AECOM

Renewable Energy Potential Study

Volume 1 - Final Report

Eastbourne Borough Council

October 2009

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27 October 2009

Prepared by: APA .... Approved by: RS ....
Abena Poku-Awuah Rob Shaw
Senior Consultant Associate Director

Renewable Energy Potential Study

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The Johnson Building, 77 Hatton Garden, London, EC1N 8JS
Telephone: 020 7645 2000 Fax: 020 7645 2099 Website: http://www.aecom.com

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Non Technical Summary

Non Technical Summary

1.1 Introduction

This study has been commissioned to support the planning department of Eastbourne Borough Council in identifying policies and targets for decentralised, low carbon and renewable energy generation across the borough. The study forms the evidence base associated with the production of the Core Strategy and required by the PPS1 Supplement on Planning and Climate Change.

The study identifies the resource in Eastbourne for low carbon and renewable energy generation across existing development, new development and community-scale interventions and recommends appropriate planning policies and targets. Developing a sustainable building, however, is about more than just reducing energy consumption and CO_2 emissions. Environmental concerns affecting each of the neighbourhoods in Eastbourne have been assessed and appropriate levels of the Code for Sustainable Homes and BREEAM have been recommended for new homes and non-domestic buildings.

While this is ultimately a planning study, it encourages Eastbourne Council to regard the Core Strategy not only as a planning document, but as the spatial element of a wider corporate plan that guides the delivery of energy generation opportunities across the borough. In response the study identifies a set of appropriate delivery mechanisms alongside each of the proposed policies.

1.2 The need for a Renewable Energy Potential Study

Planning Policy Statement 1: Delivering Sustainable Development (PPS1) places an emphasis on promoting more sustainable development. The PPS1 Supplement expects local authorities, through their local development documents, to encourage the uptake of decentralised, low carbon and renewable energy generation. The PPS1 Supplement states that planning authorities should have "*an evidence-based understanding of the local feasibility and potential for renewable and low-carbon technologies*."

Buildings are responsible for a large proportion of Eastbourne's CO_2 emissions. Tackling this sector is essential for making significant cuts in emissions from the borough. Assessment of the CO_2 emissions from other sectors is beyond the scope of this study.

1.3 Policy Drivers

There is a clear framework through national policy for inclusion of planning policies designed to mitigate and adapt to climate change. Key drivers are the legal requirement, through the Climate Change Act 2008, for an 80% reduction in the UK's CO_2 emissions over 1990 levels by 2050 and the binding commitment to generate 15% of the UK's total energy from renewable sources by 2020. The Government's strategy for delivering these hugely challenging targets is set out in the UK Low Carbon Transition Plan and the Renewable Energy Strategy. These national targets alone provide sufficient justification for setting stringent energy policies in development plan documents.

In addition, new buildings must comply with Part L of the Building Regulations which govern the level of CO_2 emissions that are permissible from any building. Changes to the Building Regulations in April 2010 and 2013 are expected to bring in demanding CO_2 emissions targets, leading to zero carbon homes by 2016 and non domestic buildings by 2019. These changes will gradually shift most of the onus for delivering on-site energy efficiency, low carbon and renewable energy generation away from planning and onto the Building Regulations.

1.4 Growth in Eastbourne

Eastbourne is predominantly urban and is almost completely built up to its administrative boundaries. The South East Plan states that the Borough needs to deliver 4,800 new homes in the period 2006-2026. It is likely that a considerable portion of this will be small-scale development on brownfield sites within existing development boundaries. To some extent this will favour certain types of development, such as higher densities and flats, instead of housing.

The regeneration of the town centre is a priority for the Council. A recent study confirmed that Eastbourne is in need of new retail space to satisfy the needs of the surrounding community. The Council has selected planning consultants David Lock Associates to produce a Town Centre Area Action Plan (AAP). Unfortunately, proposals were not available at the time of this study and thus the Town Centre AAP area has been excluded from the evidence base.

Eastbourne has major geographical constraints that will prove challenging to future development. Overcoming flood risk, transport and accessibility requirements are likely to threaten the delivery of housing and will also impact upon the ability to achieve significant on-site reductions in CO_2 emissions and wider standards for sustainability. However, the borough is likely to be disproportionately affected by climate change. Priority should be given to actions that reduce adverse impacts of climate change and adapt development to the effects of this and other environmental damage.

1.5 Opportunities for Energy Efficiency

Existing buildings represent the largest energy demand in Eastbourne. Any strategy for CO_2 reduction in buildings should consider the potential for increased energy efficiency in the existing stock as well as new developments. There are approximately 41,000 homes in the borough and the current replacement rate is negligible, with virtually all new dwellings being built to increase supply rather than replace older stock. This means that most of the current existing stock will be retained, certainly over the period of influence of the Core Strategy and probably decades afterwards. This presents a significant problem for energy consumption but also great potential for making improvements. Chapter 4 of this report provides further detail on possible improvements to upgrade the existing stock and energy efficiency measures that could be incorporated into new development.

1.6 Opportunities for Energy Supply Networks and Low Carbon and Renewable Energy Generation

The opportunities for the generation and supply of low carbon and renewable energy have been assessed across existing and new development and at the community scale. The results are summarised below in Table 1.

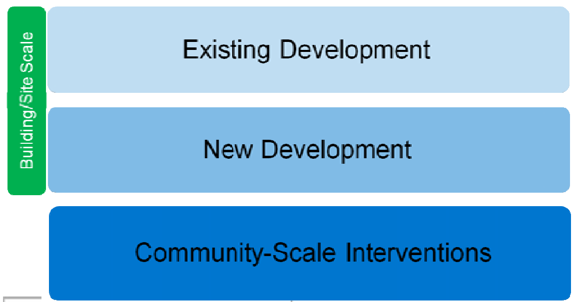


Figure 1 The three opportunities for CO_2 reduction in Eastbourne

The available opportunities consist of district heating networks to provide community heat (preferably with CHP to provide electricity), establishing supply chains to manage local biomass, large and small scale wind energy, and microgeneration technologies. Microgeneration technologies tend to be less location specific and therefore have little influence on the spatial arrangement of development.

The expected tightening of the Building Regulations means that the installation of on-site microgeneration technologies will increasingly fall beyond the remit of planners. The role of the local authority will be to support developers in fulfilling their regulatory obligations and, where necessary, requiring building performance standards ahead of the Building Regulations. Post 2016, the Council will need to assist by identifying “allowable solutions;” the proposed mechanism for new development to achieve “zero carbon” status, by linking to off-site solutions. Opportunities will still exist for local authorities to influence energy efficiency measures and the retrofitting of microgeneration technologies to the existing stock.

These opportunities cannot be delivered through planning alone. However, planning is unique in that is the only activity that is able to build up a comprehensive spatial understanding of the opportunities and constraints for decentralised, low carbon and renewable energy. This study has enabled the preparation of an Energy Opportunities Plan based on Eastbourne’s physical characteristics that spatially maps the low carbon and renewable opportunities available and provides the starting point for identifying appropriate delivery mechanisms [Figure 2].

The breadth of this approach allows us to take advantage of the distinct merits of the planning system in promoting decentralised, low carbon and renewable energy without unnecessarily stretching its remit where other regulatory or support regimes may be better placed to take a lead. Importantly, the focus on delivery helps to address the difficult issue of developer viability by shifting much of the cost burden away from developers and onto third parties.

Technology	Resource in Eastbourne
District Heating with CHP	Significant resource identified
Large Scale Wind	Limited resource identified
Small Scale Wind	Significant resource identified
Energy from Waste	Outside the scope of this study.
Biomass Energy	Limited resource identified
Hydro Energy	No resource identified
Tidal Energy	No resource identified
Wave Energy	No resource identified
Geothermal Energy	No resource identified
Microgeneration	Significant resource identified

Table 1 Summary of low carbon and renewable energy resource in Eastbourne

1.7 The Code for Sustainable Homes and BREEAM

The sustainability issues covered in both the Code and BREEAM which are of particular relevance to Eastbourne are waste and recycling, ecology and land use, pollution and Lifetime Homes. These have been described in chapter 7. Other issues, including management, health and wellbeing and materials depend more on the design and construction of the development, or the specific constraints of a given site. It has been assumed that these credits relating to these other issues can be achieved at the discretion of the developer, subject to financial viability or other considerations.

1.8 Policy Recommendations

This study proposes three new policies for the borough:

- Proposed policy 1 identifies the Energy Opportunities Plan as the supporting framework and spatial plan for energy projects in Eastbourne. It underpins the policies and targets relating to CO_2 emissions and low carbon and renewable energy generation.

  The proposed policy requires new development on strategic sites to install or connect, or be able to connect in the future, to an energy network. This policy will need to be appraised in the context of decisions taken over the suitability of Eastbourne Council to set up an appropriate delivery vehicle such as an Energy Service Company (ESCo);

- The constrained nature of Eastbourne means that there are limited opportunities for community-scale energy generation. Therefore, opportunities to maximise energy generation and CO_2 reductions in new development ahead of the Building Regulations are promoted. Proposed policy 2 accelerates the move towards zero carbon by increasing the amount of onsite energy efficiency and microgeneration required on site. All new buildings, both homes and non-domestic, are expected to achieve an additional 15% reduction on the residual CO_2 emissions after Building Regulations compliance.

- To encourage wider sustainability standards beyond energy and carbon, the evidence base supports using planning policy to require new development to adopt the full Code for Sustainable Homes and BREEAM in line with the standards for CO_2 emissions due to be introduced into the Building Regulations

  Code Levels 5 and 6 have not been targeted since the stringent mandatory requirements for water use effectively mean that all new homes will need to have a water reuse or recycling system installed. In our judgement, it is not clear that this is a cost-effective or proportionate contribution to reducing water stress in Eastbourne. The Code requirements in the proposed policy 3 could be reviewed in response to any future changes in Code water criteria for Code Levels 5 and 6;

In order to provide flexibility for developers in meeting planning policy requirements and targets, policy should be supported by allowing developers to pay into a Carbon Buyout Fund where it is demonstrated that meeting targets on-site is unviable. It is likely that this would be operated through the forthcoming Community Infrastructure Levy.

The opportunities identified in the EOP will not all be deliverable through individual developments or planning applications. A coordinated approach between Core Strategy policy and wider corporate policy-making will be crucial to effective delivery.

1.9 Delivery

The Energy Opportunities Plan identifies a number of low carbon and renewable opportunities that are not deliverable through individual developments or planning applications. To deliver these, Eastbourne Borough Council will need to take an active role in management and delivery to:

- Improve the energy performance of the existing building stock;
- Promote faster uptake of microgeneration technologies than could be expected by relying on national support measures alone;
- Develop large scale wind energy;
- Develop district heating networks;
- Create a biomass supply chain;
- Set up a monitoring database to capture information about the renewable energy systems installed on buildings, allowing Eastbourne to report against local, regional and national targets for renewable and low carbon energy.

Delivery options for each energy opportunity are described in detail in Chapter 10. The Wellbeing Power, introduced through the Local Government Act 2000, promotes innovation in the way that local authorities provide services. This includes the setting up or participating in local energy services companies (ESCo) and other joint ventures, supplying heat and/or power.

Alongside the Wellbeing Power, the Government also introduced the concept of Prudential Borrowing that could enable Eastbourne Council to borrow money to establish and deliver services that they would otherwise be unable to. The loans, obtained at public sector borrowing rates can be serviced by energy sales and other related income sources.

Other potential income sources include: money raised through a Community Infrastructure Levy or similar charge; revenue from Renewable Obligations Certificates (ROCs), the feed-in-tariff (to be introduced from April 2010), the renewable heat incentive (from April 2011); and bonds issued to local communities.

The implications for the Council of some of the options are significant, particularly that of establishing an Eastbourne Council-led ESCo. The preferred delivery mechanism should be a coordinated approach between the planning and other Council departments, the Eastbourne Environment Partnership, the Eastbourne Strategic Partnership and the local community.

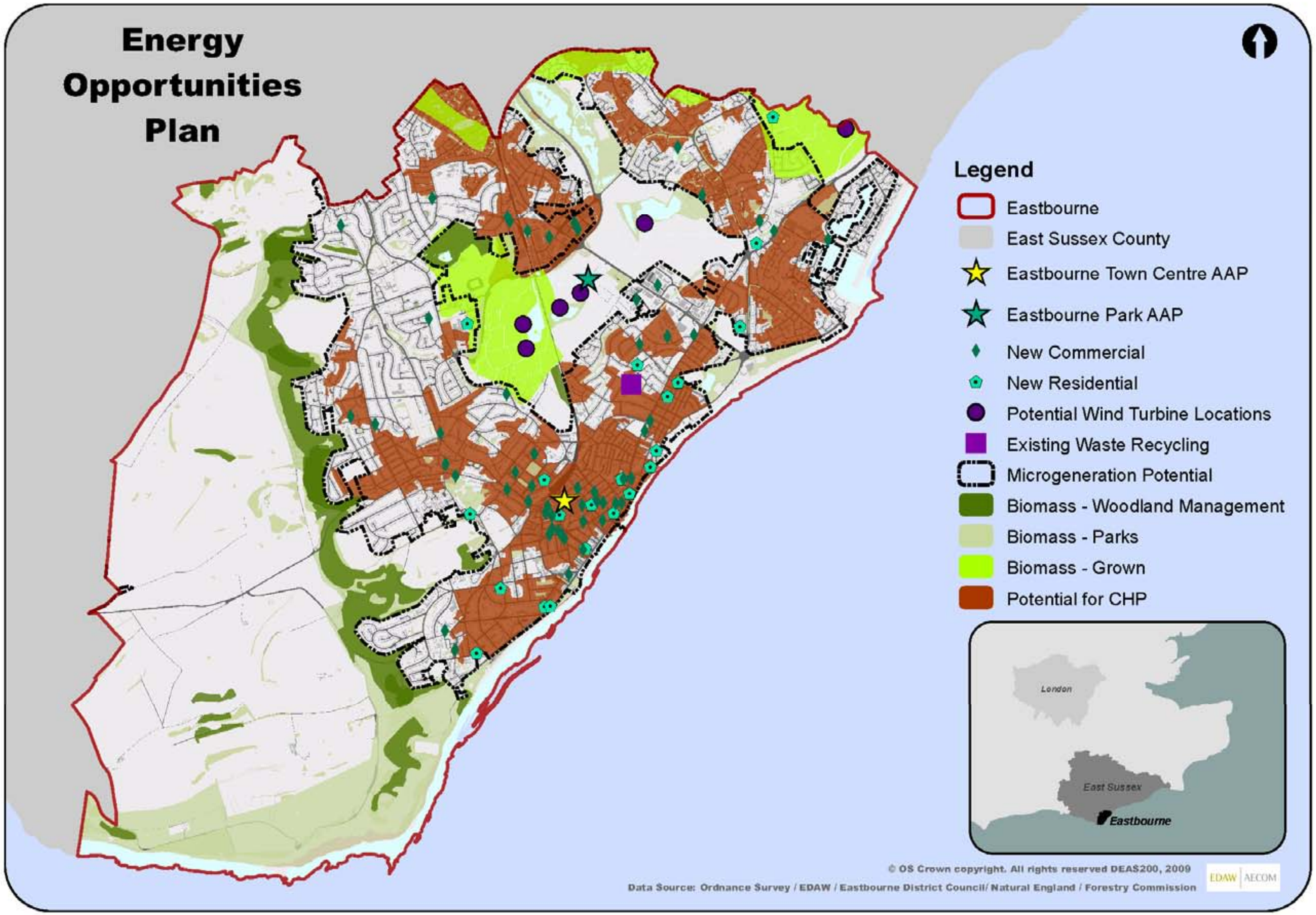


Figure 2 Eastbourne Energy Opportunities Plan

The recommendations made throughout the report have been summarised below.

