic Sites, due to their physical scale and high-profile nature, have the potential to meet higher requirements than those set by general Development Management policies. Strategic site requirements could be explained in each policy box in the Core Strategy, or could be stated in future Supplementary Planning Documents or development briefs.

This section of the report reviews the potential for the four strategic sites in Dover District to exceed the proposed building regulation minimum standards for energy performance, and sets out what could realistically be set as challenging targets in other areas of sustainable construction. The section concludes with recommendations for future policy objectives for each of the four strategic sites.

## 7.1 METHODOLOGY

### Part 1: Low and Zero Carbon Energy Strategy

Faber Maunsell has undertaken a high level assessment of the types of energy strategy which may be proposed to meet various Code energy targets - or future building regulation minimum standards - considering the development density and the location of each of the four strategic sites.

The options tested for meeting different energy performance standards are heavily based on options which came forward as a result of an earlier commission to 'assess the costs and benefits of the government's proposals for low carbon housing'[10], although they are also informed by modelling work that has been undertaken for the Energy Saving Trust and for private residential developers developing real schemes in the South of England.

Low or zero carbon (LZC) technologies or building improvement measures considered include:

- Energy efficiency - improved fabric and services specifications in line with efficiency measures outlined in the Energy Saving Trust's Best and Advanced practice energy efficiency standards[11]
- Solar Water Heating (SWH)

[10] A study for Communities and Local Government – undertaken in partnership with Cyril Sweett and Europe Economics – (http://www.communities.gov.uk/publications/planningandbuilding/housingcarbonfootprint)

[11] (http://www.energysavingtrust.org.uk/business/Business/Building-Professionals/New-housing/A-history-of-our-new-build-standards) These standards have now been superseded by guides CE290-292 on Energy efficiency and the Code for Sustainable Homes Levels 3 to 6 (http://www.energysavingtrust.org.uk/corporate/Corporate-and-media/Library/Corporate-publications)

- Photovoltaics (PV)
- Ground Source Heating (GSHP)
- Biomass Boilers
- Gas fired Combined Heat and Power (CHP)
- Biomass Combined Heat and Power (BCHP)
- Large Wind Turbines

Basic detail is provided to highlight the implications of proposed energy strategies on the masterplan and development phasing. For cost information refer back to section 4.

It is important to note that:

1. GSHP can deliver Code level 3 (or 4 when combined with other technologies). However much of the benefit from GSHP is due to the technology taking advantage of the 'fuel factor' for electricity; this means that the calculated TER is higher than if the base case were gas heating, therefore making it easier to meet the target improvements set by the Code. The use of this fuel factor for heat pumps is likely to be reviewed in future versions of building regulations[12], meaning that in future GSHP's may not achieve the calculation benefits they do under current regulations.
2. Micro (building mounted) wind turbines have not been considered – early feedback from field trials (by BRE, Carbon Trust and EST) has shown limited energy outputs from small turbines installed in urban locations where wind conditions are turbulent.
3. To achieve higher energy performance targets more than one LZC technology can be specified. Some combined technology options have been considered.

#### Part 2: Other Sustainable Construction Standards and Targets

A number of the BREEAM and Code credit compliance requirements can have implications on the masterplan, design and cost. These requirements will apply across the strategic sites. Given this, Faber Maunsell has undertaken a site review for the first of the strategic sites (Whitfield) to outline the key implications of meeting the likely proposed BREEAM and Code targets on the masterplan. Any significant changes for the other three strategic sites have been highlighted, although most of the masterplan implications identified for Whitfield also apply on the other strategic sites.

### 7.2 WHITFIELD

#### Development description

The Whitfield development is a proposed major new housing scheme on the edge of the Whitfield/Dover Township. Proposals suggest that the Greenfield site will accommodate a total of 6,000 new homes. The East site (72 hectares), for which there is an existing masterplan, will accommodate 1800 homes, with a further 4000 at Whitfield West (160 hectares).

[12] Energy efficiency requirements for new dwellings, A forward look at what standards may be in 2010 and 2013 http://www.communities.gov.uk/documents/planningandbuilding/pdf/Energyefficiencyrequirements.pdf

There are no major commercial building uses proposed within the Whitfield development, although a major office development - Whitfield Business Park - is planned to the South of the Eastern part of the site. Schools and a health centre are expected with c. 3000m$^2$ retail (c. 1000m$^2$ East and c. 2000m$^2$ West) to support the housing development (from general housing to service need ratios). Construction is planned to begin in 2013 and run until 2026, with 20% of homes expected to be complete by 2016, the government's proposed date for introducing 'zero carbon' as a minimum standard for new homes.

**Current proposed policy**

The Core Strategy currently contains CP11 Whitfield which states: "Proposals for the expansion of Whitfield should cover the whole of the development area.

The Council will permit proposals provided:-

(i) A comprehensive Masterplan is agreed by the Council in advance of the determination of any planning applications and all applications accord with it;

(ii) The scale and layout of the proposed development is planned in a way that creates a new local centre for the benefit of the whole of the settlement;

(iii) The scale and the rate of the release of the development keeps in line with infrastructure and other elements of a balanced community (e.g. local shops and amenities);

(iv) A phasing programme is agreed in advance of the determination of any planning applications that is integrated with the urban housing renewal initiatives in Dover and the release of previously developed land allocations;

(v) There is a mix of dwelling types and sizes on individual sites, and that mix contributes towards creating a socially inclusive and sustainable community;

(vi) There is a combination of on-site provision of affordable housing and a commuted sum is paid for the remainder of the contribution which will be used to help finance the cost of urban renewal initiatives that have been identified in the Site Allocations Document;

(vii) It can be demonstrated that there are community and environmental benefits with the scheme which will need to include development contributions towards the cost of building a new primary school, Doctor's Surgery and community facility to cater for the expanded population;

(viii) There would be no significant adverse effect on the amenity of nearby residents or operations of adjoining land uses;

(ix) New buildings have been designed to have a minimal impact on the skyline and do not dominate nearby residential properties;

(x) Development is set back from Church Whitfield and makes a positive contribution to the setting and views of the Listed Building;

(xi) Structural landscaping, incorporating existing vegetation, is retained and reinforced;

(xii) Provision is made for pedestrian and cycle access to the existing settlement and the White Cliffs Business Park;

(xiii) The development is acceptable in terms of traffic generation and access; and Vehicular access to land to the east of Whitfield is

achieved off a 'new arm' on the roundabout off the A256/A2 which is to be funded from the development

### Future development scenarios – for testing purposes

Two density scenarios have been tested on the Whitfield site to highlight the possible energy strategies that may be proposed for the Whitfield development. In the first scenario housetypes and density across the site follows the market desired split indicated by the Housing Demand Study[13]. In the alternative scenario density is increased to a level ideal for the incorporation of the district energy solutions that may be required to meet higher Code levels. The higher density scenario is purely demonstrative to show an 'ideal solution' from an energy point of view. In practice the masterplanning will have to balance density based on a balanced consideration of energy strategies, market demand and place-making.

The scenarios are intended to show what energy targets could be delivered, and at what cost. In both scenarios, the overall number of houses delivered remains the same, and is in keeping with the core strategy Option 4.

**Table 13: Whitfield Development Scenarios**

| Scenario 1 – 'Market driven' | Scenario 2 – 'CHP driven' |
|---|---|
| ▪ Following market survey for housetypes - a mix of 32% detached, 37% semi-detached, 20% terraced and 11% apartments.<br>▪ This equates to an estimated average housing density of c.40 dwellings/hectare<br>▪ Some high density cores at density of c. 85 dwellings/hectare | ▪ Following regional strategy, this option was proposed to test the viability of district heating/CHP systems. Average densities proposed are c. 60 dwellings/hectare<br>▪ This density is deliverable and realisable without impacting on placemaking as long as good design principles are adhered to<br>▪ The mix of housetypes in this scenario would be mostly terraced housing, with a smaller proportion of detached and semi-detached along with some apartments. |

An indication of the densities outlined in these two alternative development scenarios, and the corresponding land take is shown in Figure 19 and Figure 20. It should be noted that these are purely indicative scenarios, and the locations and densities in the diagrams are not prescriptive or suggested. The masterplanning of Whitfield will determine layout and densities, but this masterplanning should take into account the principles demonstrated here to ensure a robust energy strategy is incorporated.

[13] 'A strategic Housing Market Assessment for the East Kent Sub Region', Ecotech, August 2008


Figure 19: Illustrative distribution of densities for the Whitfield development under the 'market driven' scenario. Subject to further masterplanning.

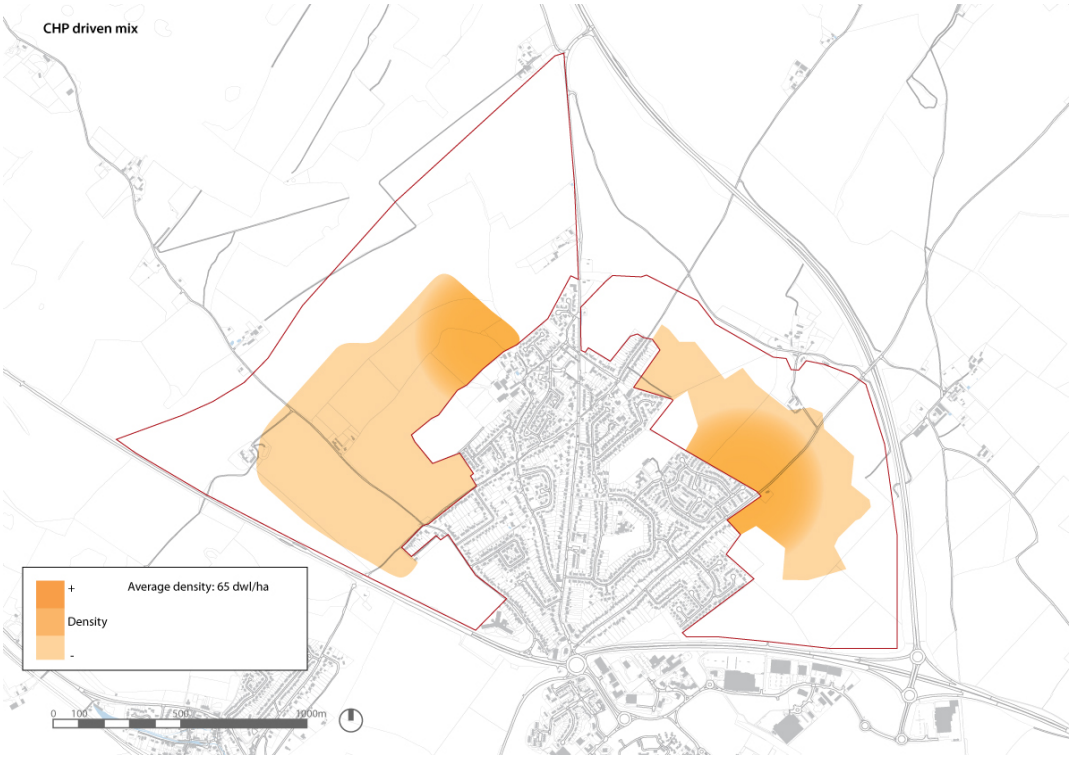



Figure 20: Illustrative distribution of densities for the Whitfield development under the 'CHP driven' scenario. Subject to further masterplanning.

The masterplan testing builds on the existing East Whitfield masterplan plots to give an idea of how the community could be structured with a high focus around the school, at the crossroads of the two main roads. On the Western part of the site a 100 x 100 meter density grid has been applied to give an indication of the implications of different densities (the primary road network area is embedded in the density calculation). Compared with the baseline market driven option, the higher density option has an additional 59ha of un-developed space.

### Implications of housing density

The very basic exercise undertaken to test the effects of the development scenario on the energy strategy options provides some evidence to support two important and widely accepted points:

- Dense development is less energy intensive - Large detached homes have a much greater heat requirement and greater heat loss than terraced homes or flats in apartment buildings due to their increased surface to floor area ratio. Calculations show that the higher density 'CHP scenario' which has a greater proportion of terrace homes and apartments would emit 15,400 tonnes of $CO_2$ per annum, compared to 17,300 tonnes for the less dense development scenario. It would require approximately 27,000$m^2$ of photovoltaic panels to offset the difference (1,900 tonnes $CO_2$) each year. (These figures exclude any $CO_2$ which is associated with the proposed commercial development - this is expected to remain the constant across both options.)
- Compact master plans facilitate a greater number of options for delivering heat and power to homes in a low carbon way. The higher density helps to make district heat and power options more economically viable, it also means that more space is available for the siting of wind turbines (if suitable) or other renewable technologies.

While market drivers favour a significant proportion of detached and semi-detached housing, the financial implications of lower density housing to meet energy requirements may adversely impact their commercial viability. An increase in density is generally desirable in masterplanning terms and a move towards higher density is in keeping with the intentions of the RSS. In Whitfield an increase in density could also offer opportunity to bring together the critical mass to sustain a local centre with a greater concentration of people and activities. It will facilitate the organisation of public transport, reduce infrastructure requirements and maximise the viability of community facilities and retail. An increase in density will however need more analysis to ensure the new development links well with the existing Whitfield which is very low density. The nature of the roads will have to change to accommodate more local traffic and non-vehicular movements.

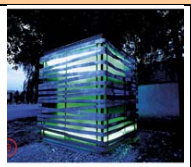
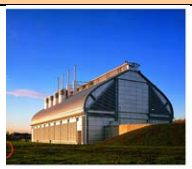
Sustainable construction criteria also place pressure on open space areas for water management and sustainable drainage, ecology and recreational needs. An increase in density will also be beneficial from this point of view, as it will create larger areas of open space within the site boundaries to enable higher Code Levels to be met in a cost-effective manner.

In urban design terms, renewable energy technologies have their own constraints. CHP facilities can be large, and space also needs to be allowed for access and the storage of fuel. However despite this the facilities can be embedded in the urban grain with careful design. Large wind turbines require a buffer distance separating it from residential development. For a 2MW turbine, the noise buffer is expected to be at least 400m, though more detailed analysis and noise testing would be required to determine exact positioning. **Detailed landscape and view analysis would need to feed into a feasibility study for wind power on site, but conversely, wind turbine/s could be used a landmark in the vista design and celebrated as a community feature that can bring identity to Whitfield. The figure below demonstrates the urban design implications of CHP and wind power.**

**District wide energy centres: Implications for masterplanning**

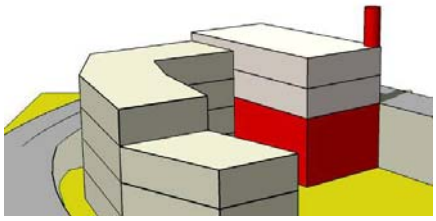
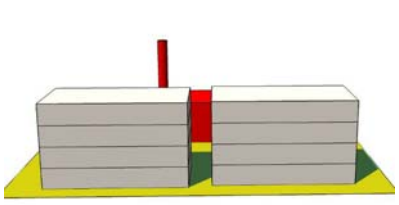
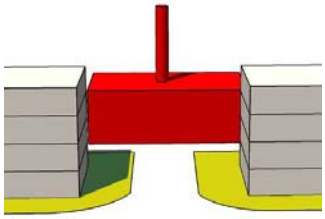
Location *(Example: The Carbon Challenge Brief, Peterborough)*


Visual



Design considerations

| ‘Bury it’ | ‘Screen it’ | ‘Celebrate it’ |
|---|---|---|

**Wind Turbines: Implications for masterplanning**

- Location
- Size
- Hub height
- Prevailing wind
- Wind speed
- Distance to nearest building (‘buffer zone’)
- Shadow
- Flicker
- Noise
- Visual appearance
- EIA
- Proximity to airports and radar interference

*Image: The Carbon Challenge Brief, Peterborough.*

**Figure 21: Urban design considerations for integration of CHP or wind power**

### Delivering energy requirement for Code Level 4

Aside from a wind turbine option (discussed later) the single technology options which can deliver a 44% reduction on the dwelling emission rate (DER), compared to the target emission rate (TER) are typically biomass boilers, combined heat and power (powered by gas or biomass – the later being less proven and more expensive) and photovoltaics - provided there is sufficient roof space available to accommodate the necessary panels.

Alternatively combined technology strategies could be employed, using for example solar water heating and photovoltaics or significant energy efficiency measures (such as outlined in either EST's advanced practice standard or the Passivhaus specification) with solar water heating and/or photovoltaics. Typically combined system solutions increase costs; however at low density these costs may not outweigh the increased costs of installing insulated community heating pipe networks.

Based on experience of working with developers we believe the preferred options for meeting the 44% target in the market scenario would be to use energy efficiency, and a combination of solar water heating and/or photovoltaics. Some developers (where densities are very low) may consider using stand alone pellet fired biomass boilers or ground source heat pumps.

In the high density (or CHP) scenario (and in the more dense areas on the market scenario) it is likely that communal heating systems connected either to biomass heat only boilers, or gas fired combined heat and power engines would be favoured.

**Table 14: Likely energy strategies – Whitfield Code 4**

| Likely Code 4 energy strategies | |
|---|---|
| **Higher Density (CHP) Option** | **Lower Density Option** |
| Connection to a large scale wind turbine | Connection to a large scale wind turbine |
| Biomass heat only boilers – district heating | Energy efficiency with solar water heating and/or photovoltaic panels |
| Gas fired CHP – district heating | Ground source heating |
| | Individual biomass boilers |

### Delivering energy requirements for Code Levels 5 & 6

Strategies to deliver Code 5 and 6 in the market scenario, where district heating networks are not installed, are likely to rely heavily on the use of PV. The target could be met using a combination of biomass boilers and photovoltaics - c. 15m$^2$ of PV panel would be required on a detached home fitted with a biomass boiler.

In the CHP scenario densities are more suited to community heating options. Biomass CHP, although still relatively unproven at development scale, has potential to deliver Code level 5. Gas fired CHP and biomass boilers – with PV

can also meet this target.

Biomass fuelled CHP with PV can be used to meet the requirements of CSH level 6. This is the only real option that has been put forward by developers bidding to English Partnerships as part of their 'Carbon Challenge' for sites where wind turbines have been discounted. English Partnerships' Carbon Challenge has the principle aim to accelerate the house building industry's response to climate change. It is being delivered by English Partnerships on behalf of the Department of Communities and Local Government and has a brief which calls for developers to meet level 6 under the CSH. The initiative is intended to assist house builders to develop the skills and technology needed to meet the 10-year environmental goals being set by Government for new housing development and to test the targets set within the Code for Sustainable Homes.

**Table 15: Likely energy strategies – Whitfield Code 5 & 6**

| **Likely Code 5 energy strategies** | |
|---|---|
| **Higher Density (CHP) Option** | **Lower Density Option** |
| Connection to a large scale wind turbine | Connection to a large scale wind turbine |
| Biomass heat only boilers – district heating with photovoltaics | Individual/communal biomass boilers with photovoltaics |
| Gas fired CHP – district heating with photovoltaics | Energy efficiency, ground source heating and PV |
| Biomass CHP – district heating | |
| **Likely Code 6 energy strategies** | |
| **Higher Density (CHP) Option** | **Lower Density Option** |
| Connection to a large scale wind turbine (with advanced energy efficiency – HLP 0.8Wm$^2$K) | Connection to a large scale wind turbine |
| Biomass heat only boilers – district heating with photovoltaics (with advanced energy efficiency – HLP 0.8Wm$^2$K) (may be insufficient space for photovoltaics in some instances) | Individual/communal biomass boilers with photovoltaics |
| Gas fired CHP – district heating with photovoltaics (with advanced energy efficiency – HLP 0.8Wm$^2$K) (may be insufficient space for photovoltaics in some instances) | *Utilise technology options more suited to use in high density areas* |
| Biomass CHP – district heating with photovoltaics | |

**Meeting the non-residential energy targets**

Non residential buildings proposed for the Whitfield development (aside from the school) are fairly minor in the context of the whole development and are therefore not likely to have significant implications on the energy strategy.

### Cost implications

The cost implications of the alternative energy strategies are shown in the graphs in section 4. It should be noted that to meet Code 6 homes must be constructed with a heat loss parameter (HLP) of 0.8W/$m^2$K. This is roughly equivalent in cost terms to the cost of EST's advanced practice energy efficiency standard.

### Wind turbines

Large scale wind turbines are probably the most proven and cost effective renewable technology. Developments able to take advantage of large wind turbines are likely to be able to deliver $CO_2$ savings at lower cost, than developments where turbines are not viable.

The planning system has a significant role to play in promoting the use of appropriately sited wind turbines and could look to place a requirement on developers to meet higher energy performance targets where there is potential to generate energy from wind turbines.

As reported in section 6, a GIS mapping exercise has been undertaken to show the potential sites for wind turbines in the Dover District: it shows that where development density at Whitfield is high (i.e. average 60 dwellings/ha as in the CHP scenario) sufficient land can be safe-guarded to site three 2MW turbines onsite, allowing for a 400 metre buffer zone around each turbine.

A recent planning application for East Langdon proposed five 2MW (120 metre) turbines on a site to the North of the Whitfield development. Public enquiry has been triggered and is currently investigating the suitability of the site for wind power.

In order for the developer to take credit for energy generated by wind turbines onsite or offsite, under current rules, the turbines need to be connected to the development by private wire. This has a cost implication, which increases with the distance between the turbines and the site.

Three 2MW turbines located close to the Whitfield development would generate around 15,000MWh, offsetting c. 8500 tonnes of $CO_2$. This is roughly equivalent to the predicted $CO_2$ emissions from 3000 homes. The cost of the turbines would be in the region of £6m or £2000 per home. There may also be further potential to locate additional turbines offsite.

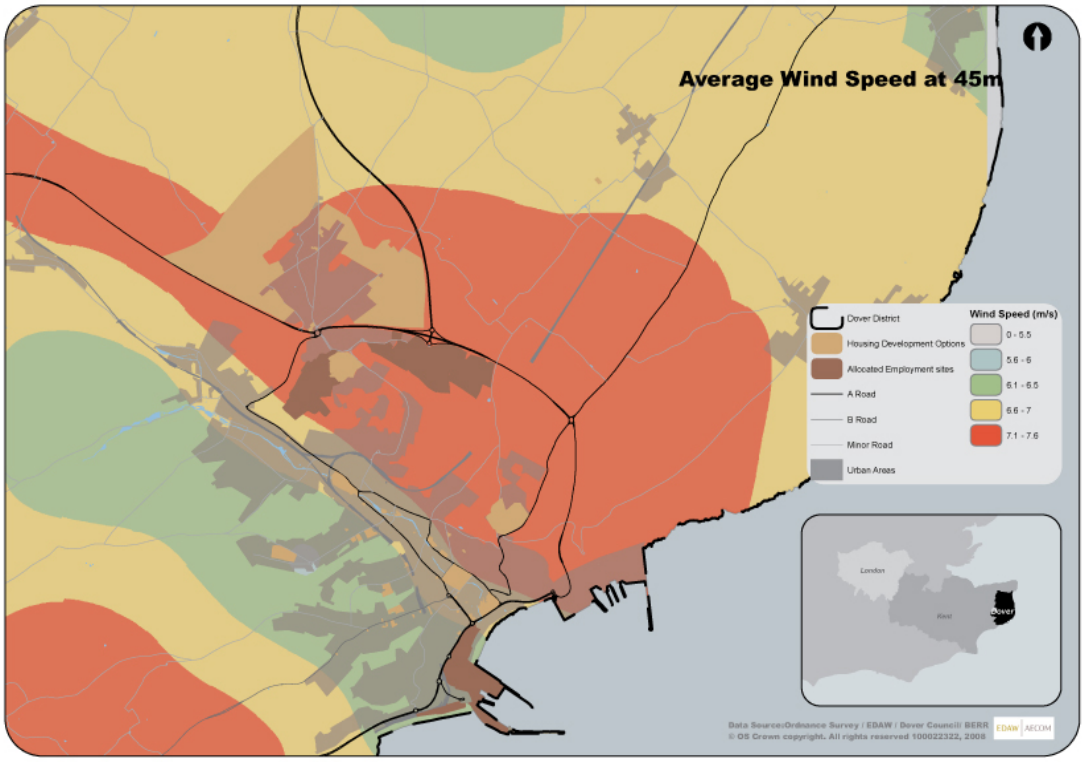



Figure 22: Wind speeds at 45m height in the Dover District area

The figure above demonstrates the variation in wind speed in the Dover area. The wind speeds in this area are favourable in comparison to the wind speeds across the rest of the district. Significant further investigation would be needed to determine the suitability of wind power in the area and also the most favoured locations either on-site or off-site. To accommodate large wind power on-site, spatial arrangements would have to identify a clear area of land with sufficient buffer distance from houses to eliminate noise pollution.