Recommendations 1-3: Once clarity is gained over the CIL regulations and the remaining issues specific to this project, appropriate planning policy should be prepared for implementation in the Core Strategy, with supporting SPD guidance.

Recommendations 4: The planning and Development Control departments of the Council collaborate to draw up appropriate compliance criteria and validation checklists for new policy, for example, based on submission of Building Control documentation or Code for Sustainable Homes certificates.

Recommendation 5: Further work is undertaken to establish the most appropriate type of ESCo and its remit.

Recommendation 6: Local Development Orders are defined for strategic areas where it is considered that district heating networks with CHP would be advantageous.

Recommendation 7: The Eastbourne Council website is updated to include a guidance section on the Code for Sustainable Homes, to aid developers in complying with policy and targets. This guidance should be reflected in the SPD.

Recommendation 8: A detailed energy Masterplan and strategy is carried out for the Town Centre AAP, with particular focus on the potential for a biomass and/or waste fuelled, CHP district heating system.

Recommendation 9: Local initiatives are implemented to drive improved energy efficiency standards in both existing homes and non-domestic buildings, particularly schemes to encourage private landlords to invest in whole house energy efficiency.

Recommendation 10: Further work is undertaken to confirm the best approach for delivering microgeneration technologies in Eastbourne.

Recommendation 11: Reviews of the Sustainable Community Strategy should address energy and climate change, with consideration given to preparing a dedicated, decentralised and low carbon and renewable energy strategy.

Recommendation 12: The Council demonstrates leadership by investing in its own buildings to improve energy performance. Corporate strategies should reflect the need for energy effiency in procurement, operation and maintenance (for example, by requiring energy efficient appliances in public stock). The Council could commit to the 10:10 campaign to cut carbon emissions by at least ten per cent by next year.

Recommendation 13: Further work is undertaken to confirm the low carbon and renewable energy opportunities for reducing CO_2 emissions from transport in the borough.

Recommendation 14: A database is developed of all planning applications showing the energy/CO_2 reduction targets met for new development. This should be linked to GIS, allowing spatial representation of progress against CO_2 and renewable energy targets and should be accessible by other departments outside planning (such as Transport).

Recommendation 15: Periodic reviews are carried out into the development of emerging technologies, in particular, those with the capability to generate renewable electricity such as marine technologies, building mounted wind turbines and fuel cells.

Recommendation 16: Further work is undertaken to investigate ways of adapting the borough's building stock to climate change effects, for example, those predicted by the UKCIP models.

Introduction

1 Introduction

1.1 Project scope

AECOM (formerly Faber Maunsell) has been commissioned by the planning department of Eastbourne Borough Council to undertake a Renewable Energy Potential Study, in order to support the reduction of carbon dioxide (CO_2) emissions from residential and non-domesticl buildings. The study will form part of the evidence base and inform work associated with the production of the Local Development Framework (LDF) including the Core Strategy and other plans and strategies that make up the planning framework for the Borough.

The objectives of the study, as defined in the brief, were to:

- Identify opportunities for any renewable energy installations in the Borough, be they domestic, commercial or open land;
- Help to set an appropriate level of Code for Sustainable Homes for new housing and a BREEAM standard for non-domestic buildings taking into account the circumstances in each of the Borough's 14 neighbourhoods;
- Provide information that will enable the Council to produce a Sustainable Design Supplementary Planning Document (SPD) to minimise carbon emissions in all new development, taking into account the latest guidance and technologies.

1.2 The Need for a Renewable Energy Potential Study

Planning Policy Statement 1: Delivering Sustainable Development (PPS1) (2005) places an emphasis on promoting more sustainable development. The PPS1 Supplement expects local authorities to provide a framework through their local development documents to encourage the uptake of decentralised low carbon and renewable energy generation.

The PPS1 Supplement states that planning authorities should have "*an evidence-based understanding of the local feasibility and potential for renewable and low-carbon technologies".* It goes on to explain that, by drawing on the evidence base and with consistency in housing and economic objectives, planning authorities should:

"(i) set out a target percentage of the energy to be used in new development to come from decentralised and renewable or low-carbon energy sources where it is viable. The target should avoid prescription on technologies and be flexible in how carbon savings from local energy supplies are to be secured;

(ii) where there are particular and demonstrable opportunities for greater use of decentralised and renewable or low-carbon energy than the target percentage, bring forward development area or site-specific targets to secure this potential; and, in bringing forward targets,

(iii) set out the type and size of development to which the target will be applied; and

(iv) ensure there is a clear rationale for the target and it is properly tested."

The PPS1 Supplement states that in preparing Local Development Framework (LDF) Core Strategies, planning authorities should:

"Consider identifying suitable areas for renewable and low-carbon energy sources, and supporting infrastructure. Care should be taken to avoid stifling innovation including by rejecting proposals solely because they are outside areas identified for energy generation and…

Expect a proportion of the energy supply of new development to be secured from decentralised and renewable or low-carbon energy sources."

1.3 Structure of the Report

The report is structured as follows:

1. Introduction: Introduces the purpose and scope of the study.

2. Policy Drivers: Sets out the national, regional and local policy context and provides background on other locally important studies and initiatives in the energy or sustainability sector.

3. Growth in Eastbourne: Brief description of the character of Eastbourne and energy demand of the development expected over the period of the Core Strategy.

4. Opportunities for Energy Efficiency Improvements: Discussion of the potential to reduce baseline energy demand by designing the form, fabric and services of new buildings to higher energy efficiency standards and refurbishing existing buildings.

5. Opportunities for District Heating: Assessment of the potential to supply low carbon heat through district heating with CHP, based on heat density mapping of the borough.

6. Opportunities for Low Carbon and Renewable Technologies: Assessment of the potential for generating energy from low carbon and renewable sources.

7. Code for Sustainable Homes and BREEAM: Overview of other sustainability issues beyond energy and carbon which could affect the Code or BREEAM scores of future developments, including issues relating to water, waste and recycling, ecology and flood risk.

8. Policy Options: Sets out recommendations for policy targets the most appropriate Code levels.

9. Testing Targets and Policy: Assessment of the costs and benefits of a range of policy options.

10. Delivering Low Carbon Energy in Eastbourne: Discussion of the different mechanisms which may assist in delivering the proposed policy and targets for Eastbourne.

11. Recommendations: Summary of recommendations made throughout the study and suggestions for next steps and further work.

12. References: Summary of references used in the report.

Appendix A: Analysis of low carbon and renewable opportunities available in Eastbourne's 14 neighbourhoods.

Appendix B: Details of workshop held to present interim results of study and harness views of stakeholders on appropriate policy for Eastbourne.

Appendix C: Review of the different forms of decentralised, low carbon and renewable energy policy currently being used in England.

Appendix D: Description of modelling carried out to estimate current and future energy demand and CO_2 emissions of Eastbourne, and subsequently test policy and target options.

Appendix E: Description of funding available for low carbon and renewable technologies.

Appendix F: Detailed description of low carbon and renewable technologies assessed in the study.

Policy Drivers

2 Policy Drivers

At the international level, governments are negotiating a new international framework for reducing greenhouse gas emissions, to follow the first commitment period of the Kyoto Protocol which ends in 2012. This is due to be agreed in Copenhagen in December 2009. It is expected to commit the UK to further binding targets for greenhouse gas emissions reductions, as well as measures to promote development and financial investment in low carbon technologies.

There is already a range of policies, strategies and legislation in the UK intended to address both the causes and impacts of climate change. They define the responsibilities of local authorities in this area and establish a range of powers to enable local action to reduce emissions and adapt to the changes in climate which are already occurring or are projected to emerge over the course of this century. The role of regional and local planning bodies includes:

- Setting policies and targets for energy generation and CO_2 reduction that enable the UK to meet its national targets;
- Setting policies and targets for new developments that are more stretching than national regulations, where local conditions make this feasible and viable;
- Identifying and enabling spatial opportunities, such as promoting suitable locations for renewable energy generation or taking into account climate change risks when making spatial planning decisions;
- Enabling the development of community infrastructure, including district heating networks;
- Providing organisational and financial delivery mechanisms.

The following sections review relevant national, regional and local policy context and summarise the implications for planning and the wider role of local authorities in addressing climate change.

2.1 National Policy Context

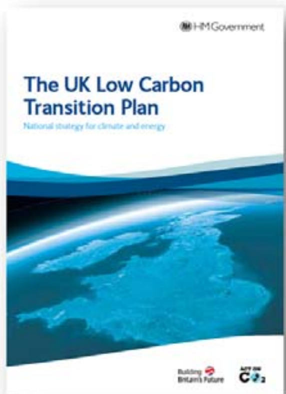
Climate change is now an established area of Government policy making. The following sections summarise national policy and legislation of significance for this study and, where known, the Government's future plans.

2.1.1 The Climate Change Act (2008)

The Climate Change Act[1] sets a legally binding target for reducing UK CO_2 emissions by least 80% on 1990 levels by 2050. It established the Committee on Climate Change, which is responsible for setting binding interim carbon budgets for the Government over successive five year periods. The first three carbon budgets were announced in the Budget 2009, resulting in an interim target of a 34% reduction in CO_2 equivalent emissions on 1990 levels by 2020. A target of a 42% reduction by 2020 will come into effect if a global deal can be reached at the Copenhagen Climate Change Conference in December 2009.

2.1.2 UK Low Transition Carbon Plan (2009)

The Department of Energy and Climate Change (DECC) published a White Paper, the UK Low Carbon Transition Plan[2] in July 2009. The plan sets out how the UK will achieve a 34% cut in CO_2 equivalent emissions by 2020.



The Plan is accompanied by a suite of documents, including:

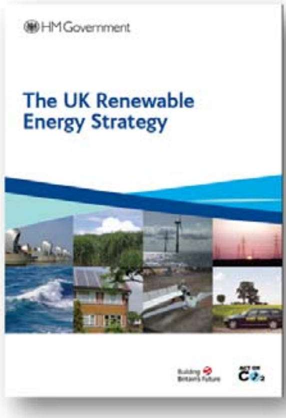
- The UK Renewable Energy Strategy,

[1] Climate Change Act 2008
[2] The UK Low Carbon Transition Plan (DECC, July 2009)

- The UK Low Carbon Industrial Strategy,
- Consultation on Renewable Electricity Financial Incentives,
- Low Carbon Transport: A Greener Future.

As it is of particular importance to this study, further information is provided on the Renewable Energy Strategy below.

2.1.3 UK Renewable Energy Strategy (2009)



The UK Renewable Energy Strategy [3] describes how the UK will meet its legally binding target to supply 15% of all of the energy it uses from renewable sources by 2020. It anticipates that this will be achieved by using renewable energy technologies to supply:

- Over 30% of our electricity,
- 12% of the heat we use, and
- 10% of energy for transport.

The strategy includes the following actions to help achieve these targets:

- *Planning process:* establishing a new planning process for nationally significant infrastructure projects (as introduced in the Planning Act 2008, see below); support for English regions to develop evidence-based strategies for achieving 2020 renewable energy targets; developing skills and providing resources to support swifter development and implementation of regional and local energy planning policy; helping to resolve environmental impacts of renewable energy technologies and address spatial conflicts with other uses such as radar and navigation.
- *Establishing the Office of Renewable Energy Deployment*: to work with other Government departments and stakeholders to remove barriers in the planning system, strengthen the supply chain and stimulate investment.
- *Financial mechanisms:* extended Renewables Obligation for large scale renewable electricity generation; amended Renewable Transport Fuel Obligation; renewable heat incentive and feed-in-tariffs to pay a guaranteed premium for each unit of renewable heat or small-scale renewable electricity generation.
- *Investing in emerging technologies:* supporting offshore wind, marine energy and advanced biofuels; and investing in the Severn Estuary tidal power project.

2.1.4 Draft Heat and Energy Saving Strategy (February 2009)

The Draft Heat and Energy Saving Strategy was published for consultation by DECC in February 2009. It aims to ensure that emissions from all existing buildings approach zero by 2050.

The draft strategy proposes a new focus on district heating in suitable communities, removal of barriers to the development of networks, and encourages the development of combined heat and power and better use of surplus heat through carbon pricing mechanisms. It also suggests a new way of coordinating improvements to homes and communities, house-by-house and street-by-street. This would take the form of a 'whole house' package of improvements for all existing homes by 2030, which would provide energy saving measures such as insulation, renewable heat and renewable electricity technology as appropriate.

2.1.5 Planning Acts (1990, 1991, 2004 and 2008)

The Planning and Compulsory Purchase Act 2004, which supplements the 1990 and 1991 Acts, places sustainable development at the heart of the planning system. Implementation of the Act is guided by Planning Policy Statements (PPSs) covering a range of issues. Those of particular relevance to this study are:

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[3] The UK Renewable Energy Strategy (DECC, July 2009)

- PPS1 Delivering Sustainable Development,
- PPS1 Planning and Climate Change - Supplement to Planning Policy Statement 1,
- PPS11 Regional Spatial Strategies,
- PPS12 Local Spatial Planning, and
- PPS22 Renewable Energy.

The most relevant statements, on Planning and Climate Change and Renewable energy, are discussed below. The Government has announced that it will review these policy statements and consult on a new combined PPS by the end of 2009. It is not expected that the broad policy goals will change significantly, but Eastbourne Borough Council should keep policies under review.

Issues addressed in other PPSs, including planning for housing, industrial and commercial uses, waste management, noise and flood risk, are also relevant to this study.

The Planning Act 2008 established a single development consent regime and a new planning process for nationally significant infrastructure projects. It created a new independent Infrastructure Planning Commission (IPC), which will be able to independently grant permission for nationally significant infrastructure projects and energy schemes, such as the construction or extension of power stations of over 50MW and the installation of electricity lines above ground. District heating networks are not currently classed as nationally significant infrastructure, although other types of pipeline are included.

The Planning Act 2008 also introduced the enabling legislation for the Community Infrastructure Levy (CIL) which will empower local authorities to levy a charge on development to support infrastructure development. Section 205(2) of the Act details that the overall purpose of the CIL will be to ensure that costs incurred in providing infrastructure to support the development of an area can be funded (wholly or partly) by owners or developers of land. According to the Act, the CIL may only be used to pay for infrastructure. The definition of infrastructure for this purpose is broad, to allow local authorities flexibility to account for local needs. In the context of this study, it could also include district heat networks or other energy supply infrastructure. CIL funds may be pooled across local authority areas to provide sub-regional infrastructure, provided that it supports development in the area. Local authorities will not be required to introduce the CIL, however where it is introduced it will be a mandatory charge. The levy will be calculated using formulae based on the size and character of a development.

This Planning Act establishes the role of planning authorities in setting energy targets and empowers local planning authorities to set requirements for energy use and energy efficiency in development plans.

2.1.6 PPS1: Planning and Climate Change – Supplement to PPS1: Delivering Sustainable Development (2007)

The Planning Policy Statement 1 (PPS1) Supplement has a specific focus on planning and climate change. It seeks to ensure that spatial strategies integrate climate change issues into all planning decisions. Local planning authorities are required to develop policies which employ a strategic approach to identifying existing decentralised energy networks and planning for new ones, and to identify appropriate locations for renewable energy infrastructure and developments.

An important requirement of the PPS1 Supplement is the need for policies within Development Plan Documents (DPDs) to expect a proportion of the energy supply for new development to be secured from decentralised and renewable or low carbon sources, and for area based opportunities for such infrastructure to be identified through the planning process.

All policies relating to low carbon or renewable energy generation must be underpinned by a robust evidence base. A key objective of this study is to meet that requirement.

2.1.7 PPS22: Renewable Energy (2004)

Planning Policy Statement 22 (PPS22) sets out principles which regional planning bodies and local authorities should adhere to in planning for renewable energy, including the following:

- Regional spatial strategies and local development documents should encourage rather than restrict renewable energy development. Renewable energy developments should be located where they are viable and where environmental, economic and social impacts can be addressed satisfactorily.