There are a number of sites within 1km of Whitfield which, from high level analysis within this study, that could be investigated further for the inclusion of large wind power (see the figure below). These sites could be explored in connection with the Whitfield development to determine whether turbines could be installed off-site and connected to the development directly by private wire to meet the current Code for Sustainable Homes requirements.

In determining the number of homes which could be potentially served by wind turbines we have assumed an output from a 2MW turbine of 5000MWh per annum. This falls somewhere between 5m/s and 6m/s on the power curve shown as Figure 23. Power (kW) multiplied by hours gives kWh or MWh. An average power output of 570kW (multiplied by 8760 hours) gives 5000MWh. We believe this is a conservative estimate of output for Whitfield given that wind speeds over 7m/s (at 45m) are expected in areas adjacent and surrounding the proposed Whitfield development.

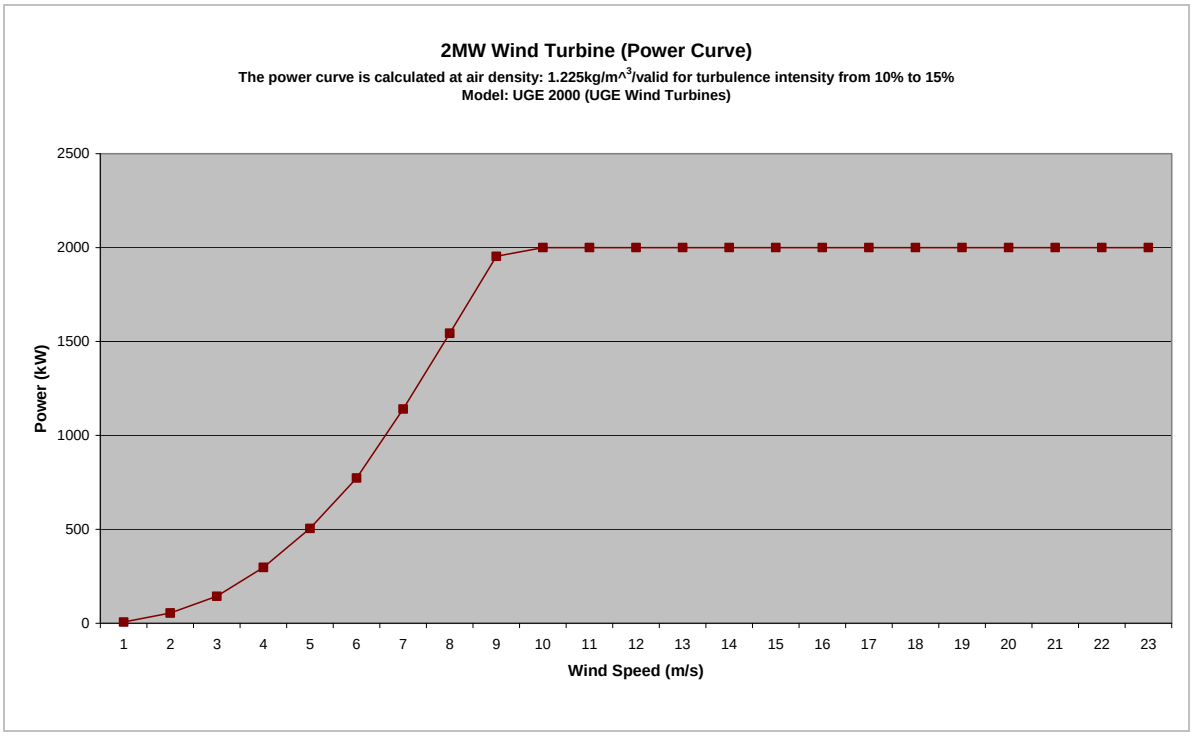



Figure 23: Power curve for 2MW turbine, showing energy output relative to Wind Speed.

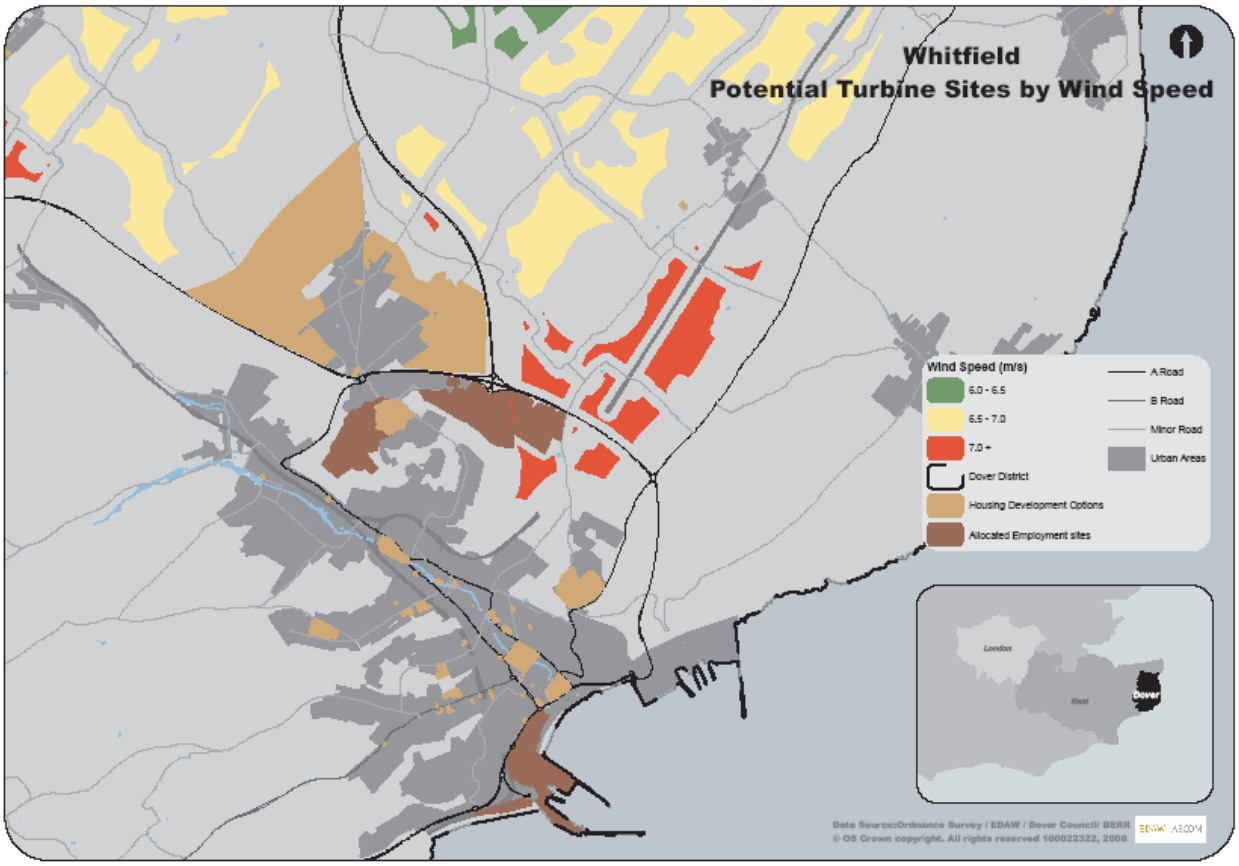



Figure 24: Potential areas that have good high-level feasibility to accommodate wind power, and relative wind speed

### Energy strategy implications on the masterplan

Depending on the solutions put forward in the energy strategy for Whitfield, the following points need to be taken into consideration in the preparation of Whitfield's masterplan:

Table 16: LZC technology - Implications on masterplanning

| Technology | Impact on the masterplan |
|---|---|
| **Wind Turbines** | ▪ Buffer zone from buildings required due to noise, shadow and flicker.<br>▪ Need to be located in open space<br>▪ Need to be connected to the development by private wire<br>▪ Need access for maintenance |
| **Biomass boilers and combined heat and power** | ▪ Need a central plant room<br>▪ Require fuel storage room and system for fuel conveyance<br>▪ Often require a 'thermal store' – there is a requirement for vertical temperature stratification within the thermal store (i.e. plant room needs increased floor to ceiling heights)<br>▪ Need access for fuel delivery and maintenance<br>▪ Require district heating infrastructure |
| **Solar water heating** | ▪ Need to be located to face within 45 $^{o}$ of South at an optimal inclination of 30$^{o}$<br>▪ Require hot water storage tanks either in homes or within a central plant room. |
| **Photovoltaics** | ▪ Need to be located to face within 45 $^{o}$ of South at an optimal inclination of 30$^{o}$ |

### Phasing implications

Phasing can be problematic for district heating options, especially where a single central plant room and boiler/engine is proposed. Often it is not practical to commission the central system where only a few of the homes have been completed. In this situation there is a need for an interim energy solution which often can not deliver on the low carbon aspirations of the overall strategy.

The phasing issue, in the context of zero carbon development was recognised as a potential problem for the governments proposed EcoTowns. The draft Town and Country Planning Association energy guidance note for EcoTowns, written by Faber Maunsell stated: 'Eco-towns are likely to be built out gradually, in phases of several hundred homes at a time, perhaps over a decade or more. It will sometimes be possible for delivery of major items of zero carbon infrastructure and large scale generating plant to be similarly phased (e.g. inherent scalability of fuel cells, modular design of heating/CHP capacity on a local network). Initially large surplus amounts of electricity from a large wind turbine could be sold to off-site customers. Technologies that rely for their economics on scale and the supply of heat to local consumers face the biggest issues with phasing (biomass CHP in particular). For these

technologies a delay in delivering the LZCs infrastructure may be the only sensible approach.'

### Meeting non-residential sustainable construction targets

In addition to the residential development at Whitfield, a school, health centre and c.1000m$^2$ of retail space is proposed.

### School

The Department of Children Schools and Families (DCSF) has set up a zero carbon taskforce and has announced all new schools will need to achieve zero carbon status by 2016. Depending on development phasing the school proposed for Whitfield may need to meet a zero carbon target. In addition DCSF has set a requirement that all major new school buildings and refurbishment projects must be the subject of a BREEAM Schools assessment and must achieve at least a 'very good' BREEAM rating.

### Health centre

BREEAM Healthcare was commissioned by the Department of Health and the Welsh Health Estates and will replace the existing NEAT (NHS Environmental Assessment Tool). NEAT is a self assessment tool developed in 2002 by BRE on behalf of the NHS Estates. As of 1st of July 2008, the Department of Health will require, as part of the Outline of Business Case approval, that all new builds achieve an Excellent and all refurbishments achieve a Very Good rating under BREEAM Healthcare. Additionally all projects will need to achieve credit TRA 5 requiring the buildings to have a Travel Plan.

### Retail

Based on current proposals, it is unlikely that the retail space at Whitfield will be large enough to require independent assessment.

### Proposed Policy

**New policy:**

a) Whitfield will achieve at least Code for Sustainable Homes level 4 aspiring towards level 5 with immediate effect.
b) Schools within Whitfield will be zero carbon and meet BREEAM Excellent.