- Planning authorities should set out criteria that will be used to assess applications for renewable energy development. These should not rule out or constrain all, or specific types of renewable energy development without sufficient justification.
- The wider environmental and economic benefits of renewable energy should be material considerations in determining applications.

PPS22 does not apply to offshore renewables or to combined heat and power (unless fuelled by a renewable resource). Some of its requirements have now been superseded by the PPS1 Supplement.

2.1.8 The Well-being Power

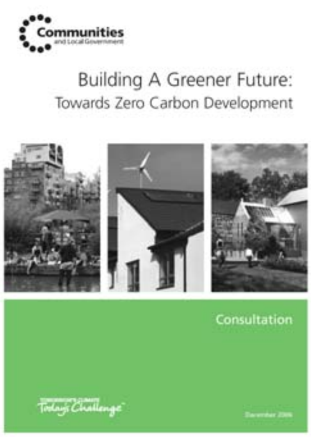
The Well-being Power, introduced in 2000, enables local authorities in England and Wales to *"do anything they consider likely to promote the economic, social and environmental well-being of their area unless explicitly prohibited elsewhere in legislation."* This provides the basis for a local authority to take a broad range of actions to achieve climate change policy objectives, such as:

- Setting up companies, contracts, joint ventures, trusts and take shares;
- Agreeing lower land receipts from developers in return for improved energy standards;
- Taking climate change impacts into account in their own procurement decisions;
- Initiatives such as affordable warmth programmes and those aimed at influencing behaviour.

Linked to this, the Local Government Act (2003) enabled local authorities to use prudential borrowing to fund capital investment in fixed assets. This allows authorities to be more innovative in the services and facilities they offer. In relation to this study, it could be used for example to fund community energy infrastructure or energy efficiency improvements to the existing building stock.

2.1.9 Building Regulations and Zero Carbon

The current 2006 Building Regulations Part L require that CO_2 emissions calculated for a new development should be equal to or less than a Target Emission Rate. This is in the region of 20% lower than emissions from a building which complies with the 2002 Building Regulations, depending on the specific building type.



Following consultation, the Government announced in July 2007[4] that all new homes will be zero carbon from 2016. In the Budget 2008, the Government also announced its ambition that all new non-domestic buildings will be zero carbon from 2019 and all new schools and other public buildings will be zero carbon from 2016.

4 Building A Greener Future: Policy Statement

The Definition of Zero Carbon Homes and Non-Domestic Buildings consultation in 2008[5] sought to clarify the definition of zero carbon that will be applied. A Government statement in July 2009 confirmed the definition and set out the proposals which will be taken forward to implement this policy. In the run up to the introduction of the zero carbon policy, the following changes to the Building Regulations for homes are likely to be introduced:

- 2010 - 25% improvement in regulated emissions (relative to 2006 levels). This corresponds with the mandatory energy and CO_2 standards for Level 3 of the Code for Sustainable Homes.
- 2013 - 44% improvement in regulated emissions (relative to 2006 levels), corresponding to Code Level 4 mandatory energy standards.

Figure 3 illustrates the planned changes in the Building Regulations requirements for homes. It should be highlighted that the changes in 2010 and 2013 will only apply to emissions that are regulated (heating, ventilation, cooling and lighting) inside the dwelling. From 2016, the Building Regulations requirements will apply to all emissions associated with energy use in the dwelling, including cooking and other appliances.

The consultation[5] implied that from 2016, minimum standards for energy efficiency will be introduced to reduce emissions from building services and building fabric. This, combined with onsite microgeneration technologies will lead to reduction in total emissions of approximately 40% on 2006 levels. Developments will not be required to achieve further reductions entirely within the site boundary beyond this level. In order to reach zero carbon status, the residual emissions are to be dealt with through “allowable solutions,” which currently include:

- Further carbon reductions on site;
- Energy efficient appliances;
- Advanced forms of building control system which reduce the level of energy use in the home;
- Exports of low carbon or renewable heat from the development to other developments, and
- Investments in low and zero carbon community heat infrastructure;

Other allowable solutions remain under consideration. A final Government announcement is expected at the end of 2009.

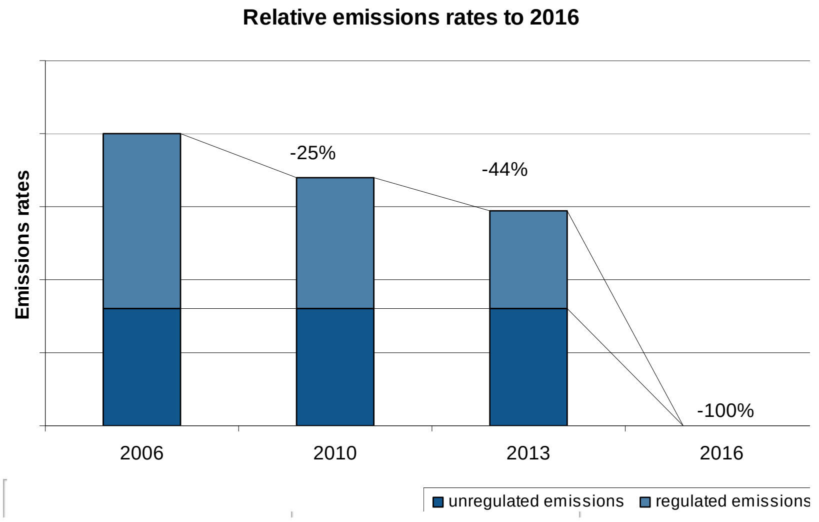


Figure 3: Incremental changes to Building Regulations requirements for new homes

[5] Definition of zero carbon homes and non-domestic buildings (Department for Communities and Local Government, December 2008)

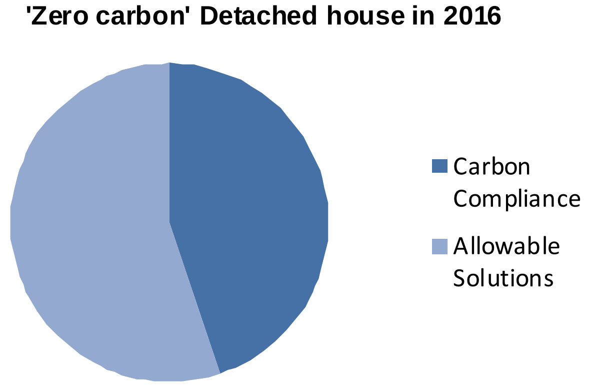


Figure 4: Proportion of CO_2 emissions dealt with through carbon compliance (on site energy efficiency and renewable energy generation) compared to allowable solutions, for a detached house

2.2 Regional Policy Context

The following policy and guidance documents have informed the regional policy review:

2.2.1 The South East Plan (May 2009)

The Regional Spatial Strategy for the South East was published in May 2009 and is referred to as the South East Plan[6]. The Plan contains a suite of policies relating to climate change and renewable energy. Policy CC2: Climate Change emphasises the central role which planning policy is expected to address climate change and sets carbon reduction targets broadly consistent with those in the Climate Change Act:

"Local authorities … will 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, by at least 25% below 1990 levels by 2015 and by 80% by 2050. A target for 2026 will be developed and incorporated in the first review of the Plan."

Policy CC3 requires plans and programmes which help to stabilise the South East's ecological footprint by 2016 and reduce it by 2026. Actions will include:

- increased efficiency of resource use in new development
- adaptation of existing development to reduce its use of energy, water and other resources
- changes in behaviour by organisations and by individuals

Policy CC4 requires local authorities to promote best practice in sustainable construction and help to achieve the national timetable for reducing CO_2 emissions from residential and non-domestic buildings.

Policy NRM12 expects local development documents and other policies to encourage the integration of combined heat and power, including mini and micro–CHP, in all developments and district heating infrastructure in large scale developments in mixed use. The use of biomass fuel should be investigated and promoted wherever possible.

Policy NRM13 sets out regional and sub-regional renewable energy targets for electricity. The renewable energy resources with the greatest potential for electricity generation are considered to be onshore and offshore wind, biomass, and solar. The targets are considerably lower than the targets set out by the UK Renewable Energy Strategy produced earlier this year.

2.3 Local policy context

2.3.1 Eastbourne Core Strategy Preferred Options (2006)

In its Core Strategy Preferred Options report[7] Eastbourne Council outlined its vision that *"by 2026 Eastbourne will be at the forefront of the UK effort to mitigate the impacts of climate*

[6] The South East Plan Regional Spatial Strategy for the South East of England (Government Office for the South East, May 2009)

[7] Local Development Framework Core Strategy Preferred options report (Eastbourne Borough Council, November 2006)

change. Its homes and businesses have achieved the maximum energy efficiency and universally incorporate renewable energy generation technology."

A number of policy options were put forward for consultation to meet the following spatial objectives:

- Spatial Objective 32: For all planning applications to incorporate on-site renewable energy technology by 2026 so that 20% of Eastbourne's energy requirements for buildings is provided by on-site renewables.
- Spatial Objective 33: To deliver a reduction in the total CO_2 emissions generated by heating and the supply of electricity to buildings across the whole of Eastbourne by 40% compared to 1990 levels.

The preferred option is intended to meet both of the spatial objectives and states *that "for all future planning applications the Council will require compliance with either Level 5 of the Government's nationally recognised Code for Sustainable Homes which is for Carbon Neutral Developments or BREEAM 'excellent' standards for all developments, including schools, industrial units, retail developments, hospitals and homes."*

Correspondence with DECC has confirmed that data on CO_2 emissions for local authorities only exists from 2005. The proposals in this study have been set against a 2006 baseline.

2.3.2 Eastbourne Sustainable Design SPG (2000)

The Council currently has Supplementary Planning Guidance (SPG) on energy efficient development adopted in 2000 which elaborates on Policy NE11 in the Adopted Borough Plan (2003). It requires updating to reflect best practice and the latest technologies as well as emerging policies in the South East Plan and Core Strategy. As part of this study, AECOM has produced illustrative sustainable design guidance that provides information on the most up-to-date measures and technologies available to improve energy efficiency, as well as the most appropriate, cost effective renewable energy systems, for homes and non-domestic buildings.Local Energy Strategies, Initiatives and Policies

2.3.3 East Sussex Energy Partnership Solar Energy campaign

East Sussex Energy Partnership (ESEP) is made up of four councils – Eastbourne Borough Council, Hastings Borough Council, Rother District Council and Wealden District Council. These councils have united to deliver Government-funded grants to homes in East Sussex.

2.4 Other Relevant Targets and Standards

2.4.1 Code for Sustainable Homes

The Code for Sustainable Homes (The Code) is an environmental assessment system for new housing in England and was introduced in April 2007. The Code assesses a development against a set of criteria under nine key categories: energy and CO_2 emissions, water; materials, surface water run-off, waste, pollution, health and well-being, management, and ecology.

The Code awards a rating to each dwelling type based on a scale of Level one to six. The rating depends on whether the dwellings meet a set of mandatory standards for each level, as well as their overall score [Table 2].

Since May 2008 it has been compulsory for new homes to have a Code rating. Residential developments supported by Homes and Communities Agency funding are currently required to achieve Code level 3, expected to rise to Code level 4 from 2010.

Code Levels	Mandatory Requirements		Total Points Score out of 100
	Energy Improvement over TER	Water litres/person/day	
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

Table 2 Minimum requirements for the six levels under the Code

2.4.2 BREEAM

The Building Research Establishment Environmental Assessment Method (BREEAM) assesses the environmental performance of new and existing non-residential buildings. A BREEAM rating is awarded based on achievement of credits in categories such as energy, water, materials, waste, pollution, health and well-being, management, land use and ecology and transport.

As of August 2008, the ratings that can be achieved are Pass, Good, Very Good, Excellent and Outstanding, with mandatory requirements for each rating. There is no legal requirement for non-domestic development. However, ratings are commonly required by local planning authorities or as a condition of Government funding. For example, the Building Schools for the Future programme requires new school buildings to achieve at least a BREEAM Very Good rating.[8]

2.5 Key Considerations Emerging from this Chapter

The sections above have considered the wider policy context which will influence the development of policies for Eastbourne:

- There are challenging policy drivers for both the reduction of CO_2 emissions and the inclusion of renewable and low carbon technologies at the national and regional level;
- The emerging Core Strategy provides a useful framework for the implementation of policy relating to building related CO_2 emissions;
- The PPS1 Supplement requires local authorities to investigate the potential for the inclusion of renewable and low carbon technologies in their area and to identify opportunities to exceed borough-wide targets on strategic sites where there is potential for additional CO_2 reductions.
- Expected changes in Building Regulations will significantly decrease CO_2 emissions from new development, removing some emphasis in this role from planning authorities.
- The changes to Building Regulations are likely to create demand for 'allowable solutions.' After 2016, new development will be allowed to incorporate renewable and low carbon solutions outside of the site boundary to achieve a reduction in CO_2 emissions.
- The Code for Sustainable Homes and BREEAM are national and independent assessment tools which can be utilised to appraise sustainable design and construction in new development.

[8] An introduction to Building Schools for the Future (produced for department of Children, Schools and Families by 4ps and Partnerships for Schools, 2008)

Growth in Eastbourne

3 Growth in Eastbourne

Eastbourne is a traditional seaside town on the Sussex coast with a population of around 90,000 people. The borough is predominantly urban and and is almost completely built up to its administrative boundaries. It is heavily constrained by the Pevensey Levels to the east, the English Channel to the south, and the South Downs National Park to the west. The Willingdon Levels form a green 'heart' to the borough and this area has been known for many years as 'Eastbourne Park'.

There are currently 40,918 households in Eastbourne. The stock contains a disproportionately large number of smaller homes, including a high proportion of flats; over 80% of new homes delivered within Eastbourne in 2005 were flats.

3.1 Future residential development

The South East Plan requires the borough to deliver 4,800 new homes in the period 2006-2026. The Council is undertaking a Strategic Housing Land Availability Assessment (SHLAA) looking at future supply of land. Details of allocated land in the SHLAA were made available to AECOM for energy modelling; these were confidential at the time of the study [Figure 5]. Sites of less than 15 dwellings are estimated to deliver 91% of the future supply. It therefore seems likely that a considerable proportion of Eastbourne's future housing supply will be small-scale development, located on brownfield sites within existing development boundaries. To some extent this will favour certain types of development, such as higher densities and flats instead of housing.

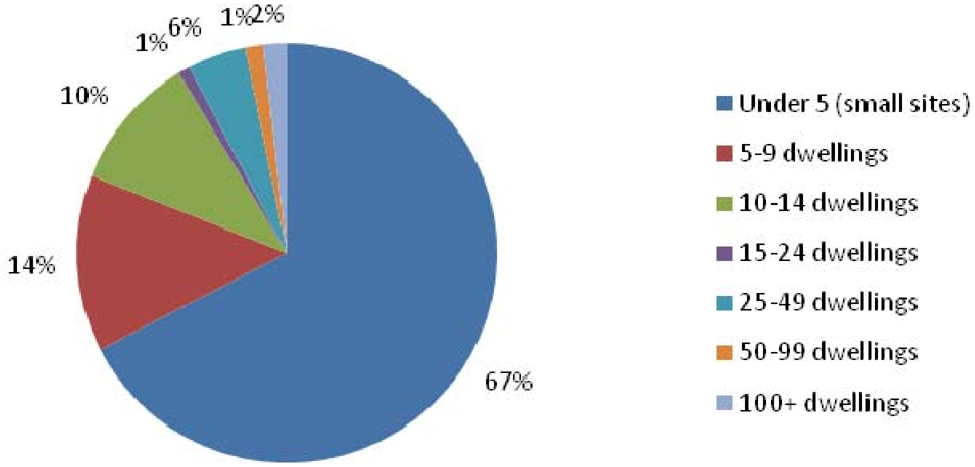


Figure 5 Expected number of units on housing delivery sites in Eastbourne until 2026 (Source: Eastbourne Draft SHLAA)

3.2 Future non-domestic development

The regeneration of the town centre is a priority for the Council. A recent study[9] confirms that Eastbourne is in need of new retail space to satisfy the needs of its communities. The study showed that the town centre can support twice the retail area of the existing Arndale Centre. Emerging regeneration proposals *"should extend the primary retail pitch in the town centre and provide additional high quality retail floorspace which will be beneficial to the character of the town centre."*

9 Wealden and Eastbourne Employment Land Review (Cluttons, April 2008)

Figure 6 Eastbourne town centre

The Council has selected planning consultants David Lock Associates to produce a Town Centre Area Action Plan (AAP). No draft was available at the time of this study and the Town Centre AAP area has had to be excluded from the evidence base.

3.3 Baseline CO_2 emissions

To test and monitor the effects of national, regional and local targets on the borough, a model was developed covering the period of influence of the Core Strategy [Appendix C]. Modelling work was undertaken to predict CO_2 emissions if development progresses to minimum standards in line with likely changes to Building Regulations (i.e. a business as usual scenario). Further details of the modelling are contained in Appendix D.

Emissions per capita in Eastbourne are lower than average for the UK, the breakdown can be seen in Table 3. There was an improvement of 1.7% in the period 2006-2007 and 3.6% in the period 2007-2008 on the 2006 baseline.[10]

Eastbourne has higher emissions per capita than the UK average. Emissions from gas use (which is likely to be primarily for space heating) are notably higher than the national average. The borough could look into supplying this gas in a lower carbon manner.

Tonnes CO_2 per annum in 2006	UK	% of Total	Eastbourne	% of Total
Industry & Commercial	191,654,000	42.8	192,000	38.7
Domestic	151,278,000	33.7	218,000	44.0
Road Transport	104,651,000	23.4	87,000	17.5
Total Emissions	**447,583,000**		**496,000**	
Emissions Per Capita	**7.40**		**5.23**	

Table 3 Baseline CO_2 emissions in the UK and in Eastbourne. (Source: Emissions of carbon dioxide for local authority areas) [11]

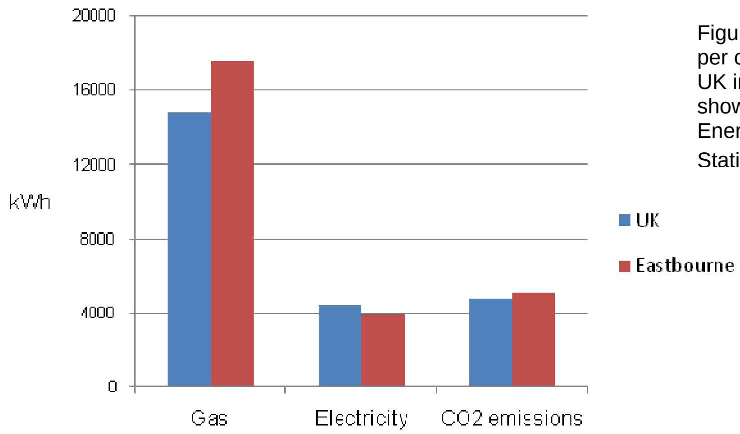


Figure 7 Average domestic energy use per capita in Eastbourne compared to the UK in 2009. CO_2 emissions figures are shown in tonnes. (Source: Domestic Energy Consumption, Neighbourhood Statistics website) [1]

[10] Eastbourne HECA Calculator for 2007-2008 (Supplied by Eastbourne Borough Council for study, July 2009)
[11] Emissions of carbon dioxide for local authority areas (DEFRA, 2006)

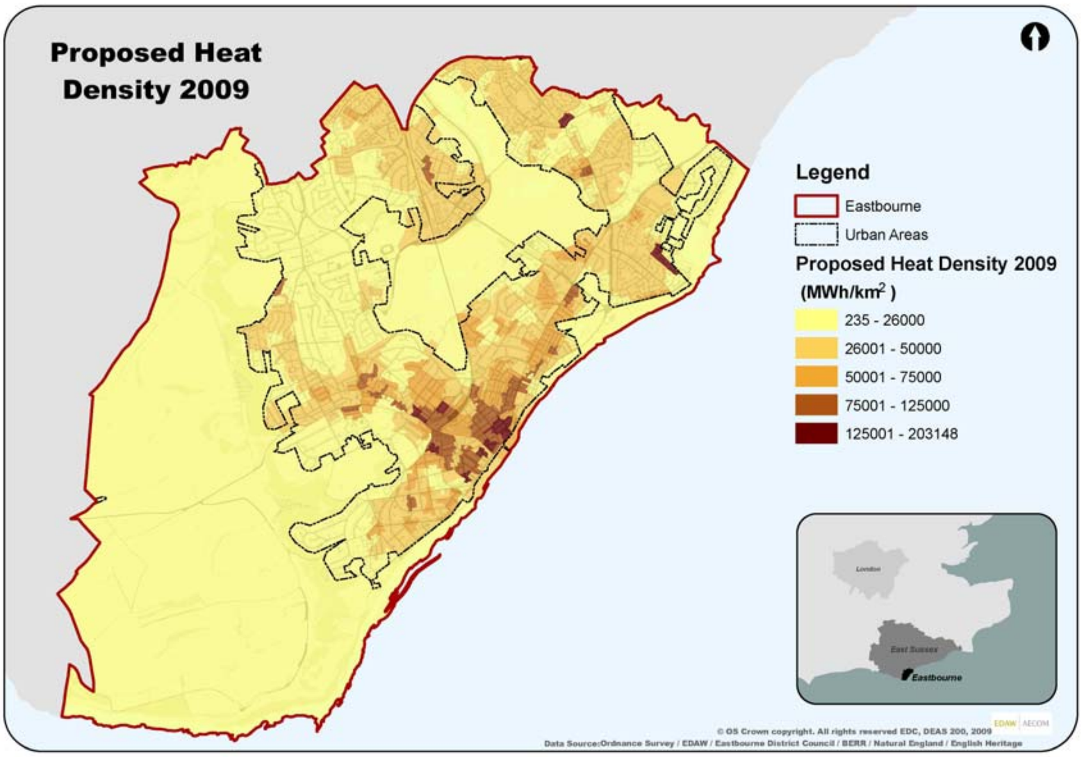


Figure 8 Annual heat density map of Eastbourne as of 2009, in MWh/km^2 (Source: Eastbourne Stock Energy model, AECOM)

3.4 Key Considerations Emerging from this Chapter

Key considerations emerging from the energy profile of Eastbourne over the period of the Core Strategy are:

- An understanding of the scale of existing and future energy demand is important in order to set appropriate planning policies and targets;
- Achieving the Core Strategy spatial objectives to reduce emissions in the borough by 40% whilst simultaneously meeting housing targets allocated in the South East Plan will prove challenging;
- Eastbourne uses more gas for domestic space heating than the UK average. There should be a focus on reducing the demand for space heating (considered in detail in Chapter 4) and supplying this demand in a lower carbon way (discussed in detail in Chapter 5);
- The largely urban nature of the borough means that Eastbourne has good opportunities to generate and supply renewable and low carbon heat and these opportunities should be supported through planning and appropriate delivery mechanisms.

Opportunities for Energy Efficiency

4 Opportunities for Energy Efficiency

Existing buildings represent the largest energy demand in Eastbourne. Any strategy for CO_2 reduction should consider the potential for increased energy efficiency in this sector as well as higher standards of energy efficiency in new developments.

The performance of existing homes depends on a number of factors, including:

1. *Building type*: The mix of housing types is fairly evenly split between houses and flats across the borough. Buildings with a larger surface area of exterior walls generally lose less heat and are more efficient.
2. *Age of Buildings*: Generally, Eastbourne has a younger dwelling stock when compared with equivalent national data [Figure 9]. Nearly half of existing private homes were built post 1964. Unusually, the rate of failure of the Decent Homes Standard in the borough does not correspond with the age of dwelling. The highest proportion of non-decent private homes is found in those built between 1945 and 1964 (37.9%) and this is predominantly failure in thermal comfort.[12] The majority of these non decent dwellings do not use mains gas but have either electric storage heating or room heater systems. Since these homes will probably need to have a new heating system in order to meet Decent Homes Standards, the Council could consider a lower carbon replacement (compared to individual gas boilers).

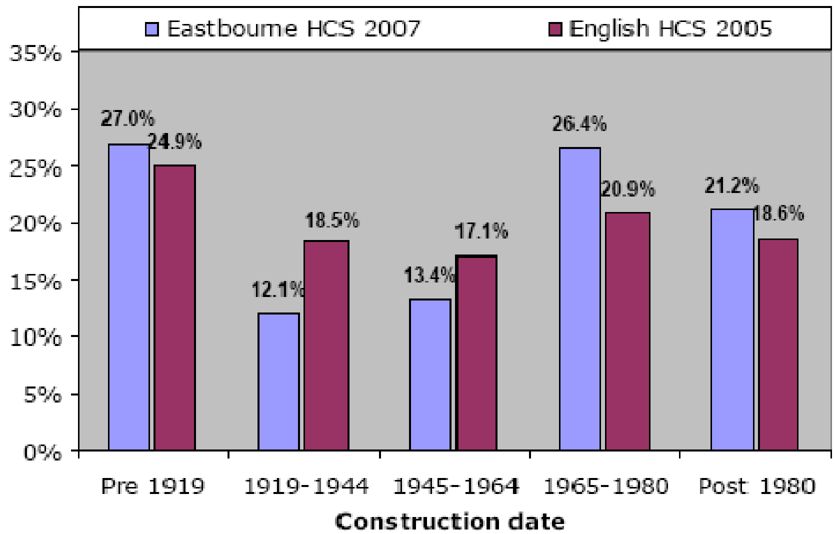


Figure 9 Profile of private dwellings by age in Eastbourne and in England. (Source: Private Sector House Condition Survey) [12]

3. *Tenure*: The type of tenure and the utility billing arrangements affect the energy use of a property. The most recent English House Condition Survey revealed that social sector homes on average have been the most energy efficient and have also shown the highest rate of energy efficiency improvement since 1996.[13]

   Generally 'split' incentives, where private landlords invest, but tenants benefit, have not been successful in delivering significant energy improvements. This is reflected in Eastbourne where the private rented sector of housing has the highest proportion on non-decent homes [Figure 10].

[12] Private Sector House Condition Survey 2007 (Eastbourne Borough Council, February 2008)
[13] English House Condition Survey 2007 (Department for Communities and Local Government, September 2009)

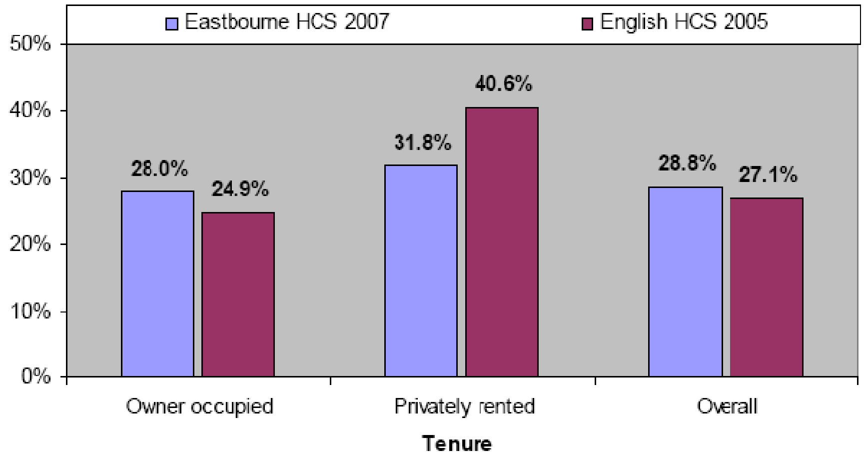


Figure 10 Non decent homes in Eastbourne by tenure. (Source: Private Sector House Condition Survey)[12]

Government has proposed the introduction of a “green landlord scheme” to incentivise landlords to invest in whole house energy efficiency. In the interim period, the Council could implement a similar, local scheme which will encourage landlords with poorly performing properties to invest in energy efficiency.

4. *Local Initiatives*: Under The Home Energy Conservation Act 1995 (HECA), local authorities with housing responsibilities are required to implement practical and cost-effective measures to improve the energy efficiency of all accommodation in their area and report on progress. The Eastbourne HECA report for 2007/2008 calculates a 1.84% reduction in energy use in existing housing compared to the previous year. A corresponding reduction in CO_2 emissions of 5.3% is reported for this period.

   The Private House Condition Survey shows that 16.7% of the total housing stock fell below the Decent Home Standard in 2007 due to poor levels of thermal comfort. Figure 11 indicates the homes in the borough where attention should be focused on increasing energy efficiency in homes.

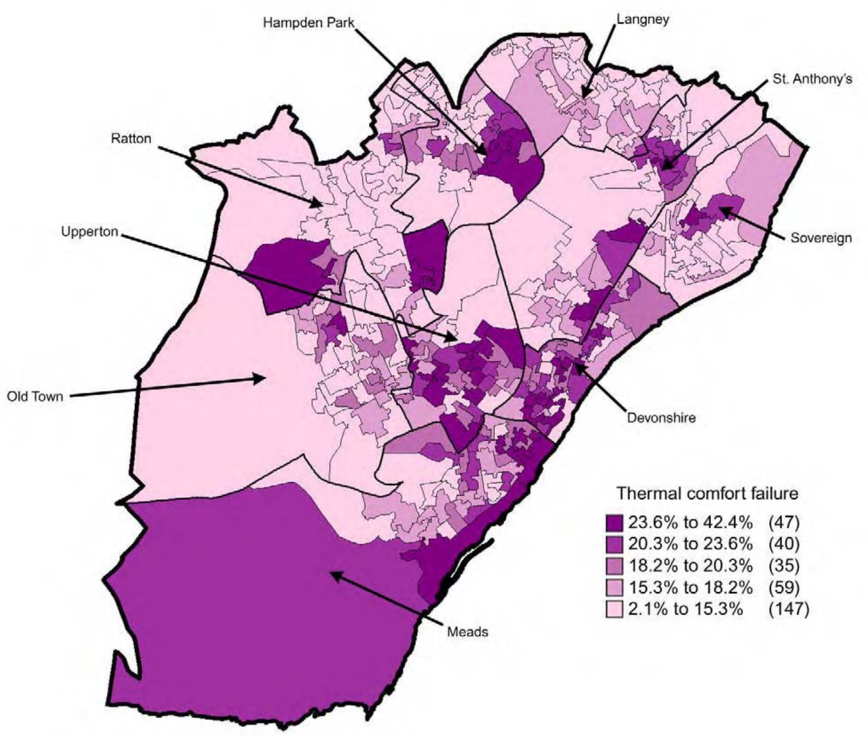


Figure 11 Geographical distribution of homes with thermal comfort failure. Failure of the thermal comfort criterion, and consequently the work required to remedy that failure, is based on the combination of heating system type and insulation present within a dwelling. (Source: Private Sector Housing Condition Survey) [12]

Measures that could be implemented in existing and new homes in order to improve energy efficiency and reduce corresponding CO_2 emissions have been presented below. It should be noted that improving energy efficiency does not always result in a reduction in energy consumption. A "rebound effect"[14] has also been identified where any CO_2 savings from energy efficiency improvements are nullified by changes in occupier behaviour. A better insulated house needs less fuel to maintain a given temperature but as fuel costs decline, people seem to be inclined to turn up the thermostat. Use of cheaper fuels can create affordable warmth, but also lead to increased energy consumption. This effect may explain why average temperatures in homes in the UK are estimated to have increased from 16°C to 19°C in 2002 and should be accounted for when calculating potential savings.