**Revisions to existing policy:**

- Policy (i) should now read: 'A comprehensive Masterplan, energy strategy and water strategy is agreed by the Council in advance of the determination of any planning applications and all applications accord with it. The Masterplan/SPD will test and define exact levels of achievement, particularly with regard to the delivery of heat and water recycling requirements and the balance between onsite and offsite provision of carbon savings.;'
- Consider revising existing policy (ix) reference to impact on skyline which may conflict with some energy solutions.

### Policy Justification

PPS1 clearly states that 'where there are particular and demonstrable opportunities for greater use of decentralised and renewable or low-carbon

energy…..bring forward development area or site-specific targets to secure this potential'. This is further supported by the South East Plan which states that 'Due to their size, strategic sites have a particular role to play in meeting renewable energy targets'.

Whitfield, due to its size and location, has been identified as a site suitable for early adoption of exemplary $CO_2$ reduction targets. It is thought that large wind turbines, which would offer a cost effective way for developers to meet the $CO_2$ reduction targets, could be accommodated on or near the development site (subject to more detailed investigation). The policy for Whitfield is intended to encourage developers to thoroughly investigate the potential for all renewables to serve the energy demands of this development and help meet regional renewable energy generation targets.

In the event that wind turbines are proven not to be viable for Whitfield, achieving a 100% reduction on target emission rates (TER) (i.e. the Code 5 energy standard) will still be technically feasible utilising other technologies. Building regulations at the time the first homes are constructed at Whitfield is expected to require a 44% reduction on TER, so although there will be a cost uplift to deliver the policy requirements in early development phases this is not expected to jeopardise development viability. $CO_2$ reductions targets proposed for building regulations may overtake the $CO_2$ reductions required by policy for Whitfield by 2016.

Rainwater or grey water systems will also be required to meet Code 5. This will help to reduce the development water demand whilst also providing some level of onsite attenuation for surface water runoff. Additional costs of achieving Code credits (aside the headline energy credit ENE 1) to meet Code 5 are estimated at around 5 - 10% of construction cost (depending on the unit type) and is not expected to affect development viability.

The DCSF have announced that all new schools should be zero carbon by 2016; they also require all new schools to achieve a 'Very Good' BREEAM rating. The policy requires the school at Whitfield to deliver an 'Excellent' BREEAM rating. This should be achievable given that it will come forward as part of a much larger masterplan and should therefore be able to secure BREEAM credits for surface water attenuation or ecological enhancement at relatively low cost. There may also be opportunities for the energy strategy.

### 7.3 WELLINGTON DOCK

#### Development description

Wellington Dock runs along the southern end of the Dover sea front. The preferred option development contains 300 flats, a 200 bed hotel, some retail space, a restaurant, cafes and bars and potentially 2000$m^2$ of office space. This constitutes medium – high density development, which is estimated to release $CO_2$ emissions of 684 tonnes $CO_2$/year

These development quantities and the indicative masterplan were taken forward as the scenario to be tested.

Figure 25: Wellington Dock Initial Design Illustration

**Current proposed policy**

The draft Core Strategy contains policy CP8 Wellington Dock area, which states: "Planning permission for a mixed use scheme consisting of retail (A1), restaurants and cafes (A3), drinking establishments (A4), residential (C3) and, if viable, offices (B1) and hotel (C1) at the Dover Wellington Dock area, will be permitted provided:

- the proposals are comprehensive rather than piecemeal and are preceded by a masterplan which has been agreed by the Council
- the opportunity is taken for exhilarating and dramatic design which is capable of becoming a modern day symbol of Dover through the creation of a landmark for entry to the town from the sea and landward from the west and east
- the access proposals to the site include a major improvement to the public realm and the pedestrian and cycle access between the town centre, the site and the seafront
- the design takes maximum advantage of the waterfront setting including provision for increased public access whilst retaining important views of the sea
- the retail proposals in terms of both type and scale must complement the town centre rather than create competition

- the residential proposals comprise a minimum of 300 dwellings.

**Future development scenarios – for testing purposes**

Only one development scenario was tested for the Wellington Dock development, in line with the existing preferred option masterplan.

**Implications of housing density**

The existing proposed masterplan creates a medium high density development, it is likely that technologies such as combined heat and power and district heating would be viable for this development.

Furthermore the provision of a hotel as part of the development will increase the base load for hot water all year round, suggesting that a district heating system powered by CHP, biomass or both is likely to be favourable.

**Delivering energy requirement for Code Level 4**

No sites for wind turbines have been identified in close proximity to the Wellington Dock development. The high medium high density development and the presence of a hotel are likely to mean a district heating option will be favoured. For Code 4 this could be powered by heat only biomass boilers or gas fired combined heat and power (CHP).

**Delivering energy requirements for Code Levels 5 & 6**

Strategies to deliver Code 5 and 6 include Biomass CHP, which although still relatively unproven at development scale, has potential to deliver Code level 5 without any support from additional low and zero carbon (LZC) technologies. Gas fired CHP and biomass boilers – with PV can also meet the Code 5 target.

Biomass fuelled CHP with PV can be used to meet the requirements of CSH level 6. Additional PV can be employed with the technologies used to meet Code 5, although often in high density developments roof area limitations prevent Code 6 targets being met.

**Meeting the non-residential energy targets**

The commercial development on this site represents the significant proportion of the proposal and will therefore be a key driver in dictating the proposed energy strategy. The hotel in particular is a significant part of the proposal. Hotels have a high demand for hot water; their energy profile is therefore suited to combined heat and power which becomes more economic with longer running times. Solar water heating is another technology often promoted for hotels (normally as part of a communal system). A district energy solution could be engineered to deliver the demands of the hotel and the homes as well as the retail and commercial spaces, the diversity of energy load would ensure longer run times. Given the proposed phasing (up until 2016) it is likely that a district heating system would meet residential and non-residential targets, both the residential and non residential elements would be expected to deliver a 44% reduction on the TER. Higher targets for this development would be challenging due to the available space for location of photovoltaic panels.

### Cost implications

The cost implications of the alternative energy strategies are shown in the graphs in section 4. No estimate has been made of the costs to deliver targets for the non-residential elements of the Wellington Dock development.

### Energy strategy implications on the masterplan

The following points need to be taken into consideration in further developing the designs for the Wellington Dock development:

Table 17: LZC technology - Implications on masterplanning

| Technology | Impact on masterplan |
|---|---|
| **Biomass boilers and combined heat and power** | ▪ Need a central plant room<br>▪ Require fuel storage room and system for fuel conveyance<br>▪ Often require a 'thermal store' – there is a requirement for vertical temperature stratification within the thermal store (i.e. plant room needs increased floor to ceiling heights)<br>▪ Need access for fuel delivery and maintenance<br>▪ Require district heating infrastructure |
| **Solar water heating** | ▪ Need to be located to face within 45$^{o}$ of South at an optimal inclination of 30$^{o}$<br>▪ Require hot water storage tanks either in homes or within a central plant room. |
| **Photovoltaics** | ▪ Need to be located to face within 45$^{o}$ of South at an optimal inclination of 30$^{o}$ |

### Phasing implications

Little information is available at this stage on the proposed phasing of the development however the time frame currently proposed (2011-2016) implies the following:

- Most dwellings and the non residential elements are likely to have to comply with the Part L requirements post 2013.

Because of the above, a central CHP system will be required, and therefore a central plant will have to be designed and built at the outset. It is likely that various CHP modules will have to be planned and introduced as the development progresses, in order to ensure that homes in early phases deliver on low carbon targets.

If any of the later homes are required to meet Code 6 the CHP system will have to be powered by biomass, hence a fuel store and fuel delivery infrastructure will also have to allowed for within the master plan. Also houses built to meet Code level 6 will have to be built with advanced building fabric in order to achieve a heat loss parameter of 0.8 (required by the CSH). This would mean that the last phase could require a different construction from previous phases which may mean dwelling layouts will have to be amended to account for thicker walls, different window specifications etc.

### Meeting non-residential sustainable construction targets

To meet the Council's aspirations for a landmark development, the hotel, retail and office development should meet BREEAM Excellent. The hotel will require a bespoke BREEAM assessment.

### Proposed Policy

**New policy:**

a) Wellington Dock will include a district heating system.
b) Non-residential buildings exceeding 1000m2 gross will meet BREEAM Excellent.
c) At least 75% of the sound insulation credits must be achieved using the Code for Sustainable Homes, unless proved to be technically infeasible.

**Revisions to existing policy:**

- Policy (i) should now read: 'A comprehensive Masterplan, energy strategy and water strategy is agreed by the Council in advance of the determination of any planning applications and all applications accord with it;'

### Policy Justifications

PPS1 clearly states that 'where there are particular and demonstrable opportunities for greater use of decentralised and renewable or low-carbon energy…..bring forward development area or site-specific targets to secure this potential'. This is further supported by the South East Plan which states that 'Due to their size, strategic sites have a particular role to play in meeting renewable energy targets'.

Community heating has potential to significantly reduce development $CO_2$ emissions and reduce fuel costs for tenants. Although capital costs can be substantial, in many cases, community heating schemes can offer the lowest whole life cost option for heating provision. A major advantage is that once a community heating system is installed heat can be supplied to the system from a range of sources including boilers (e.g. biomass), heat from power generation (combined heat and power – CHP) including energy from waste, renewable heat sources such as solar, geothermal or heat pumps or waste heat from industrial processes.

Published guidance[14] states that district heating schemes are most viable for development of over 100 homes where housing density is 55 dwellings per hectare or more - as is expected to be the case at Wellington Dock.

The policy requires the main non-residential uses at Wellington dock to achieve BREEAM 'Excellent'. This should be achievable where these buildings are linked to a site wide district heating network – which would be expected to improve running times and economic viability – and can benefit from sustainable measures introduced through the wider masterplan.

Due to its urban location, noise pollution is likely to be more prevalent, especially due to dock operations, therefore sound insulation standards are required. It is prescribed that at least 75% of the sound attenuation credits should be achieved to attenuate movement of airborne and impact sound

[14] EST guide - CE55 Community Heating – A Guide specifically states 'Most new build will be constructed by private developers, and assuming a project lifetime of 20 years with a discount rate of 12 per cent, new developments of 55 or more dwellings per hectare are, prima facie, likely to be cost effective.'

through separating walls and floors, specifically to prevent noise ingress from neighbouring retail, entertainment and commercial premises. 75% of credits is deemed deliverable in a high density setting.

### 7.4 CONNAUGHT BARRACKS

#### Development description

Connaught Barracks is on the eastern edge of Dover town, just north of the A258. The proposed development contains 500 dwellings, with the potential for some office space, holiday accommodation and a school, at a proposed density of 40 dwellings/ha. The estimated $CO_2$ emissions are 1482 tonnes $CO_2$/year. The Connaught Barracks site comprises a 12.7 ha part of the larger 56 ha Fort Burgoyne development. The site is being brought forward by the Homes and Communities Agency, which will be applying requirements above building regulation.

#### Current proposed policy

The draft Core Strategy contains CP10 Connaught Barracks which states: "The former Connaught Barracks site is allocated for residential development provided:

(i) a comprehensive Development Brief is agreed with the Council in advance of determining any planning applications;

(ii) planning applications should relate to a comprehensive rather than piecemeal development of the site and be consistent with the Brief;

(iii) a phasing programme is agreed by the Council that is linked to the future management, restoration and sustainable future of the Fort Burgoyne Scheduled Ancient Monument and the Local Nature Reserve;

(iv) the redevelopment comprises of a minimum of 500 dwellings;

(v) structural landscaping, including the existing vegetation and trees are retained and incorporated in the design and layout of the proposal;

(vi) residential development alongside Dover Road should front the road but be set back to allow for the creation a of grass verge with a tree lined avenue;

(vii) improvements are made to the existing vehicular access on Deal Road and any road improvements arising from the development are funded by the developer, together with pedestrian and cycle links to the local highway and footpath network. This may involve using part of the Connaught Barracks site for the necessary highway improvements;

(viii) the existing pedestrian link between Connaught Barracks and the adjacent playing fields is retained and incorporated into the design and the layout of the site; and

(ix) a financial contribution is made towards the cost of upgrading of play facilities and equipment on the adjacent playing fields and a Locally Equipped Play Area, which has been sensitively designed to take into account the setting of the Scheduled Ancient Monument, is provided on the main barrack site along with a maintenance payment for the long term upkeep of these areas.