4.1 Improvements to Building Fabric

The rate of heat loss through the building fabric will depend upon the thermal properties of the building material and the area through which heat loss can take place; this is measured by a parameter known as a U-value. A lower U-value value means a lower rate of heat loss.

In existing buildings, the main method of improving the U-values of the fabric is through improved insulation in the loft and cavity walls where possible; this is straightforward to apply and relatively cheap. For older buildings with solid walls, insulation can be applied internally, but this can reduce the size of rooms (by up to 200mm on each wall in extreme cases) and can be very disruptive to occupants. Alternatively, insulation can be applied externally, which can be costly, may require units in blocks of flats to be treated simultaneously, and may be restricted by planning constraints due to visual impacts. Improved window glazing is also effective.

Reducing U-values can affect the construction of new buildings, particularly the walls and floors. Achieving lower U-values for walls can result in them being thicker than conventional specifications, although this will depend upon the insulation type that is being used. Similarly, reducing floor U-values through additional insulation will have an impact on the floor levels. Additional insulation in the roof may increase heights but is unlikely to have such a significant impact on the design.

4.2 Improvements to Air Tightness and Thermal Bridging

In existing buildings, draught-proofing of the building envelope, for example sealing joints around service pipes and at junctions, will reduce heat loss through air infiltration.

The type of construction used in new building design affects how straightforward it is to achieve improvements in air tightness. For timber construction and other pre-fabricated constructions, an air tightness barrier can be incorporated into the panels so that the construction team only need to seal joints between panels. Structurally insulated panelised systems can also achieve good standards of air tightness. Conventional wisdom suggests that achieving this air tight membrane is more difficult in traditional masonry build, although air leakage rates of less than 3 m^3/m^2hr @ 50 Pa have been recorded in masonry dwellings.

Homes with very low air permeability levels will generally require mechanical ventilation in order to achieve adequate ventilation. Such systems should incorporate heat recovery wherever possible, where heat from the air extracted from kitchens and bathrooms is used to warm incoming fresh air, thus reducing the energy demands for heating. Additional electrical energy is required to operate the fans but if the fan power is low and the efficiency of heat recovery is high then the system should provide a net benefit in terms of reducing CO_2 emissions over the course of a year.

Thermal bridging can be designed out through attention to design detailing and careful construction. Accredited and enhanced construction details allow designers to reduce the number of thermal bridges.

4.3 Improvements to Lighting

The penetration of natural daylight should always be enhanced to reduce the use of artificial lighting within buildings. For new buildings, the design should take advantage of south facing orientations and consider overshading, internal layouts and window dimensions and specifications, all of which influence the levels of daylight and hence, the energy consumption from artificial lighting.

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[14] Zero Carbon Britain – An Alternative Energy Strategy (Centre for Alternative Technology and the University of East London, 2007)

All buildings could make use of dedicated low energy light fittings (i.e. fittings which only accept low energy lamps), in conjunction with appropriate controls to reduce energy consumption. For example, smart controls can be specified which enable all lights to be switched off from a single switch, thus avoiding lights being left on during the night or periods of non-occupancy. External lighting can be controlled using daylight sensors or timers to avoid lights being switched on during daylight hours. Similarly, PIR sensors should be used for security lighting.

4.4 Passive Design and Reducing Overheating

There is a real risk of overheating in many of our buildings as the effects of climate change become more evident and higher summertime temperatures become commonplace. Overheating risk is generally caused by excessive solar gains, particularly high angle and intensity solar infiltration during the summer months. Measures to address overheating include mechanical cooling, which can lead to higher CO_2 emissions. Passive approaches include the incorporation of external louvers, shutters, overshading from balconies and the specification of green roofs and walls.

The orientation of new buildings can assist shading strategies and the use of orientation and sun spaces can provide additional solar gains during the colder winter period.

Thermal mass can be beneficial in controlling temperatures by acting as a buffer to the temperature variations through the day. For traditional masonry or stone construction, external walls will have large areas of external thermal mass. For timber or steel construction, thermal mass can be incorporated into the floors and internal walls. The addition of phase change materials to walls and floors in both existing and new buildings can add thermal mass. These can absorb heat as temperatures rise and release heat as temperatures fall.

4.5 PassivHaus

PassivHaus is a standard for ultra-energy-efficient homes where demand for space heating is dramatically reduced, often to the point where a separate heating system (such as a gas boiler) is no longer necessary. The standard is met by using passive design, specifying very low U-Values, air tightness, thermal bridging, and the use of mechanical ventilation with heat recovery. However, such buildings are high maintenance and need commitment, technical understanding and skill from their occupants to operate to their intended performance. The standard is generally only targeted at new buildings.

Recent research from the Passivhaus Institut suggests that once initial design and construction skills have developed, it is possible to construct Passivhaus buildings more easily and for less money than conventional buildings of similar types. There is currently considerable interest in this building technique in the UK, as evidenced by its mention in the recent zero carbon consultation.[5] It remains to be seen whether it will take off as a viable option for new development.

4.6 Energy Efficiency in Historic Buildings

Eastbourne is recognised for its finely preserved Victorian and Edwardian Townscape [Figure 12], its well maintained and managed urban heritage, and its compact town centre. Reducing CO_2 emissions from historic buildings presents more challenges than for dwellings built more recently. Changes in construction techniques means that traditional buildings tend to perform differently to more modern builds. In addition, individual and collections of historic buildings may be of architectural importance and/or create an important character that would not suit modern energy efficiency measures. As Eastbourne has 12 conservation areas that have been designated for their historic and architectural importance, as well as numerous listed and historic buildings that contribute to areas highlighted for their high townscape values in the Eastbourne Townscape Guide SPD (2004), this is an important issue to address.

Maintaining the historic character and appearance of these buildings is paramount. Inappropriate alterations or the thoughtless installation of energy- efficient equipment could compromise historic character and appearance. Once lost, historic fabric cannot be authentically replaced, so careful consideration of alterations is important and should focus on works which are easily ‘reversible’.

Traditional buildings are often permeable and allow moisture to move through the building fabric to evaporate and be released into the atmosphere. Modern buildings materials are often impermeable and impair this process, potentially trapping moisture within the building and accelerating decay.

Modern loft insulation materials such as fibreglass and mineral wool tend to hold moisture and are therefore not suitable for traditionally built buildings. Suitable substitutes could include sheep's wool and hemp fibre which still have high thermal insulating properties but do not prevent moisture movement. Although it is important not to reduce ventilation rates such that moisture is trapped within older buildings, they are still often over ventilated and draughty. Simple measures, such as heavy curtains and removable draft excluders could provide effective, low cost solutions without being too intrusive. Replacing windows with double glazing might not be aesthetically appropriate. A more suitable solution could be provided by sensitively installed secondary glazing which sits behind the retained original windows.

As Figure 9 demonstrates, older buildings are not necessarily more inefficient in their use of energy. They often have features such as high thermal mass, many windows, which are beneficial in terms of efficient energy use. Upgrading the fabric of a historic building can often be difficult, so it becomes particularly important to make the installed plant and services as efficient as possible. A holistic approach will balance the need for energy conservation with the need for building conservation. The Building Regulations contain specific guidance on historic buildings and the need to improve energy efficiency whilst not prejudicing the character of the building.

Figure 12 Historic buildings close to Eastbourne Pier

4.7 Energy Efficiency in non-domestic buildings

The options for reducing CO_2 emissions from housing are also applicable to non-domestic buildings. However, non-domestic buildings tend to be more complex; analysis of monitored data suggests that the energy performance of a non-domestic building is generally determined by its fabric, the mechanical services and the occupants. These operate as a system and each controls a range of performance. A poorly performing building may require much input from services, which if badly managed can lead to high energy consumption. The reverse may also be true. The variation in the fabric, mechanical services or occupant behaviour can result in a 20 fold variation in energy performance. [14]

We have described below the principles that should be adopted when improving energy efficiency in non-domestic buildings.

Excessive areas of glazing should be avoided. CIBSE TM23 [15] sets out best practice air permeability rates for different building types which should be adopted for all buildings.

The most appropriate and efficient form of heating for a non domestic building will vary depending on the use. For buildings which are used intermittently (such as churches) or which have large air volumes (such as industrial units) radiant heating may be an effective form of heating. For buildings which are used more regularly and those with smaller air volumes, central hot water systems will be more effective.

The use of air conditioning has become widespread and this is likely to get worse as summertime temperatures increase as a result of climate change. Air conditioned offices consume about twice as much energy as naturally ventilated buildings [16]. However, studies

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[15] TM23 Testing buildings for air leakage (CIBSE, 2000)

[16] Energy consumption guide 19: Energy use in office (CIBSE)

have shown that in spite of the extra capital and running costs, occupant satisfaction is no greater (and often lower) than in naturally ventilated buildings [17]. There is therefore a case for implementing strategies in non-domestic buildings that reduce the need for air conditioning. These can include:

- Controlling solar gains through glazing - making maximum use of daylight while avoiding excessive solar gain
- Selecting equipment with reduced power requirements (e.g. flat screen monitors),
- Separating high heat demand processes (including industrial processes, mainframe computers, large photocopiers etc) from office accommodation,
- Making use of thermal mass (and enhancing thermal mass with phase change materials) and night ventilation to reduce peak temperatures,
- Providing effective natural ventilation,
- Shading devices for the windows,
- Using task lighting to reduce background illuminance levels,
- Reducing energy demand for lighting by installing energy efficient lighting with a high light output ratio and selecting lamps with a high luminous efficacy,
- The use of pale colours on walls and ceilings to reduce the need for artificial lighting,
- Providing effective controls which prevent lights being left on unnecessarily.

Figure 13 Strategies to improve energy efficiency in non-domestic buildings. Shading devices fitted to Lycée Chevrollier, a high school in France (left) and office layout of Stevenage Council offices after Accommodation Review. The existing cellular offices were converted into modern IT based 'open plan' office areas, with new modular desks and high efficiency layouts to improve occupancy levels. The number of unoccupied desks was reduced, and CRTs were replaced with pole mounted, flat screen computer monitors to reduce the desk area used by each employee. (right). (Source: REVIVAL project, AECOM) [17]

Effective window design is essential in naturally ventilated buildings. Windows should allow ease of control by occupants regardless of desk arrangements. The benefits of daylighting and good window design are not only related to energy savings. There is growing evidence that the view from windows and the perception of the presence of daylight, even without direct views, is valued by occupants. This can lead to increased well-being and productivity, and also increased tolerance of non-neutral environmental conditions.

4.8 Key Considerations Emerging from this Chapter

The sections above have considered the opportunities for reducing CO_2 emissions through increased energy efficiency in the existing stock and in new development. Key considerations emerging from this chapter are:

- Existing buildings make up the bulk of the energy demand from buildings. Measures to reduce the energy demand of existing stock could have a significant impact on CO_2 emissions;
- The existing stock is reasonably efficient in comparison with the national average, though opportunities remain for improvements. Efforts to improve energy efficiency should be concentrated in areas with high thermal comfort failure [Figure 11];

[17] REVIVAL project WP15: Coordination Final Report, (AECOM, May 2008)

- The Council could consider how to encourage landlords to improve the energy efficiency of homes in the private rented sector;
- Planning has an influence on the CO_2 emissions from new buildings by affecting the density of development and mix of house types. Passive design, efficient fabric and services and higher densities should be encouraged where suitable;
- The PassivHaus standard for ultra-energy-efficient, new buildings has the potential to deliver substantial CO_2 savings. The operation of such a building would have serious implications for the occupier;
- Older buildings are not necessarily inefficient in their use of energy. Refurbishment of historic buildings often requires specialist techniques. The need for energy conservation should be balanced with the need for building conservation;
- Initiatives to increase energy efficiency in existing non-domestic buildings often receive less focus than existing homes and should be encouraged.
- The public sector is a significant owner of the building stock in its own right. The Council has an opportunity to demonstrate leadership by investing in its own buildings to improve energy performance.

AECOM

Opportunities for District Heating

5 Opportunities for District Heating

The energy demand of buildings has traditionally been met by electricity supplied by the national grid, heating supplied with individual gas boilers and cooling supplied through chillers. The PPS1 Supplement supports the development of networks to supply electricity and heat at a community scale from local sources. This chapter discusses the opportunities in Eastbourne for establishing such networks.

5.1 District Heating

An alternative method of supplying heat to buildings is to use district heating. This consists of a network to deliver heat to multiple buildings from a central heat source. Heat is generated in an energy centre and then pumped through underground pipes to the building, which is usually connected to the network via a heat exchanger, which replaces individual boilers for space heating and hot water. This is a more efficient method of supplying heat than individual boilers and consequently, district heating is considered to be a low carbon technology that can contribute towards meeting CO_2 reduction targets.

5.2 Combined Heat and Power (CHP)

The traditional method of generating electricity at power stations is inefficient, with 60-70% of the energy inputs being wasted. A CHP plant is essentially a local, smaller version of a power station. CHP provides a much more efficient method as the system generates electricity but also makes use of the heat that is usually wasted through cooling towers. This heat can be pumped through district heating networks for use in buildings. Since it is generated closer to where it is needed, losses in transmission are reduced [Figure 14].

A standard, gas-fired CHP typically achieves a 35% reduction in energy usage compared with conventional power stations and gas boilers. CHP can also be run using biomass or biogas to provide reductions in CO_2 emissions nearing 100% and in this setup can therefore be counted towards renewable energy targets.

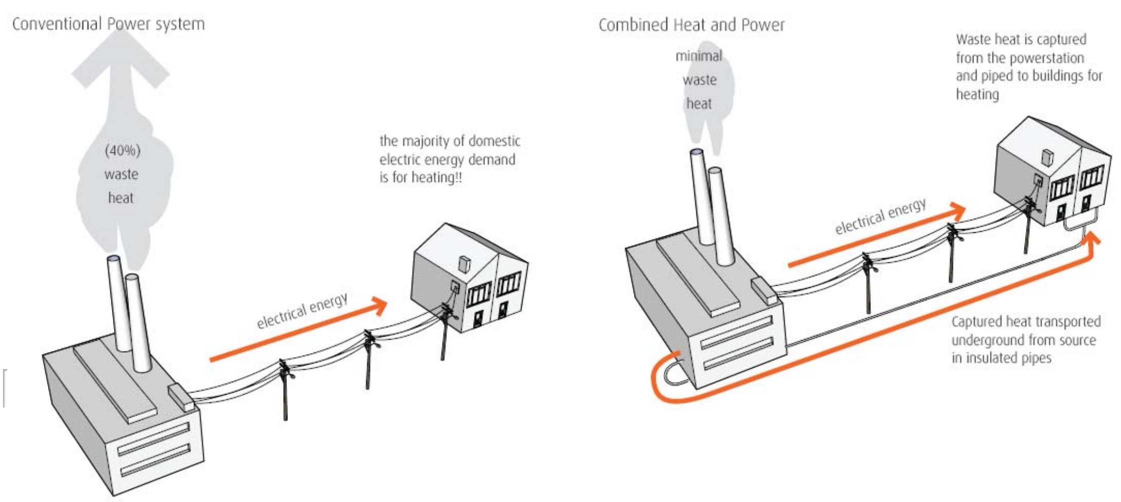

Figure 14 Relationship between district heating and CHP, compared to conventional energy generation

5.3 Existing District Heating and CHP capacity

We are not aware of any existing district heating networks in Eastbourne. There is a 1kWelectrical CHP installation at the District General Hospital.

5.4 Local Potential for District Heating and CHP

We have identified areas where there is sufficient heat demand for the installation of a district heating or CHP system to be commercially viable, based on professional experience.

5.4.1 Heat mapping of Eastbourne

Heat mapping of the borough has been carried out to estimate the potential demand for heat [Figure 15]. Heat mapping has been conducted using gas supply data and assuming an average boiler efficiency of 80%. Heat density is defined as the annual heat demand in kWh, divided by the number of hours per year to give an annual average demand. This was then divided by the area under consideration. Potential issues with this method are:

- The use of gas data ignores the use of other heating fuels such as electricity and oil, which is expected to make up a small proportion of heat demand.
- The resolution of the heat map is limited by the Middle Layer Super Output Area boundaries, which is the format in which address data is provided. The results only provide an average of each Middle Layer Super Output Area and do not highlight point sources which may have a high heat demand.

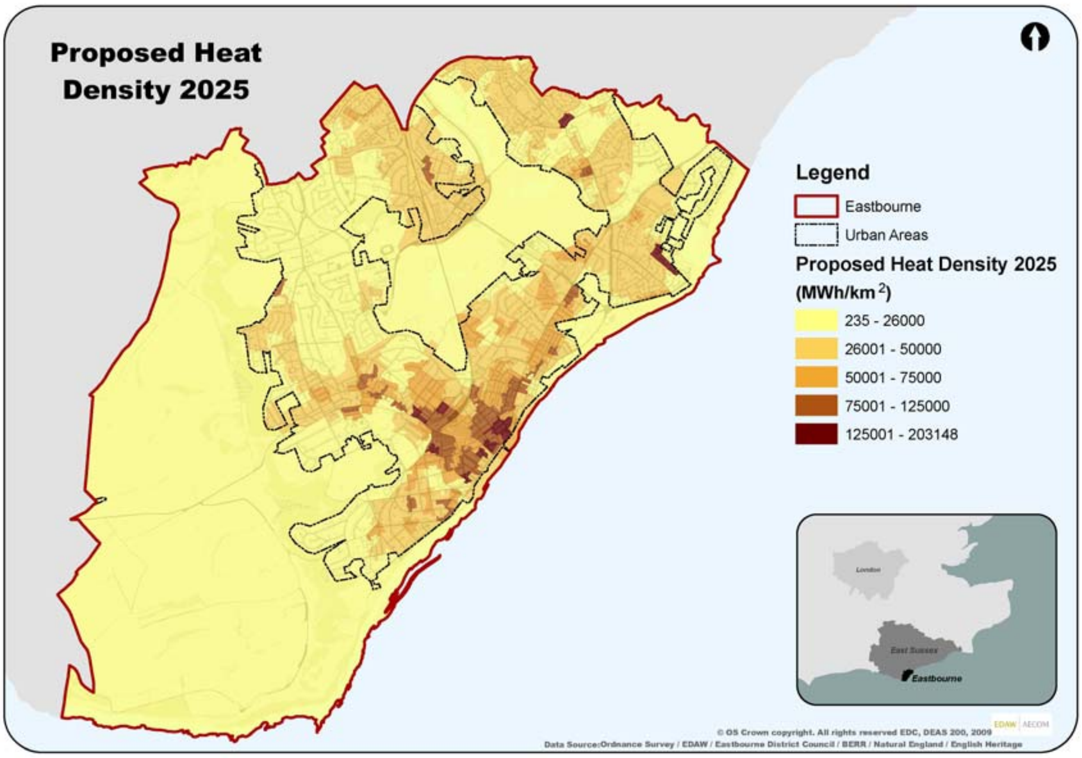

Figure 15 Annual heat density map of Eastbourne in MWh/k m^2, incorporating future development with planning permission as of September 2009. (Source: Eastbourne Stock Energy model, AECOM)

As expected, the areas of highest heat demand are concentrated on the town centre. It is theoretically possible to develop a CHP district heating network anywhere that there are multiple heat consumers. However, the economics of such a network are determined by the size of the CHP engine and the number of hours of annual operation. Ideally, a system would have at least 4,500 run hours per year for a reasonable return on investment. This equates to around 17.5 hours per day five days per week, or 12.5 hours per day every day of the year. CHP is therefore most effective when serving a mixture of uses, which guarantees a relatively constant heat load throughout the day and night.

Another contributory factor to the economic viability of CHP is the difference between the cost of electricity and gas, referred to as the “spark gap”. The greater the cost of electricity over gas is, the more likely a CHP installation is to be viable.

The potential for district heating powered by CHP can be assessed at a high level by setting a threshold heat density above which schemes become viable. Previous research into the economics of district heating and CHP has suggested that a threshold of 3,000 kW/ km^2 (which equates to 26,280 MWh/km^2) can give financial returns of 6%, which is below typical commercial rates of return but greater than the discount rate applied to public sector financial appraisal.[18]

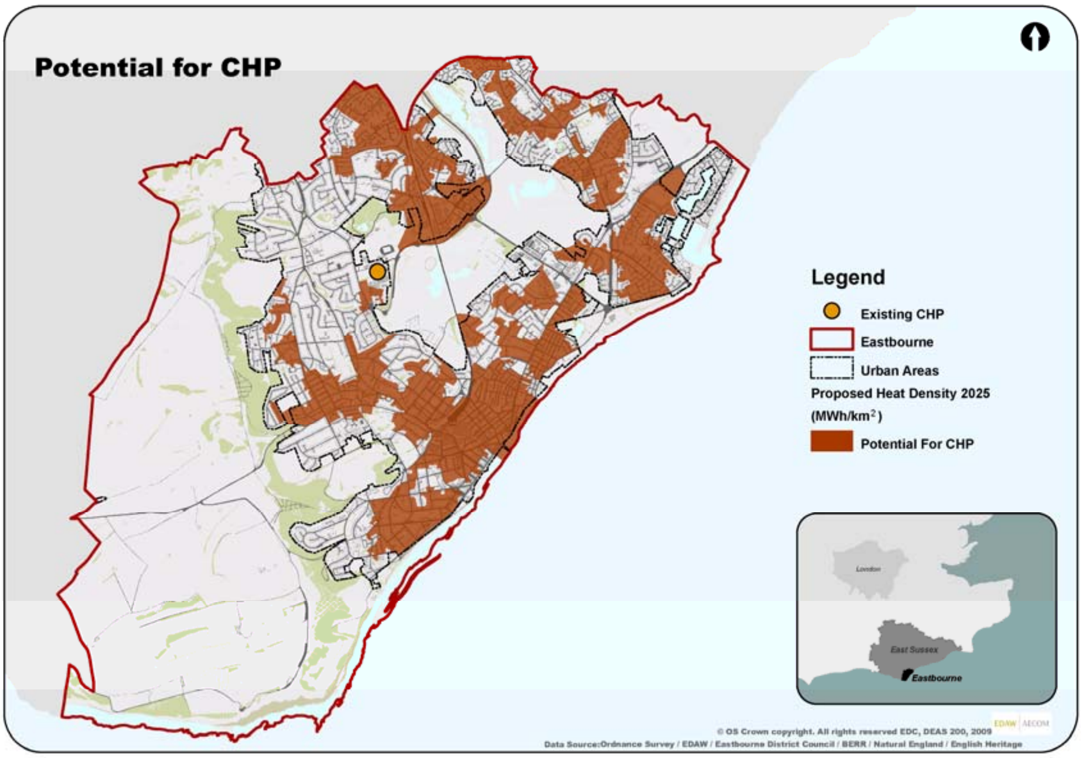

Figure 16 Resource in Eastbourne for district heating networks powered by CHP. (Source: Eastbourne Stock Energy Model, AECOM)

The brown shading in Figure 16 represents the areas in Eastbourne where heat demand is above 3,000 kW/km^2 (equivalent to 26,280 MWh/km^2) and thus district heating with CHP is considered to be financially viable. High energy demand facilities within these areas such as hospitals, leisure centres, public buildings and schools could become anchor loads to form the starting point for a district heating CHP scheme. This has been assessed in detail in Appendix A.

Assessing the feasibility for district heating with networks with CHP in new development containing only residential elements can be problematic. Current insulation standards mean the requirement for space heating is very low and demand is present during the winter months. The only constant source of heat demand is for domestic hot water and in terms of reducing CO_2 emissions, much of this demand could be met by the use of solar water heating instead (particularly in low rise buildings of the type that are widespread in Eastbourne). New housing or office developments are able to make use of existing networks – if this solution is adopted then the Council should take a strategic approach to the planning and phasing of district heating infrastructure so that new developments that are within feasible range of planned networks can be required to connect into the schemes.

Figure 17 models the impact of supplying heat through district heating systems with CHP could have on the borough's CO_2 emissions. It can be seen the greatest CO_2 savings are made when both existing and new development move to district heating networks (shown in purple, Figure 17) fuelled by biomass. It is unlikely that this scenario by itself will achieve the spatial objective 33; the next chapter will describe the low carbon and renewable energy technologies that can be applied.

[18] The potential and costs of district heating networks (Faber Maunsell & Poyry, April 2009)

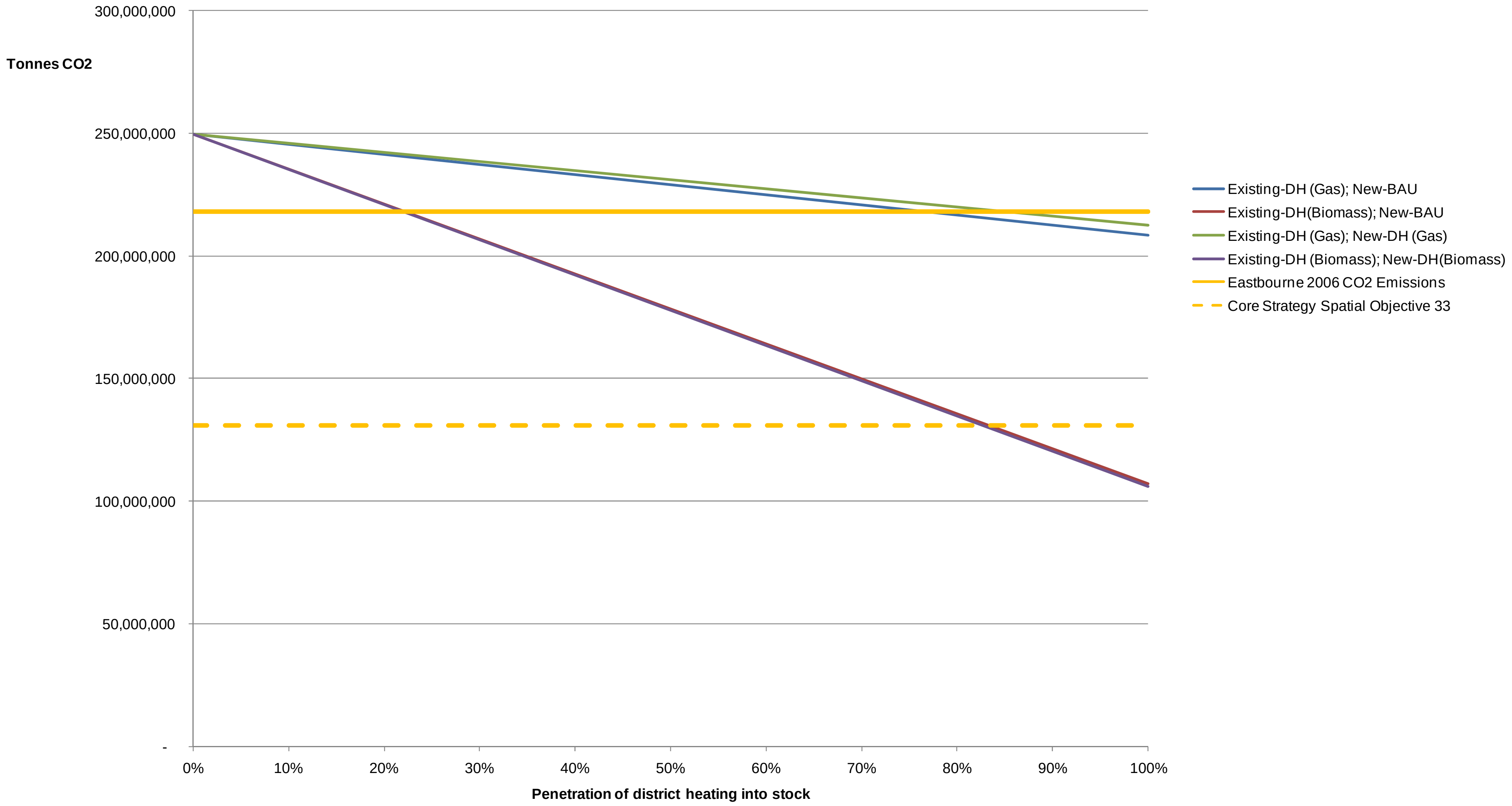

Figure 17 Impact of district heating networks on CO_2 emissions in Eastbourne in 2030.(Source: Eastbourne Stock Energy Model, AECOM)

Based on domestic CO_2 emissions in Eastbourne in 2030

DH = District Heating
BAU = Business As Usual
Existing = existing building stock
New = New development

5.4.2 Financial implications of district heating with CHP

Figure 18 compares the capital cost of a range of low carbon and renewable heat technologies options with gas and electric heating. Full infrastructure costs of converting existing homes to district heating can vary from about £5,000 per dwelling for flats, to around £10,000 per dwelling for detached or semi-detached properties, details can be seen in Table 4. These costs assume no prior district heat network infrastructure in the area and that existing dwellings are fitted with individual heating systems. Table 5 provides the cost of providing district heating with CHP to non-domestic buildings.

Section 3.3 showed that there is potential for Eastbourne to supply heat in a lower carbon way. The main benefit of moving to district heating networks is the carbon savings that they can deliver. Figure 19 shows the potential CO_2 savings from a range of heat generating technologies. The figures are based on carbon factors that reflect today's grid mix. District heating with CHP solutions are cheaper in terms of cost per CO_2 saved than heat pumps; air source heat pumps actually result in a net increase in CO_2 emissions. District heating with biomass is only a cost-effective method of supplying low carbon heat when biomass, waste, waste heat from power stations, or efficient gas turbines are the fuel source.