Subject to detailed discussions with English Heritage, Fort Burgoyne is allocated for managed employment workspaces, low key holiday accommodation and heritage opportunities with an ancillary café providing:

(i) a structural condition survey that examines the economics of the full conservation of the Fort, stabilisation of the monument to prevent further deterioration and the cost of future management of the Fort is undertaken and agreed by English Heritage and the District

(ii) Council; and any features that are not considered sufficiently significant to warrant preservation, which have been agreed by English Heritage and the District Council, are recorded and documented.

**Table 18: Future development scenarios – for testing purposes**

| Scenario 1 – 'Market driven' | Scenario 2 – 'CHP driven' |
|---|---|
| ▪ Average housing density of c.40 dwellings/hectare<br>▪ A mix of 32% detached, 37% semi-detached, 20% terraced and 11% apartments. | ▪ Following regional strategy, this option was proposed to test the viability of district heating/CHP systems. Average densities proposed are c. 60 dwellings/hectare<br>▪ The majority of homes in the high density scenario are terraced houses and apartments. |

### Implications of housing density on energy strategy

High density development is less energy intensive and can improve the viability of some low and zero carbon technologies. Purely from an energy point of view high density development should be encouraged, although this has to be balanced against the market demand for homes in any given location.

### Delivering energy requirement for Code Level 4

Development should take into account the following options:

| Likely Code 4 energy strategies | |
|---|---|
| **High Density (CHP) Option** | **Low Density Option** |
| Biomass heat only boilers – district heating | Energy efficiency with solar water heating and/or photovoltaic panels |
| Gas fired CHP – district heating | Ground source heating |
| | Individual or 'block by block' biomass boilers |

### Delivering energy requirements for Code Levels 5 & 6

Development should take into account the following options:

| Likely Code 5 energy strategies | |
|---|---|
| **High Density (CHP) Option** | **Low Density Option** |
| Biomass heat only boilers – district heating with photovoltaics | Individual or 'block by block' biomass boilers with photovoltaics |
| Gas fired CHP – district heating with photovoltaics | Energy efficiency, ground source heating and PV |
| Biomass CHP – district heating | |
| **Likely Code 6 energy strategies** | |
| **High Density (CHP) Option** | **Low Density Option** |
| Biomass heat only boilers – district heating with photovoltaics (with advanced energy efficiency – HLP 0.8Wm$^2$K) (may be insufficient space for photovoltaics in some instances) | Individual/communal biomass boilers with photovoltaics |
| Gas fired CHP – district heating with photovoltaics (with advanced energy efficiency – HLP 0.8Wm$^2$K) (may be insufficient space for photovoltaics in some instances) | *Utilise technology options (e.g. CHP) more suited to use in high density areas* |
| Biomass CHP – district heating with photovoltaics | |

### Meeting the non-residential energy targets

Longer term this development is expected to include some employment space for Fort Burgoyne, some holiday accommodation and potentially a primary school. These uses are not expected to significantly alter the direction of any proposed energy strategy. Timing for these uses is not known, though it is likely that the school will come forward in the later stages of the development programme and will therefore need to meet a zero carbon target.

### Cost implications

Predicted costs per home to meet various Code targets are shown in section 4.

### Energy strategy implications on the masterplan

The following points need to be taken into consideration in the preparation of the Connaught Barracks masterplan:

Table 19: LZC technology - Implications on masterplanning

| Technology | Impact on masterplan |
|---|---|
| **Biomass boilers and combined heat and power** | ▪ Need a central plant room<br>▪ Require fuel storage room and system for fuel conveyance<br>▪ Often require a 'thermal store' – there is a requirement for vertical temperature stratification within the thermal store (i.e. plant room needs increased floor to ceiling heights)<br>▪ Need access for fuel delivery and maintenance<br>▪ Require district heating infrastructure |
| **Solar water heating** | ▪ Need to be located to face within 45$^{o}$ of South at an optimal inclination of 30$^{o}$<br>▪ Require hot water storage tanks either in homes or within a central plant room. |
| **Photovoltaics** | ▪ Need to be located to face within 45$^{o}$ of South at an optimal inclination of 30$^{o}$ |

### Phasing implications

The full development programme is expected to run from 2012 until 2021 with 50% complete by 2016.

A block by block heating approach would not be affected by phasing, although for later phases needing to meet higher Code levels central energy centres will be required. These will need to be considered at the outset. Higher targets will also mean that biomass fuel is more likely – storage for this will also need to be considered.

### Meeting Non-residential Sustainable Construction Targets

Current information suggests that non-domestic buildings will be built after the residential element (i.e. post 2016, maybe even post 2021). The school will have to be zero carbon and other buildings are likely to require BREEAM Excellent or equivalent.

It may be more practical in terms of meeting the non –residential targets to adopt a site wide energy strategy approach. Connecting the non-domestic buildings to a site wide district system is likely to make it easier to achieve an Excellent BREEAM rating.

### Proposed Policy

**New policy:**

a) Connaught Barracks will include a district heating system where proved suitable by detailed investigations.

b) At least 80% of the ecology credits will be achieved using the Code for Sustainable Homes and BREEAM assessments.

**Revisions to existing policy:**

- Policy (i) should now read: 'A comprehensive Masterplan, energy strategy and water strategy is agreed by the Council in advance of the determination of any planning applications and all applications accord with it;'

### Policy Justifications

PPS1 clearly states that 'where there are particular and demonstrable opportunities for greater use of decentralised and renewable or low-carbon energy…..bring forward development area or site-specific targets to secure this potential'. This is further supported by the South East Plan which states that 'Due to their size, strategic sites have a particular role to play in meeting renewable energy targets'.

Connaught Barracks is a significant site, but it also has a number of physical constraints. Currently it is proposed that a significant amount of residential housing will be brought forward on the site. There is potential for the use of a district heating system and this should be investigated in detail. However physical constraints and market delivery of the mix of uses and densities on site may be restrictive to this option. It is therefore recommended that a district heating system is investigated in detail and included if feasible.

Connaught Barracks is a sensitive site ecologically, therefore it is crucial that the development is exemplary in ecological terms. Therefore 80% of the ecology credits are required for the site.

## 7.5 MID TOWN

### Development description

In the centre of Dover town centre, the 15 hectare Mid Town regeneration site is expected to deliver between 6,000-14,500 $m^2$ of retail, restaurants and bars, 3500-8122 $m^2$ of community and the 10,000 $m^2$ redevelopment of South Kent College along with parking to serve the development and the town centre. There is provision for between 200 and 470 residential units. The low end of ranges (areas/units) outlined above are based on option A from the draft core strategy for selective re-development whilst higher figures are taken from option C for comprehensive redevelopment. Option C is the preferred option.

The main urban design elements are a retail street along the site and the River Dour which runs through the middle of the site. The Strategic Flood Risk Assessment has identified the area to be at high risk of flooding.

The Dover Masterplanning Project and the Public Realm Strategy identified the River as being an important and currently underused environmental asset. The River is not only an important ecological habitat but it also provides visual interest to the otherwise built up urban environment whilst at the same time providing a valuable and attractive pedestrian link to the town centre.

### Current proposed policy

The Mid Town area is allocated for mixed use development of C3 uses (residential development), A1 uses (shops), A3 uses (restaurants and cafes), A4 (Drinking establishments), D1 (Non-residential institutions), D2 (Assembly and Leisure), the redevelopment of South Kent College, and parking to serve the development and the town centre:

- A comprehensive masterplan is agreed by the Council for the redevelopment of this area in advance of the determination of any planning applications and all applications accord with it;
- There is provision for a minimum of 200 residential units incorporated into the comprehensive redevelopment of this site;
- The proposals assist with making a more compact town centre;
- New public spaces are created and public art is fully integrated into any redevelopment proposals;
- Ground floor uses create activity that takes full advantage of the riverside setting and take fully into account the risk of flooding; and
- The development is designed to complement and enhance the appearance of the River Dour and encourage walking and cycling.

**Future development scenarios – for testing purposes**

Only 1 development scenario was tested for the Mid Town, in line with the existing Core strategy options.

**Implications of housing density**

Housing density is likely to be medium to high density given the other proposed mix of uses on the site. In the draft Core strategy preferred option C 470 units (likely to be predominantly 1 and 2 bed units) would equate to approximately 25,000$m^2$ (based on an average unit floor area of 55$m^2$). This compares to 14,500$m^2$ of retail and over 18,000$m^2$ for the community and education uses combined. The housing density assuming no other uses on site would be 31 dwellings per hectare, so given the other uses density is likely to be at least 60 dwellings per hectare in the residential parts of the proposed development.

**Delivering energy requirement for Code Level 4**

No sites for wind turbines have been identified in close proximity to the Mid Town development. The high medium high density development and the mix of proposed uses is likely to mean a district heating option will be favoured. For Code 4 this could be powered by heat only biomass boilers or gas fired combined heat and power (CHP).

**Delivering energy requirements for Code Levels 5 & 6**

Strategies to deliver Code 5 and 6 include Biomass CHP, which although still relatively unproven at development scale, has potential to deliver Code level 5 without any support from additional low and zero carbon (LZC) technologies. Gas fired CHP and biomass boilers – with PV can also meet the Code 5 target.

Biomass fuelled CHP with PV can be used to meet the requirements of CSH level 6. Additional PV can be employed with the technologies used to meet Code 5, although often in high density developments roof area limitations prevent Code 6 targets being met.

**Meeting the non-residential energy targets**

The commercial development on this site represents the significant proportion of the proposal and will therefore be a key driver in dictating the proposed energy strategy. The proposed development timeframe – up until 2016 - will

mean that development may not need to meet the government's zero carbon target. Most of the development (residential and non residential) is likely to have to deliver a 44% reduction on the TER. This could be achieved using a district wide energy centre powered either with biomass (for heating only) or with gas or biomass through a combined heat and power engine.

The diversity of energy load from retail, residential and educational and community buildings would ensure longer run times for any proposed combined heat and power engine and would help with economic viability. Higher targets for this development would be challenging due to the probable lack of available space for installation of photovoltaic panels.

### Cost implications

The cost implications of the alternative energy strategies are shown in the graphs in section 4. No estimate has been made of the costs to deliver targets for the non-residential elements of the Mid Town development.

### Energy strategy implications on the masterplan

The following points need to be taken into consideration in further developing the designs for the Mid Town development:

**Table 20: LZC technology - Implications on masterplanning**

| Technology | Impact on masterplan |
|---|---|
| **Biomass boilers and combined heat and power** | ▪ Need a central plant room<br>▪ Require fuel storage room and system for fuel conveyance<br>▪ Often require a 'thermal store' – there is a requirement for vertical temperature stratification within the thermal store (i.e. plant room needs increased floor to ceiling heights)<br>▪ Need access for fuel delivery and maintenance<br>▪ Require district heating infrastructure |
| **Solar water heating** | ▪ Need to be located to face within 45$^{o}$ of South at an optimal inclination of 30$^{o}$<br>▪ Require hot water storage tanks either in homes or within a central plant room. |
| **Photovoltaics** | ▪ Need to be located to face within 45$^{o}$ of South at an optimal inclination of 30$^{o}$ |

### Phasing implications

It is likely that most of this development will be linked to a central energy centre. The design and detailed engineering of this energy centre will need to be considered at an early stage and a strategy will need to be developed to overcome any phasing issues. Boilers or CHP modules can be introduced as the development (and associated energy demands) grow.

### Meeting non-residential sustainable construction targets

It is expected that the College, Community Buildings and much of the retail will be subject to various types of BREEAM assessment. A joined up district wide energy strategy should help to deliver credits within the energy sections of the BREEAM assessments.

### Proposed Policy

**New policy:**

a) Mid Town will include a district heating system.
b) Non-residential buildings exceeding 1000m$^2$ gross will meet BREEAM Excellent.
c) At least 75% of the sound insulation credits must be achieved using the Code for Sustainable Homes.

**Revisions to existing policy:**

- Policy (i) should now read: 'A comprehensive Masterplan, energy strategy and water strategy is agreed by the Council in advance of the determination of any planning applications and all applications accord with it;'

### Policy Justifications

PPS1 clearly states that 'where there are particular and demonstrable opportunities for greater use of decentralised and renewable or low-carbon energy…..bring forward development area or site-specific targets to secure this potential'. This is further supported by the South East Plan which states that 'Due to their size, strategic sites have a particular role to play in meeting renewable energy targets'.

Community heating has potential to significantly reduce development $CO_2$ emissions. Published guidance[15] states that district heating schemes are most viable for development of over 100 homes where housing density is 55 dwellings per hectare or more. They can be especially viable for mixed use development such as the proposed Mid Town development where the different building uses will add diversity to the energy demand profile and create an opportunity for more efficient running of technologies such as Combined Heat and Power.

The proposed policy requires the main non-residential uses at Mid Town to achieve BREEAM 'Excellent'. This will be helped by the masterplanning process which should encourage early consideration of development wide 'quick wins' in areas such as energy, drainage, ecology, transport, waste management.

Due to its urban location, noise pollution is likely to be more prevalent, especially due to dock operations, therefore sound insulation standards are required. At least 75% of the Code for Sustainable Homes sound attenuation credits should be achieved specifically to prevent noise ingress to homes from retail, commercial, community and education spaces located in the same buildings. 75% of credits is deemed deliverable in a high density setting.

[15] EST guide - CE55 Community Heating – A Guide specifically states 'Most new build will be constructed by private developers, and assuming a project lifetime of 20 years with a discount rate of 12 per cent, new developments of 55 or more dwellings per hectare are, prima facie, likely to be cost effective.'

# 8. Delivery of policy requirements: masterplanning and urban design implications

While Code for Sustainable Homes and BREEAM requirements predominantly target the building scale, to meet higher levels of the code in a cost-effective and deliverable manner, site-wide design and masterplanning becomes important. The masterplan and urban design of a site influences more than 60 of the Code for Sustainable Home's points available. In order to achieve level 3 and above, the developments need a consolidated vision that anticipates the spatial implications of several key areas:

- Density and phasing for efficient energy provision
- Passive design and energy efficiency
- Water management and SUDS
- Ecological protection and enhancement
- Building footprint.

BREEAM credits have similar masterplanning implications.

The following table summarizes the key sustainable design and construction considerations that have an impact on masterplanning and urban design. It is important to note that these are urban design implications, and not the issues that would need to be tested in order to site renewable energy installations.

**Table 21: Masterplanning and Urban Design Implications of Code and BREEAM requirements**

| Sustainable Design Consideration | Impact on masterplan |
|---|---|
| **Efficient Use of Land** | Design to ensure density is high enough to achieve a high enough floor area to footprint ratio to achieve credits and protection of open spaces for ecological purposes. |
| **Energy Efficiency** | Energy efficiency will be improved through the use of higher density house types with greater adjoining wall areas. Apartments and terraced housing is more energy efficient than detached or semi-detached housing.<br><br>Masterplanning should consider passive design and orientation to manage natural heat and light and to minimise heat losses from wind exposure. Where possible the long-side of blocks, individual houses or streets should be orientated along an east-west axis to give maximum exposure to the southern side of buildings. Orientation initiatives need to be considered alongside other urban design criteria to ensure they do not impact adversely on place making. Landscaping can be used to provide seasonal shade and |

| | |
|---|---|
| | shelter from wind. |
| **Incorporation of on-site wind energy** | The possible incorporation of medium-large scale wind energy should be considered at the beginning of site planning, as wind energy is usually a cost-effective way of supplying on-site renewable electricity as part of code requirements. Wind installations need to be specifically sited to avoid turbulence from surrounding vegetation and structures, and placed a distance away from residential development to avoid significant noise and shadow flicker effects. |
| **Incorporation of on-site solar technologies** | Photovoltaics and solar thermal panels require an un-shaded, well-orientated surface to work efficiently. To ensure residential units with sloped roofs are well positioned for the use of solar technologies, orientate buildings so that a significant portion of roof area can be orientated within 20 degrees of south. |
| **Density and Energy Load Mix** | To increase the efficiency and financial feasibility of combined heat and power systems or district heating systems, significant heat loads should be clustered. A mixed use development with various day and night heat demands is desirable. Higher density development will lead to cost savings. The location of a site-wide energy centre should be accessible to large trucks for fuel deliveries. Location should also consider local noise, vibration, height of flue, view and pollution effects. |
| **Mandatory internal water use of 80 litres/person/day or less for Code Levels 5 and 6 means that rainwater and/or greywater recycling will be required.** | Allow for space in the masterplan for water collection tanks (can be underground) and additional plant space. Communal water recycling systems for blocks or the whole site should be considered. These could utilise rainwater, greywater, storm water or wastewater. |
| **Mandatory requirements for the reduction of surface water run-off - credits available for the use of Sustainable Drainage Systems (SUDS)** | Drainage solution should be properly considered at the beginning of masterplanning. Measures should be taken to reduced impermeable surface area and provide source control including green roofs, soakage areas and rainwater harvesting. Within the masterplan, areas should be provided to provide water treatment and attenuation. These areas should be integrated into the design of public realm and open space, providing ecological benefit where possible. |
| **Cycle storage** | Space provision for weatherproof and secure cycle storage. This may impact on building footprint and block layout. |
| **Simple rainwater collection** | Space for rainwater collection for external use (water butts or central water tanks) |
| **Waste collection** | Space for recycling and composting facilities either within individual units or in communal space. |
| **Ecology** | Ensure protection of any existing ecological features and space to allow the improvement of the ecological value of the site (e.g. green/brown roofs, wildflower meadows). |
| **Daylight** | Unit design in order to achieve good daylighting levels and view of the sky (to achieve relevant Code credit where possible). Consider overshadowing effects and effects of street widths. |
| **Private Space** | A number of Code credits can be achieved through the careful design of building typologies and private space: |

| | |
|---|---|
| | - Provision of private or semi-private amenity space for all units.<br><br>- Provision of home offices.<br><br>- Compliance with Lifetime Homes |
| **Secured by Design** | Ensure the design incorporates good natural surveillance and lighting. |
| **Noise and mix of land uses** | Ensure compliancy with noise protection levels. |
| **Local food production** | Masterplanning should consider the provision of space for allotments and private areas for food production. |

Density of development becomes a critical design criterion in sustainable construction terms. Higher density development combined with generous open space areas will contribute towards a range of credits, including energy, ecological protection and the use of open spaces for SUDS or private space. The Regional Spatial Strategy for the South East requires an average density of development of 40 dwellings per hectare. Clustering of development at higher densities within a site, leaving larger areas of open space, should be considered to meet or exceed this density requirement to enable more effective integration of sustainable construction criteria.

Sustainable construction policy and assessment methodologies have an important influence on the layout and large-scale design of a site. These implications need to be recognised and integrated with other urban design criteria to achieve the design of a successful and sustainable place. Equally, good masterplanning and consideration of sustainable construction criteria from the beginning of the design process will ensure that sustainable construction requirements can be met easily and in a cost-effective manner.

Climate Change Guide - At the Climate Change Summit 2007, the Regional Assembly launched a practical guide for planners, local councils, developers, regulators and service providers to inform their plans. The guide explains how new housing can be designed to make it more resilient against a changing climate, preparing for hotter summers and wetter winters and ways to ensure new homes are water and energy efficient.

# 9. Conclusions

There is a clear case for leading-edge policy and Dover District are utilising the very latest evidence and policy drivers for these policy recommendations. However global and national policy is currently going through a transition as it grapples with the urgency and scale of the challenges of climate change. Therefore a flexible approach will need to be taken in updating this Core Strategy and the Development Contributions SPD upon which is will depend for practical guidance and enforcement.

These recommendations take the most recent Government announcements committing to 80% carbon reductions by 2050 as the starting point for policy to 2026, and so therefore meet and go beyond the renewable targets and carbon emission reductions currently set in national and regional guidance. The policies utilise the Code and BREEAM as holistic assessment tools which measure these and other carbon and water issues, and which will be updated over time to respond to nation-wide initiatives.

Due to the uncertainty surrounding future policy and requirements at a National level, Dover District will need to keep abreast of policy developments, using the list of expected documents in Appendix B. There is also uncertainty over how the Code may change, not only in how it incorporates updates to Building Regulations, but also how it may change to include issues currently covered by ‘Build for Life’.

The preparation of the Development Contributions SPD allows some of this uncertainty and risk to be reduced and also allows the council to design how it wishes to invest in carbon emission reduction and water efficiency. The Dover Carbon Management Action Plan may also play a fundamental role.

These policy recommendations can also play a role in the Council’s corporate performance. The Council is now measured against National Indicators covering carbon dioxide reduction from local authority operations, carbon dioxide emissions per capita, fuel poverty and planning to adapt to climate change (indicators 185-188).

To deliver the infrastructure required to meet the policy targets, particularly low carbon and renewable energy infrastructure which has off-site implications, Dover District Council will need to take an active role in management and delivery. The testing of the proposed policies has shown an expected shortage of biomass fuel in the district. Dover District Council should act to firstly enable gathering of existing biomass resource from forestry management and support the building of local biomass supply chains in conjunction with neighbouring districts.

Policy testing also identified an expected shortfall in the District's performance against renewable energy targets if significant amounts of renewable electricity are not delivered off-site. It is recommended that sustainable infrastructure requirements are quantified in detail and submitted with the next round of the Programme of Development (PoD) funding estimations. To deliver significant renewable energy installations in the District, the Council will need to encourage and enable energy companies to pursue sensible opportunities in the District.

A further role for the Council could be in ensuring partnership working between developers, particularly those involved in Mid Town and the Waterfront, as economies of scale could be achieved in the joint provision of infrastructure for these developments.

The funding model to be developed to feed into the Development Contributions SPD will be key to focussed and sustainable delivery of carbon and water use reductions in the District. It is recommended that Dover District create a funding model immediately to enable enforcement of the recommended policies.

Dover District has the opportunity to take a leading role in enabling markets for biomass, renewable energy generation, greywater recycling, Energy Services Companies and community involvement in all of these new areas.

# APPENDIX A: Future expected policy and evidence updates

The following documents are all expected to be available or updated within the next year. It is recommended that the Core Strategy is kept abreast of these updates.

- Final South East Regional Spatial Strategy (Plan)
- UKCIP08 – predicted climate impacts for the UK – expected Spring 2009.
- Climate Change Bill/Act, expected Royal Assent Autumn 2008.
- Planning Bill/Act.
- Energy Bill/Act.
- Committee on Climate Change, expected outputs in December 2008.
- Further information from Communities and Local Government on zero carbon and the Code
- Output from Department of Energy and Climate Change.
- Output from UN negotiations in Poznan December 2008 and Copenhagen December 2009.

# APPENDIX B: Super-fast broadband feasibility

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**High Speed Broadband Concept**
Whitfield Development

30th September 2008

Prepared by: ..... Approved by: .....

Daniel Kler
Associate Director

Darren Smith
Associate Director

High Speed Broadband

| Rev No | Comments | Date |
|---|---|---|
| 1 | | 30.09.08 |
| | | |

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Job No Date Created 30.09.08

# Table of Contents

# 1 Introduction

## 1.1 Overview

Dover Council is completing its core strategy, and is planning to build up to 6,000 homes in Whitfield as the major green-field development area for the district. Part of the development will be Whitfield Business Centre. It is thought that if super-fast broadband can be installed in the area, this may attract a certain calibre of businesses and also provide residents with the ability to work from home. They also see this as a potential way that they could give benefit to existing surrounding communities as a result of new development.

## 1.2 Intended Scope

Faber Maunsell have been tasked with producing a report centred around the opportunity and constraints to delivering super fast broadband in Dover.

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# Technology

# 2 Technology

## 2.1 Broadband

Over the past 8 years there has been a revolution in the telecommunications sector, with the introduction of broadband services. As of 2008, broadband covers 64% of the country, primarily in urban areas.