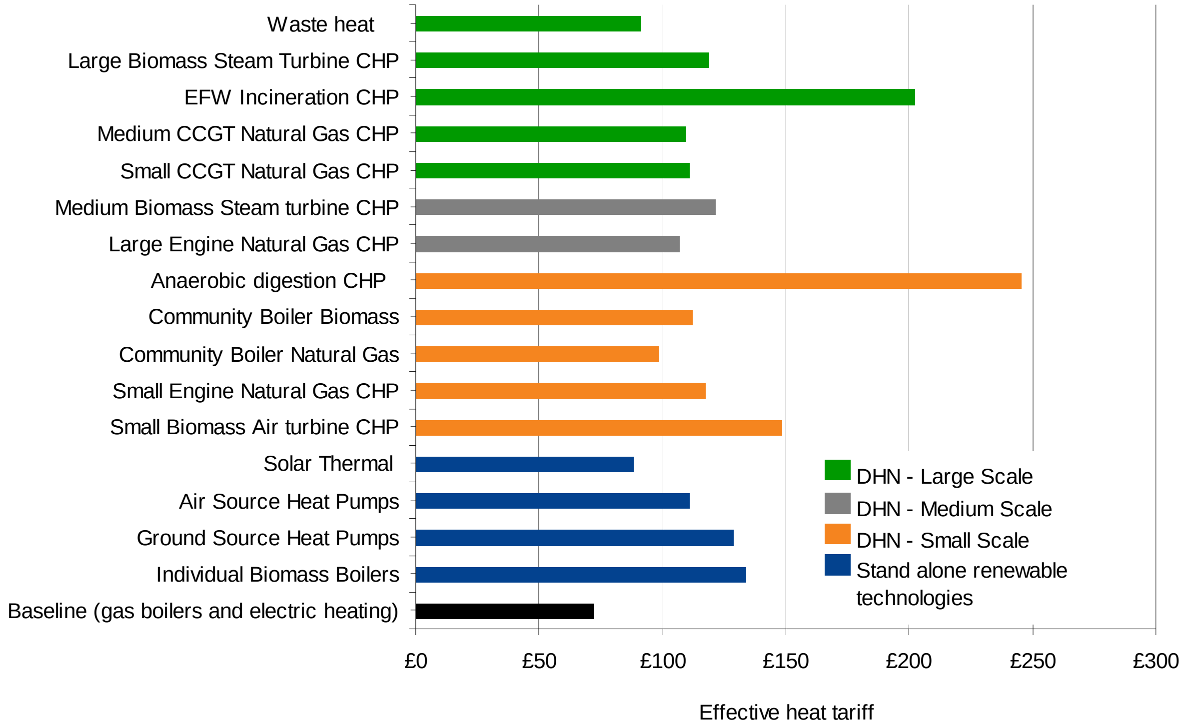

Figure 18 Cost of heat provision by technology in £/MWh, based on current market conditions. Waste heat is heat obtained at very low wholesale cost from power plants or industrial processes. Community Boiler refers to district heating, DHN in legend refers to District Heating Network. Solar thermal heating applies to water-heating only. (Source: The potential and costs of district heating networks, Faber Maunsell and Poyry)[18]

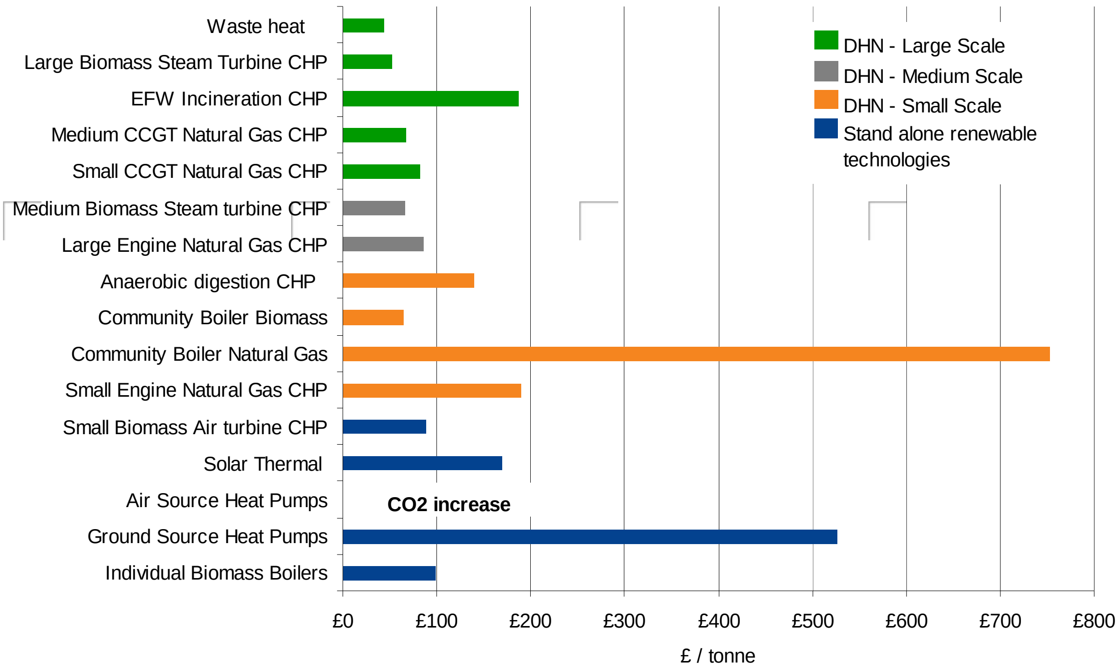

Figure 19 Cost compared to CO_2 saved by heat provision technology, in £/tonneCO_2 saved. Waste heat is heat obtained at very low wholesale cost from power plants or industrial processes. Community Boiler refers to District Heating, DHN in legend refers to District Heating Network. Solar thermal heating applies to water-heating only. (Source: The potential and costs of district heating networks, Faber Maunsell and Poyry) [18]

Dwelling type	District Heating Infrastructure Cost	District Heating Branch Cost	Heat Interface Unit (HIU) and heat meter Cost	Total Cost
Small terrace	£2,135 Based on outline network design and costing	£1,912 Based on outline network design and costing plus additional costs for HIU and metering.	£2,300 (includes £1,600 HIU, £200 for heat meter, and £500 for installation)	£6,347
Medium / Large terrace	£2,135 Based on outline network design and costing	£2,255 Based on outline network design and costing plus additional costs for HIU and metering.	£2,300 (includes £1,600 HIU, £200 for heat meter, and £500 for installation)	£6,690
Semi-detached	£2,719 Based on outline network design and costing	£2,598 Based on outline network design and costing plus additional costs for HIU and metering.	£2,300 (includes £1,600 HIU, £200 for heat meter, and £500 for installation)	£7,617
Semi detached	£2,719 Based on outline network design and costing	£3,198 Based on outline network design and costing plus additional costs for HIU and metering.	£2,300 (includes £1,600 HIU, £200 for heat meter, and £500 for installation)	£8,217

Converted flat	£712 Assumes that infrastructure costs for a 3-story converted terrace are split between 3 flats.	£752 Assumes that branch costs for a terrace are split between 3 flats with an HIU and heat meter for each flat.	£2,300 (includes £1,600 HIU, £200 for heat meter, and £500 for installation)	£3,764
Low rise flat	£1,500 Estimate	£1,500 Internal pipework	£2,300 (includes £1,600 HIU, £200 for heat meter, and £500 for installation)	£5,300
High rise flat	£1,000 Estimate	£1,500 Internal pipework	£2,300 (includes £1,600 HIU, £200 for heat meter, and £500 for installation)	£4,800

Table 4 District heating costs for homes. The Heat Interface Unit is the exchanger device that replaces the boiler and transfers heat from the district heating network into the home. (Source: The potential and costs of district heating networks, Faber Maunsell and Poyry) [18]

Type of area	Total District Heating Network Cost	Heat Interface Unit (HIU) and Heat Meter Cost
City Centre	£8.40 per m^2	£20.00
Other urban area	£16.50 per m^2	£20.00

Table 5 District heating network costs for non-domestic building. The Heat Interface Unit is the exchanger device that replaces the boiler and transfers heat from the district heating network into the home. (Source: The potential and costs of district heating networks, Faber Maunsell and Poyry) [18]

5.5 Key Considerations Emerging from this Chapter

The sections above have considered the opportunities for reducing CO_2 emissions through the supply of low carbon heat. Key considerations emerging from this chapter are:

- District heating with CHP has the potential to supply heat and electricity in a lower carbon way than individual gas boilers and conventional power stations;
- In terms of cost per amount of carbon saved and based on the current grid mix, district heating with CHP is the most cost-effective solution for supply of low carbon heat;
- There is significant potential in Eastbourne to transfer the existing stock onto financially viable, district heating networks;
- Several buildings in the borough could act as anchor loads to reduce risk for investment in such a network. These have been identified in Appendix A and include Council buildings, hospitals, leisure centres and new development sites;
- New development can make use of existing networks but the feasibility and viability is determined by the type of development. A strategic approach to the planning and phasing of district heating infrastructure and plant is necessary. Certain strategic developments could be required to install or connect into schemes.
- The regeneration of the town centre would be a prime opportunity to start off such a network. An eventual aim could be to link the suitable neighbourhoods in the borough to one overall network.

Opportunities for Low Carbon and Renewable Technologies

6 Opportunities for Low Carbon and Renewable Technologies

This section outlines the opportunities for low carbon and renewable energy installations in the borough at a range of scales.

6.1 Current installed Low Carbon and Renewable Capacity

Low carbon and renewable energy installations are often small scale with no requirement to record or register installations, making it difficult to monitor uptake. The RESTATS database owned by DECC and information from Eastbourne's recent Annual Monitoring reports were used to estimate current installed capacity. A list of known installations is shown in Table 6.

Technology	Location	Post code	Capacity kW	Annual yield kWh	TonnesCO_2 saved
Solar PV	Residential n/k	BN22 9RJ	2.00 kW	1674.0	1.0
Solar PV	Residential n/k	BN20 0AY	2.96 kW	2222.0	1.3
Solar PV	Residential n/k	BN20 0EL	1.00 kW	913.6	0.5
Solar Water Heating	Residential n/k	BN23 7EE	n/k	941.0	0.2
Solar Water Heating	Residential n/k	BN20 7EG	n/k	1800.0	0.3
Solar Water Heating	University of Brighton Eastbourne Campus	BN2 4AT	n/k	110,700.0	21,475.8

Table 6 Low carbon and renewable energy installations in Eastbourne. N/k refers to cases where specific details are not known.

6.2 Large Scale Wind Resource

6.2.1 Existing Large Scale Wind Energy

There are no large scale wind farms in the borough.

6.2.2 Local Potential for Large Scale Wind Energy

Physical constraint geographical information systems (GIS) mapping has been carried out to identify areas where large scale wind energy may be feasible, based on a wind turbine with an 80m rotor diameter and 120m tip height. The following constraints were included:

- Exclusion of wind speeds below 5.5 m/s. This is generally considered to be the minimum wind speed at which large scale wind energy generation becomes financially viable;
- Buffer of 120m from major carriageways, railway lines and major overhead transmission lines;
- 400m noise buffer around urban settlements;
- 320m buffer around other wind turbines to avoid adverse turbulence effects;
- Exclusion of South Downs National Park. The South East Plan notes that in National Parks and AONBs and on Heritage Coasts, wind energy developments should generally be of a small scale. The South Downs Management Plan anticipates that *"there will be no areas within the South Downs that can accommodate this level of wind energy development without detriment to the natural beauty of the South Downs;"*
- Exclusion of other designated sites of ecological or landscape significance; and

- Exclusion of undesignated woodland and forest.
- The potential for offshore wind has not been included in the assessment since it is not included in the sub-regional targets.