Broadband services can be delivered in several ways: ADSL, Cable, and Fibre optic cable.

Presently, the most common of the above services is ADSL (Asymmetric Digital Subscriber Line)

### *2.1.1 ADSL*

ADSL is available to anyone with a BT telephone line located within 3.5 to 5.5 kilometres of an ADSL enabled exchange, dependent on line quality.

ADSL works by splitting the telephone line signal into two frequency bands, one for voice and the other for data. ADSL technology can work at up to 16Mbps download. The most common services in the UK at the moment are running at speeds of 8Mbps. Upload speeds are 768Kbps to 2Mbps product dependant; this is why it is asymmetric, because the download speed is different to the upload speed.

ADSL connections are subject to contention as they are shared between users within the same geographic location. This is typically a ratio of 20:1 or 50:1. Contention is the distribution of bandwidth between a number of users on the same ADSL connection. In effect, an 8Mbps download speed may be shared between up to say 50 users. The effect of this is that connectivity speeds will vary hugely depending on the number of users connected at any one time.

### 2.1.2 Cable

Cable Television operators provide broadband services over their cable television infrastructure. Primarily this is over copper cable – at least to the home.
Transmission speeds for these broadband services vary from 1.5Mbps to 24Mbps depending on the transmission medium and transmission distances

### *2.1.3 Fibre Optic Cable*

There has been a recent development in providing fibre optic connections direct to the subscriber's home. This service is generally described as Fibre To The Home (FTTH). Equally this service can be rolled out to any form of subscriber, not just a home-based one. Generally the services is labelled as Fibre To The x (FTTx).

FTTx uses fibre optic cable to provide end-to-end connectivity. Thus giving each subscriber connectivity for telephony and data services at speeds of up to 100Mbps – Although this is dependant upon service provider.

At present, FTTx is the only way of supplying high-speed broadband to a large amount of subscribers.

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# FTTx Implementation

# 3 FTTx Implementation

## 3.1 Overview

Fibre To The x, can be implemented in two main ways; Fibre To The Premise (FTTP), and Fibre To The Cabinet (FTTC). – FTTP is where the fibre optic cable is run directly from the nearest point of presence* (POP), to the premises, whereas FTTC has a fibre optic cable from the POP to a number of street cabinets. From the street cabinets, a copper cable is used to connect the street cabinet to the premises.

Both technologies will deliver high speed broadband, but FTTC is expected to deliver 40Mbps, opposed to FTTP's expected speed of 100Mbps

It is envisaged that FTTP will be implemented into 'new build' sites, whereas FTTC will be implemented to existing premises.

** The point of presence is a physical location which is an access point to the Public Telecommunications Services*

## 3.2 Suppliers and Financial Implications

### *3.2.1 BT/Openreach*

A recent press release from BT has stated that they are investing £1.5bn into their network to provide up to 10 million homes with 'super-fast broadband' by 2012.

The roll-out of this technology will vary across the UK, as BT are to liaise with local councils and government to establish a demand for the service.

Historically, BT and Openreach provide a ducting and cabling infrastructure free of charge, but the infrastructure remains the property of BT / Openreach.

Even though the infrastructure is being installed by BT, they are to sell the services direct and also via BT Wholesale – which will allow other operators to resell the service.

### *3.2.2 H20 Networks*

H2O Networks have recently released their Fibrecity solution in Bournemouth, which connects premises with fibre optic cable that has been run through the local sewerage system. At this time it is unclear how they provide internet connectivity, but it is assumed that this service shall be provided by a 3rd party.

One of the main issues with running fibre optic cable, is what happens to the cable and services provided over the cable when a sewer pipe containing fibre optic cable ruptures and requires replacement. Obviously, there may be a suspension in the services being delivered over the fibre optic cable while the sewer is replaced.

We have tried to contact H2O Networks for installation costs, but at the time of writing this report, we have not had a response. Therefore, we are unable to document their commercial model, and determine whether the Council leases the services from H2O Networks, or if the service is provided free-of-charge by H2O Networks and then H2O Networks charge the end-user directly.

# Conclusion

# 4 Conclusion

## 4.1 Conclusion

Super-fast broadband is still in its infancy, but with major funding from BT, it appears that by 2012, the majority of the UK will have the potential of a 40Mbps connection to the internet, with specific sites having connectivity of 100Mbps.

It is recommended that Dover Council contact BT and Openreach to discuss how both parties can achieve a commercially viable super-fast broadband solution to the Whitfield site.

The provision of data services utilising a sewer system, may have cost benefits where existing sewer systems are in place. However, the Whitfield site is a new project, where a whole range of services are to be installed from new. Early discussions with BT and Openreach, will ensure that the ducting infrastructure for the communications system is installed in harmony with all other new-build services.

# APPENDIX C: strategic site analysis background data

Energy demand figures assumed to estimate CSH energy performance for LZC options.

***Energy use and $CO_2$ emissions from homes - showing the implications of density on overall $CO_2$ emissions.***

*.....energy data from modelling undertaken by Faber Maunsell for the study published at:*
*http://www.communities.gov.uk/publications/planningandbuilding/housingcarbonfootprint*

| House Type | | Detached House | Semi-detached | Terrace | Apartments | TOTALS |
|---|---|---|---|---|---|---|
| Name | | Hurstwood | Wessex | Wessex | Arden | |
| Floor Area | $m^2$ | 101.61 | 76.32 | 76.32 | 59.67 | |
| Roof Area | $m^2$ | 57.68 | 38.16 | 38.16 | varies | |
| Space Heating | kWh | 5087 | 3195 | 2485 | 2229 | |
| Secondary space heating (for DER calc) | kWh | 521 | 327 | 255 | 228 | |
| Domestic Hot Water | kWh | 3649 | 3156 | 3071 | 2932 | |
| Pumps and Fans | kWh | 175 | 175 | 175 | 175 | |
| Lighting | kWh | 826 | 598 | 598 | 425 | |
| Total regulated energy demand (Gas) | kWh | 8736 | 6352 | 5556 | 5161 | |
| Total regulated energy demand (Electric) | kWh | 1522 | 1101 | 1028 | 828 | |
| Gas $CO_2$ emission factor | $kgCO_2/kWh$ | 0.194 | 0.194 | 0.194 | 0.194 | |
| Electric $CO_2$ emission factor (supplied) | $kgCO_2/kWh$ | 0.422 | 0.422 | 0.422 | 0.422 | |
| Electric $CO_2$ emission factor (displaced) | $kgCO_2/kWh$ | 0.568 | 0.568 | 0.568 | 0.568 | |
| $CO_2$ emissions from regulated energy use | kg | 2337 | 1697 | 1512 | 1351 | |
| TER | | 23.07 | 22.31 | 20.07 | 23.35 | |
| Proxy DER | $kgCO_2/m^2$ | 23.00 | 22.23 | 19.81 | 22.64 | |
| $CO_2$ emissions - unregulated - appliances, cooking etc. | kg | 1264 | 1105 | 1105 | 929 | |
| Total household predicted $CO_2$ emissions | kg | 3601 | 2802 | 2617 | 2280 | |
| Total household predicted $CO_2$ emissions | tonnes | 3.6 | 2.8 | 2.6 | 2.3 | |

# APPENDIX D: compliance summary and indicative costs of achieving Code levels

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Costs based broadly on a Cyril Sweet report for CLG, using mainly the costs associated with their 'mid terrace' unit. Faber Maunsell assisted Cyril Sweett with this work. Comments relating to the cost assumptions are used throughout the spreadsheet.
A short summary of measures required for CSH credit compliance is included in the 'validation' column.
Pink cells show where *we think* developers would alter their approach depending on their target rating (Level 4, 5, 6)
Orange cells show where there is a mandatory minimum performance level to achieve the required rating.
Grey cells show where credits are assumed, but could be at risk in design/masterplan development.

| | | | | | TO ACHIEVE CODE FOR SUSTAINABLE HOMES LEVEL 4 | | | TO ACHIEVE CODE FOR SUSTAINABLE HOMES LEVEL 5 | | | TO ACHIEVE CODE FOR SUSTAINABLE HOMES LEVEL 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Issue ID | Issue | Category Weighting | No. of Credits | Potential % Points Available | Target Credits | Target Score | Validation | Target Credits | Target Score | Validation | Target Credits | Target Score | Validation |
| **1.26%** | **CATEGORY 1 - ENERGY / $CO_2$** | | | | | | | | | | | | |
| Ene 1 | Dwelling Emission Rate | 1.26 | 15 | 18.8 | 8 | 10.04 | **To achieve a 4-star rating a minimum of 44% improvement on the TER is required.** | 14 | 17.57 | **To achieve a 5-star rating a minimum of 100% improvement on the TER is required.** | 15 | 18.83 | **To achieve a 6-star rating zero net carbon emissions from regulated and unregulated energy sources must be demonstrated.** |
| Ene 2 | Building Fabric | 1.26 | 2 | 2.5 | 1 | 1.26 | Achieving a HLP of 1.3 or less would be necessary to contribute towards the improved performance required for Ene 1. The improved U values and air tightness would incur additional costs above a base case unit. | 1 | 1.26 | Achieving a HLP of 1.3 or less would be necessary to contribute towards the improved performance required for Ene 1. The improved U values and air tightness would incur additional costs above a base case unit. | 2 | 2.51 | A mandatory HLP of 0.8 is required for the CSH L6 target. This requires building fabric standards and air tightness similar to standards set out in the EST advanced practice guide (Close to Passivhaus standard). Likely to require MVHR systems. |
| Ene 3 | Internal Lighting | 1.26 | 2 | 2.5 | 2 | 2.51 | 75% of internal fittings must be dedicated low energy fittings. | 2 | 2.51 | | 2 | 2.51 | |
| Ene 4 | Drying Space | 1.26 | 1 | 1.3 | 1 | 1.26 | Requires a secure space and drying line for clothes drying - with a minimum of 4m line for 1 - 2 bed dwellings and 6m for dwellings with 3 or more bedrooms. | 1 | 1.26 | | 1 | 1.26 | |
| Ene 5 | Energy Labelled White Goods | 1.26 | 2 | 2.5 | 1 | 1.26 | Developers often don't specify white goods as standard. We have assumed where level 4 is the target they will aim for 1 credit here, which can be achieved by providing occupants with information on the EU energy labelling scheme for white goods. | 2 | 2.51 | White goods need to specified to achieve 2 credits. As a minimum fridges and freezers or fridge freezers should be A + rated. A second credit is available where **either** washing and drying white goods are specified from the highest category for energy efficiency **or** where white goods are not specified information is provided (see left). | 2 | 2.51 | |
| Ene 6 | External Lighting | 1.26 | 2 | 2.5 | 2 | 2.51 | 2 credits can be achieved where all space lighting is dedicated low energy and security lighting has a maximum wattage of 150W, and is fitted with movement and daylight sensors. | 2 | 2.51 | | 2 | 2.51 | |
| Ene 7 | Low or Zero Carbon (LZC) Technology | 1.26 | 2 | 2.5 | 2 | 2.51 | 2 credits are awarded in the CSH for undertaking a feasibility and meeting a 15% reduction in site wide CO2 emissions using LZC technologies. 15% site wide CO2 reduction on a housing developing should be broadly inline with 30% reduction on regulated emissions. A 44% reduction on regulated emissions is required to achieve CSH L4. It is assumed therefore that these credits will be achieved with no extra cost, above that outlined under Ene 1. | 2 | 2.51 | | 2 | 2.51 | |
| Ene 8 | Cycle Storage | 1.26 | 2 | 2.5 | 2 | 2.51 | For two credits (assumed in the LS and 8 scenarios) 1 space is required for each 1 bed flat, 2 & 3 bed dwellings require 2 spaces and dwellings with 4 or more bedrooms require 4 cycle spaces. | 2 | 2.51 | | 2 | 2.51 | |
| Ene 9 | Home Office | 1.26 | 1 | 1.3 | 1 | 1.26 | This credit can be achieved where a free wall space of 1.8 metres is provided, along with an additional double electrical socket and internet connection within close proximity. The home office also has to achieve a minimum daylight factor. | 1 | 1.26 | | 1 | 1.26 | |
| | **Subtotal** | | | **36.4** | | **25.10** | | | **33.89** | | | **36.40** | |
| **1.50%** | **CATEGORY 2 - WATER** | | | | | | | | | | | | |
| Wat 1 | Indoor Water Use | 1.50 | 5 | 7.5 | 3 | 4.50 | **To achieve Level 3 a maximum water consumption of 105l/p/d needs to be demonstrated.** This can be achieved by specifying efficient sanitary ware | 5 | 7.50 | **To achieve Levels 5 and 6 a maximum water consumption of 80l/p/d needs to be demonstrated.** This will require the specification of grey water and possible rain water collection systems. | 5 | 7.50 | |
| Wat 2 | External Water Use | 1.50 | 1 | 1.5 | 1 | 1.50 | This will require a water butt for each house and communal water butts or storage tanks for apartment buildings. | 1 | 1.50 | | 1 | 1.50 | |
| | **Subtotal** | | | **9.0** | | **6.00** | | | **9.00** | | | **9.00** | |
| **0.30%** | **CATEGORY 3 - MATERIALS** | | | | | | | | | | | | |
| Mat 1 | Environmental Impact of Materials | 0.30 | 15 | 4.5 | 8 | 2.40 | Credits are awarded on a sliding scale according to the element ratings for building elements in BRE's Green Guide (A+ = 3 credits - D = 0.25 credits). Assessed elements include: Roof, External Walls, Internal Walls, Upper and Ground Floors, Windows. It has been assumed that with careful specification 8 credits could be achieved without additional cost | 8 | 2.40 | | 15 | 4.50 | Careful specifications will be needed to ensure that all building elements achieve a high rating in the Green Guide |
| Mat 2 | Responsible Sourcing of Materials - Basic Building Elements | 0.30 | 6 | 1.8 | 4 | 1.20 | Credits are awarded depending on the number of points achieved for ensuring materials within the main building elements are responsibly sourced. 80% of assessed materials in each element need to be responsibly sourced. Higher points are achieved where materials are certified under an approved certification scheme, however where none are appropriate some points can be achieved where key manufacturing processes comply with an Environmental Management System. Basic Building Elements include; Frame, Ground & Upper Floors, Roof, All Walls, Foundations and Staircase. Assumed 4 credits can be achieved. | 4 | 1.20 | | 6 | 1.80 | Careful consideration will be needed in developing the supply chain for basic building elements to ensure that all 6 credits are achieved |
| Mat 3 | Responsible Sourcing of Materials - Finishing Elements | 0.30 | 3 | 0.9 | 2 | 0.60 | Same approach to scoring as above but this credit considers the following elements; Stair, Windows, All doors, Skirting, Panelling, Furniture, Fascias etc. Assumed 2 credits can be achieved. It should be noted that both Mat 2 and Mat 3 are relatively new credits. No precedent has been set to guide how complicated it maybe to achieve these credits. | 2 | 0.60 | | 2 | 0.60 | |
| | **Subtotal** | | | **7.2** | | **4.20** | | | **4.20** | | | **6.90** | |
| **0.55%** | **CATEGORY 4 - SURFACE WATER RUN-OFF** | | | | | | | | | | | | |
| Sur 1 | Management of Surface Water Run-off from developments | 0.55 | 2 | 1.1 | 2 | 1.10 | Installing rainwater holding facilities and/or a sustainable drainage system on the site to provide attenuation and reduce the surface water runoff by 100% would be necessary to obtain these points. This could be achieved through swales, permeable paving, or through use of subsurface tanks or oversized pipes. | 2 | 1.10 | | 2 | 1.10 | |
| Sur 2 | Flood Risk | 0.55 | 2 | 1.1 | 2 | 1.10 | This credit is dependent on the location of the site. It has been assumed that the site in question would be in an area at low risk of flooding. If the site were at medium risk of flooding 1 credit would be achievable but there would be design implications at a cost of £18,635 for a house and £4,150 for a flat. | 2 | 1.10 | | 2 | 1.10 | |
| | **Subtotal** | | | **2.2** | | **2.20** | | | **2.20** | | | **2.20** | |
| **0.91%** | **CATEGORY 5 - WASTE** | | | | | | | | | | | | |
| Was 1 | Storage of non recyclable waste and recyclable household | 0.91 | 4 | 3.7 | 4 | 3.66 | Credits are awarded for the provision of appropriately sized internal and external bins for storage of recyclable waste. It is assumed these credits will be achieved. | 4 | 3.66 | | 4 | 3.66 | |
| Was 2 | Construction Site Waste Management | 0.91 | 2 | 1.8 | 2 | 1.83 | A site waste management plan must be completed. This should include targets to promote resource efficiency and recycling. This credit will be achieved. | 2 | 1.83 | | 2 | 1.83 | |
| Was 3 | Composting | 0.91 | 1 | 0.9 | 0 | 0.00 | This credit is awarded where individual composting facilities are provided to houses and communal facilities for composting are made available to residents of flats. It is not expected that this credit will be targeted for L4 compliance. | 1 | 0.91 | This credit is awarded where individual composting facilities are provided to houses and communal facilities for composting are made available to residents of flats. Communal facilities will need to be run or managed by the Local Authority or a management company. | 1 | 0.91 | |
| | **Subtotal** | | | **6.4** | | **5.49** | | | **6.40** | | | **6.40** | |
| **0.70%** | **CATEGORY 6 - POLLUTION** | | | | | | | | | | | | |
| Pol 1 | Global Warming Potential (GWP) of Insulants | 0.70 | 1 | 0.7 | 1 | 0.70 | Insulations products with 0 ODP and GWP of less than 5 are readily available. It has been assumed that these points will be sought and achieved. This is unlikely to have a significant impact on costs. | 1 | 0.70 | | 1 | 0.70 | |
| Pol 2 | Nitrous Oxides ($NO_x$) emissions | 0.70 | 3 | 2.1 | 0 | 0.00 | Achieving these points will greatly depend on the proposed energy strategy. Credits have not been assumed as biomass and/or gas fired CHP technologies are likely to come forward as part of the development proposals. These technologies increase emissions in NOx and particulate matter when compared to a base case using gas boilers. These credits may be achievable if the energy strategy includes large scale wind turbines or other low NOx technologies. | 0 | 0.00 | | 0 | 0.00 | |
| | **Subtotal** | | | **2.8** | | **0.70** | | | **0.70** | | | **0.70** | |
| **1.17%** | **CATEGORY 7 - HEALTH AND WELL-BEING** | | | | | | | | | | | | |
| Hea 1 | Daylighting | 1.17 | 3 | 3.5 | 1 | 1.17 | Based on previous experience, it is considered likely that the daylight criteria for living rooms, dining rooms and studies will be achieved. However it is normally very difficult for architects to achieve compliance with the daylighting factors and a view of the sky from kitchens, which are often internal. One credit has been assumed. | 1 | 1.17 | | 1 | 1.17 | |
| Hea 2 | Sound Insulation | 1.17 | 4 | 4.7 | 1 | 1.17 | Credits are awarded for committing to providing sound insulation levels which exceed standards set out in Approved Document E. This can be demonstrated either with pre-completion testing or by ensuring all elements have been assessed and approved by Robust Standard Details Ltd. 3bB improvement over Part E for airborne and impact sound insulation values are required to achieve 1 credit. It has been assumed this credit will be targeted to achieve the L4 rating. | 3 | 3.50 | 5bB improvement over Part E for airborne and impact sound insulation values are required to achieve 3 credits. It has been assumed these credits will be targeted to achieve the L5/6 ratings. | 3 | 3.50 | |
| Hea 3 | Private Space | 1.17 | 1 | 1.2 | 1 | 1.17 | These points can be achieved if private spaces are to be allocated to each of the houses on the development and additionally an area (of suitable size) is available for the exclusive use of the residents of the apartments. | 1 | 1.17 | | 1 | 1.17 | |
| Hea 4 | Lifetime Homes | 1.17 | 4 | 4.7 | 4 | 4.67 | It is assumed that the principles of Lifetimes Homes will be complied with. | 4 | 4.67 | | 4 | 4.67 | |
| | **Subtotal** | | | **14.0** | | **8.17** | | | **10.50** | | | **10.50** | |
| **1.11%** | **CATEGORY 8 - MANAGEMENT** | | | | | | | | | | | | |
| Man 1 | Home User Guide | 1.11 | 3 | 3.3 | 3 | 3.33 | This criteria should be relatively simple to achieve, so it is assumed that the maximum number of points will be sought. The main cost will be in preparing, printing and distributing the guides. | 3 | 3.33 | | 3 | 3.33 | |
| Man 2 | Considerate Constructor Scheme | 1.11 | 2 | 2.2 | 2 | 2.22 | To achieve these points the site would need to be registered to the Considerate Constructor's Scheme (CCS) and go beyond best practice standards. This may require additional staff and training time on site to develop and implement the appropriate management. | 2 | 2.22 | | 2 | 2.22 | |
| Man 3 | Construction Site Impacts | 1.11 | 2 | 2.2 | 2 | 2.22 | It has been assumed that 4 or more of the items listed in the technical guidance under Man 3 (best practice considerate constructors measures) will be achieved, thereby achieving 2 credits. The list contains 6 best practice measures so there is some flexibility in terms of which items are selected. | 2 | 2.22 | | 2 | 2.22 | |
| Man 4 | Security | 1.11 | 2 | 2.2 | 2 | 2.22 | Achieving the "Secured by Design' standards and achieving the required minimum security standards for the external doors and windows is not considered too onerous (relative to other available options). It is assumed that developers would aim to achieve these credits. | 2 | 2.22 | | 2 | 2.22 | |
| | **Subtotal** | | | **10.0** | | **10.00** | | | **10.00** | | | **10.00** | |
| **1.33%** | **CATEGORY 9 - ECOLOGY** | | | | | | | | | | | | |
| Eco 1 | Ecological Value of the Site | 1.33 | 1 | 1.3 | 0 | 0.00 | These credits are site specific. As a conservative estimate, it is assumed that the site has some ecological value. | 0 | 0.00 | | 0 | 0.00 | |
| Eco 2 | Ecological Enhance | 1.33 | 1 | 1.3 | 1 | 1.33 | These credits are site specific. It has been assumed that an ecologist would have to be involved for other reasons (e.g. planning) and that they could advise on enhancements for the site at no extra cost specific to the Code. | 1 | 1.33 | | 1 | 1.33 | |
| Eco 3 | Protection of Ecological Features | 1.33 | 1 | 1.3 | 0 | 0.00 | These credits are site specific. As a conservative estimate, it has been assumed that not all ecological features present on site can be protected. | 0 | 0.00 | | 0 | 0.00 | |
| Eco 4 | Change in Ecological Value of the Site | 1.33 | 4 | 5.3 | 2 | 2.67 | These credits are site specific. It has been assumed that an ecologist would have to be involved for other reasons (e.g. planning) and that they could advise on ways to maintaining a neutral change in ecological features on site. | 3 | 4.00 | In order to achieve a further credit the ecologist would have to recommend additional planting to improve the number of species on site. This is likely to require additional space for soft landscaping. | 3 | 4.00 | |
| Eco 5 | Building Footprint | 1.33 | 2 | 2.7 | 2 | 2.67 | Given the CSH targets which need to be met we have assumed developers will aim to achieve 1 credit here. Houses will need to be designed with floor area to footprint ratio of 2.5:1, flats need to achieve a ratio of 3:1. | 2 | 2.67 | | 2 | 2.67 | |
| | **Subtotal** | | | **12.0** | | **6.67** | | | **8.00** | | | **8.00** | |
| **CODE TOTAL SCORE** | | | | **100.0** | | **68.52** | | | **84.89** | | | **90.10** | |
| | | | | | **Code for Sustainable Homes Rating** | **Level 4 ★★★★** | | **Code for Sustainable Homes Rating** | **Level 5 ★★★★★** | | **Code for Sustainable Homes Rating** | **Level 6 ★★★★★★** | |