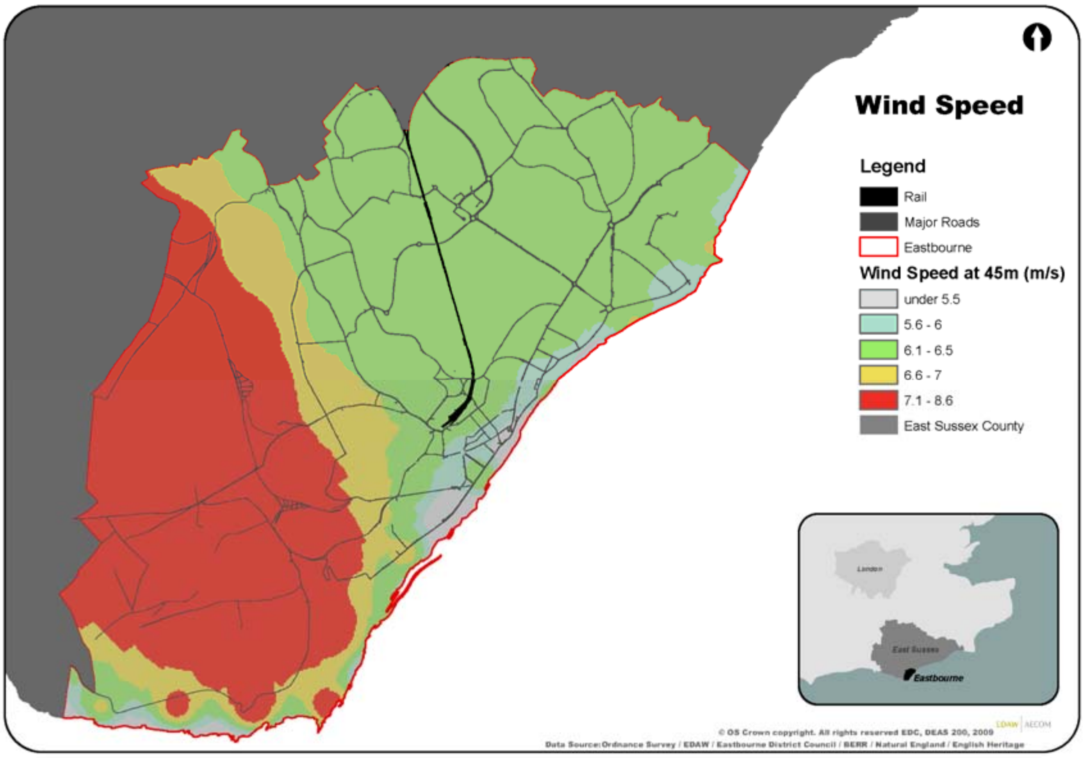

Figure 20 Wind Speeds in Eastbourne

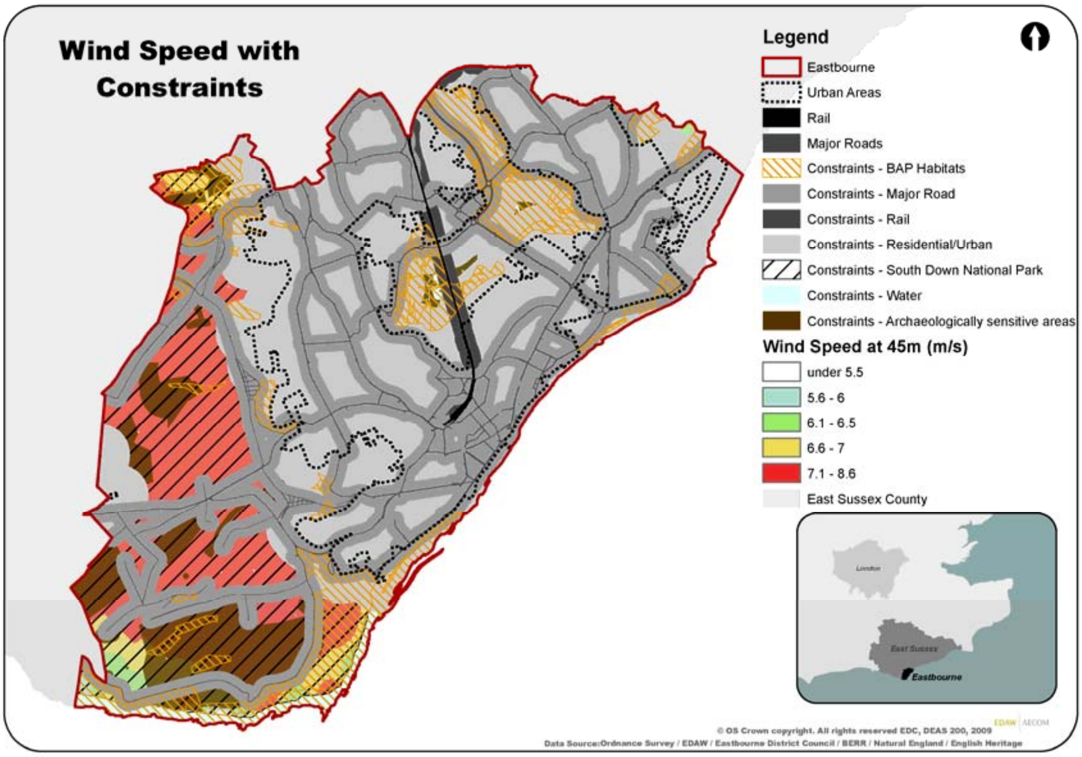

Figure 21 Constraints on large scale wind turbine siting in Eastbourne

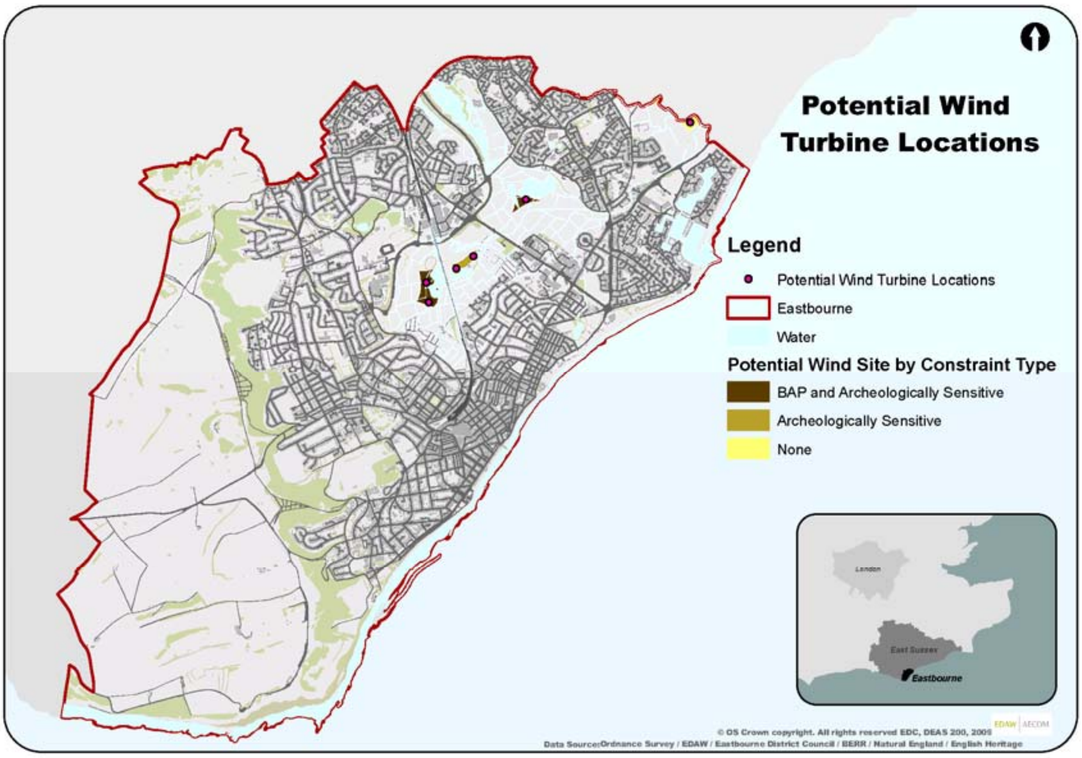

Figure 22 Potential sites for large scale wind in Eastbourne

The map in Figure 20 shows that wind speeds in the borough are relatively high, although the urban characteristic of the town is likely to result in increased local turbulence, reducing potential wind speeds. The highest wind speeds are to be found on the South Downs. The wind constraints map has been inverted in Figure 21, to show areas where large scale wind energy could be feasible. The results suggest that there is potential to locate 6 large scale wind turbines in the borough. The sites shown are approximate and detailed feasibility studies should be carried out to confirm precise locations. Issues affecting potential site locations have been described in detail in Appendix F. The most favourable sites are in Eastbourne Park and to the north-east of the borough.

The six locations represent 12MW of installed capacity. Assuming a capacity factor of 30%, this would have an annual generation of 31,536 MWh (sufficient to save 17,912 tonnes CO_2, equivalent to that emitted by 5,045 typical detached homes).

Resource	Large Scale Wind Turbines
Number of turbines	6 turbines
Hub Height	80 metres
Rotor Diameter	80 metres
Installed capacity	12 MW
Annual generation	31,536 MWh
Potential for CO_2 savings	17,912 tonnes
Number of homes equivalent	5,045 typical detached homes

Table 7 Large scale wind energy resource in Eastbourne

6.2.3 Financial implications of large scale wind

Wind turbines, when located appropriately in areas of high wind speeds, are one of the most cost effective renewable energy technologies currently available in the UK. Generally the capital cost of wind turbines reduces as the size of the turbine increases. As of February 2009, large scale wind power is projected to cost around £800,000 per megawatt installed[19]. A typical cost breakdown is provided in Figure 23.

[19] BWEA Small Wind Turbine FAQ (BWEA website, accessed September 2009)

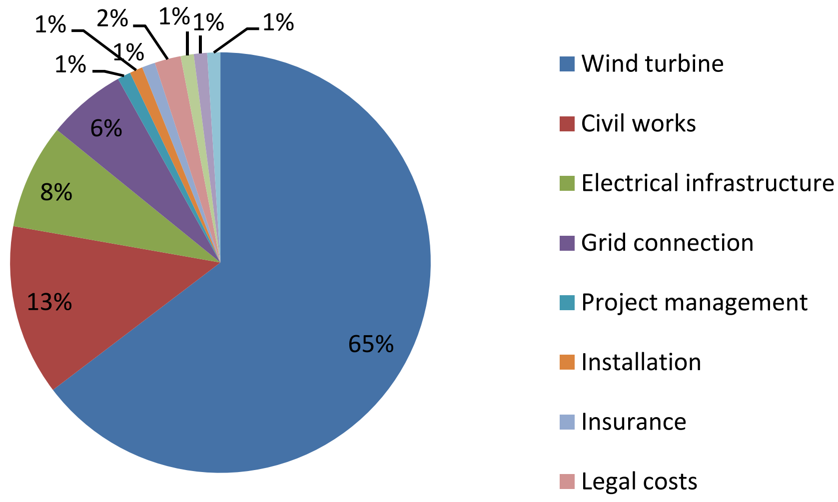

Figure 23 Capital cost breakdown for a large scale wind turbine. (Source: The economics of onshore wind energy; wind energy fact sheet 3, DTI) [20]

6.3 Small Scale Wind Energy Resource

6.3.1 Local Potential for Small Scale Wind

The relatively high wind speeds in Eastbourne mean that smaller scale turbines of the order of 20m in tip height could be a significant opportunity for reducing CO_2 emissions [Figure 24]. Smaller wind turbines have a significantly reduced visual impact would be particularly suitable for industrial sites, but also for municipal buildings such as community centres or schools. Any locations for small scale wind turbines that are around 15m tip height should incorporate a 20m buffer zone from all roads and railways and a 150m buffer zone from residential areas.

Given the lack of data on such sites, we have assumed that 50 small scale turbines could be located in the borough, for example, in parks, on municipal buildings, community centres and schools. Installation of 50, 15 kW turbines would add 0.75 MW to Eastbourne's renewable energy capacity and assuming a capacity factor of 20% would generate approximately 986 MWh annually. This contribution is around 3% of the energy generated by one large scale turbine, demonstrating the efficiencies of scale that can be achieved with large scale wind [Figure 24].

We have obtained costs from a manufacturer of small scale wind turbines, these are in the region of £1,267,000 per megawatt installed. These costs are based on an installed cost of £19,000 for one 15 kW turbine and include civil works for an average site.

Resource	Small Scale Wind Turbines
Number of turbines	50 turbines
Hub Height	15 metres
Rotor Diameter	9 metres
Installed capacity	0.75 MW
Annual generation	986 MWh
Potential for CO_2 savings	560 tonnes
Number of homes equivalent	157 typical detached homes

Table 8 Small scale wind energy resource in Eastbourne

[20] The economics of onshore wind energy; wind energy fact sheet 3 (DTI, June 2001)

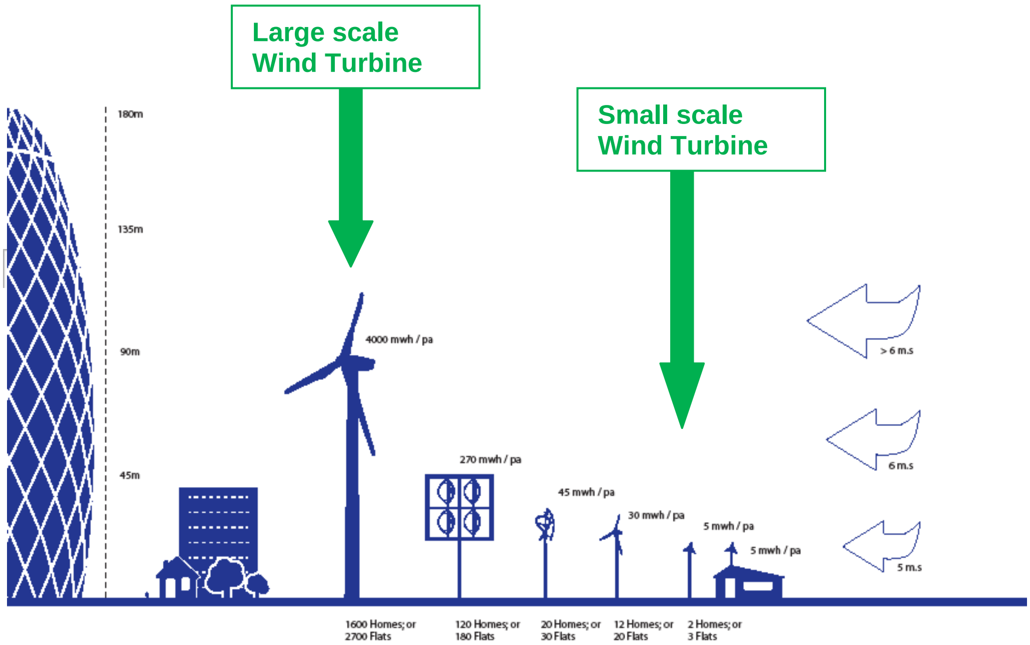

Figure 24 Difference in energy output in relation to scale of turbine

6.4 Biomass Energy

Biomass is normally considered to be a renewable fuel, as the CO_2 emitted during combustion has been (relatively) recently absorbed from the atmosphere by photosynthesis.

6.4.1 Existing Biomass energy generation sites

We are not aware of any biomass energy generation installations in Eastbourne.

6.4.2 Local Potential for Biomass

GIS mapping has been carried out to estimate the biomass resource in the borough. Natural England's agricultural land classifications have been used to assess the potential for energy crops and datasets from the Forestry Commission and Natural England cover wood biomass arisings. Four sources of biomass have been explored:

- Potential contribution of dedicated energy crops;
- Arisings from arboriculture management;
- Arisings from management of parks, highways, open spaces, green waste and waste wood. Currently these arisings are not collected in a coordinated manner;
- Contribution through wet biomass.

Details of the assessment methodology are provided in the following sections. Each type of biomass brings its own set of constraints and these should be explored in detail before finalising sites.

Energy Crops

The potential for energy crops has been assessed according to the availability of suitable arable land, taking into account competing land uses and typical yields. Agricultural land use classification maps have been used to delineate appropriate soil types.

The following criteria have been used to assess capacity:

- Grades 1 and 2 land have been omitted as being reserved for food production;
- The South Downs area has been omitted as being unsuitable for energy crop growth. Large areas of the South Downs surrounding Eastbourne have special landscape character. Its chalky, open and exposed nature is vulnerable to change from large fields of energy crops and is not ideally suited to their growth. The South Downs Management Plan anticipates that "*extensive biomass crops (short rotation coppice (SRC), short rotation forestry (SRF) and miscanthus) in the wrong location could have a major adverse*

effect on the landscape, biodiversity, cultural heritage and natural resources of the South Downs. Biomass crop types with high water demands will be inappropriate;"

- The total energy crop potential includes use of 75% of grade 3 land and 20% of grade 4 land. This covers the area covered by Eastbourne Park and the area to the north of the borough;
- The Council has confirmed that the Environment Agency is interested in providing funding to grow willow in Eastbourne Park[21]. Willow and poplar perform better in wetter areas and short rotation coppicing (SRC) is the most promising way of growing willow quickly and easily, therefore we have assumed that Willow SRC will be the most appropriate type of energy crop for the borough. [22]
- It is possible to derive 9 oven dried tonnes of Willow SRC per hectare. [23]

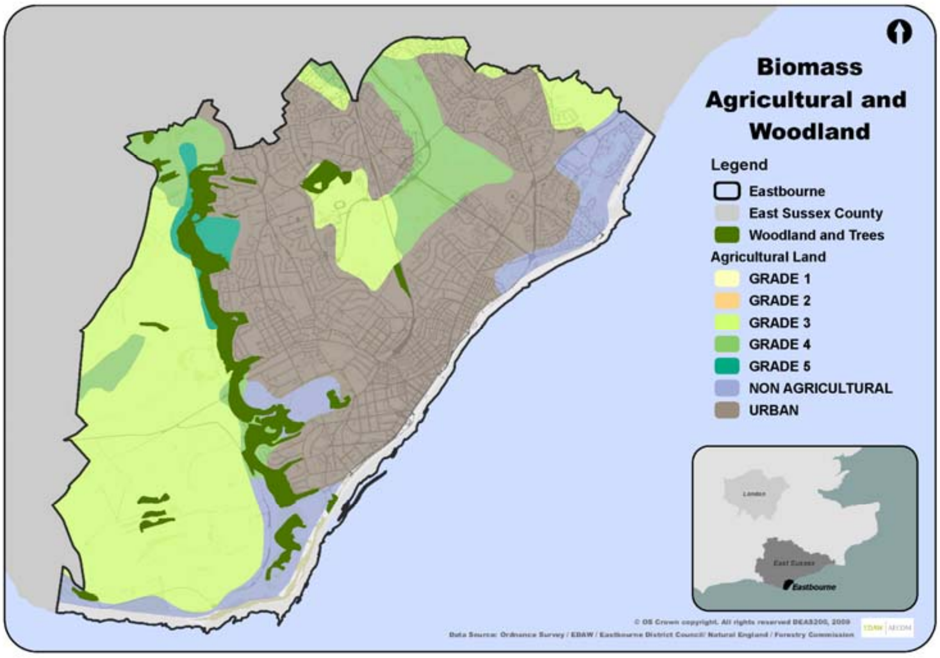

Figure 25 Classification of agricultural land for biomass resource in Eastbourne

The assessment suggests that around 1,199 hectares of land could be made available for the production of energy crops [Figure 25]. If all of this is used for energy crops, then the borough can generate 55,775 MWh per year (equivalent to 1,394 tonnes CO_2, or carbon emitted from 393 typical detached homes).

Arboriculture

The most obvious source of biomass is trees. East Sussex County Council has noted that wood is an abundant local resource (around 100,000 tonnes per year) and that their first choice fuel for heating its buildings will be biomass[15].

Around 88 hectares of the South Downs woodland is managed by Eastbourne Borough Council.[24] The management plan notes that the resumption of woodland management could bring great benefit to the South Downs as long as the emphasis is on reintroducing traditional coppice management cycles and the conversion of Planted on Ancient Woodland Sites (PAWS) back to semi-natural woodland. The second major area of woodland managed by the Council is 19 hectares in Hampden Park.

We have assumed that biomass could be sourced from both of these woodland areas through dedicated management. If all potential arisings were collected, around 33 oven dried tonnes

[21] Comments on draft of final report for this study (Eastbourne Borough Council, September 2009)
[22] Biomass as a renewable energy source (Royal Commission on Environmental Pollution, 2004)
[23] Biomass-related facts, figures and statistics (Biomass Energy Centre website, accessed October 2009)
[24] The South Downs Management Plan 2008-2013 Part B (South Downs Joint Committee, April 2008)

would be available for energy generation equating to 276 MWh heating energy, displacing 6.9 tonnesCO_2 annually (equivalent to that emitted by 2 typical detached homes).

Parks and Highways Waste

The maintenance of parks, gardens, road and rail corridors and other green spaces gives rise to plant cuttings that can be used as biomass fuel. Eastbourne Council already produces such material as part of its normal operations. For example, the Council's current grass cutting contract allows for twelve cuts each year and is a cut and let fly operation with the clippings left on the surface of the grassed areas.

We have summed all the land classified as parks, allotments or downlands in Eastbourne and assumed that cuttings from 20% of the total area could be gathered for waste [Figure 26]. This would provide 423 oven dried tonnes for annual energy generation equating to 1,854 MWh, reducing CO_2 emissions by 46.3 tonnes (or that emitted by 13 typical homes).

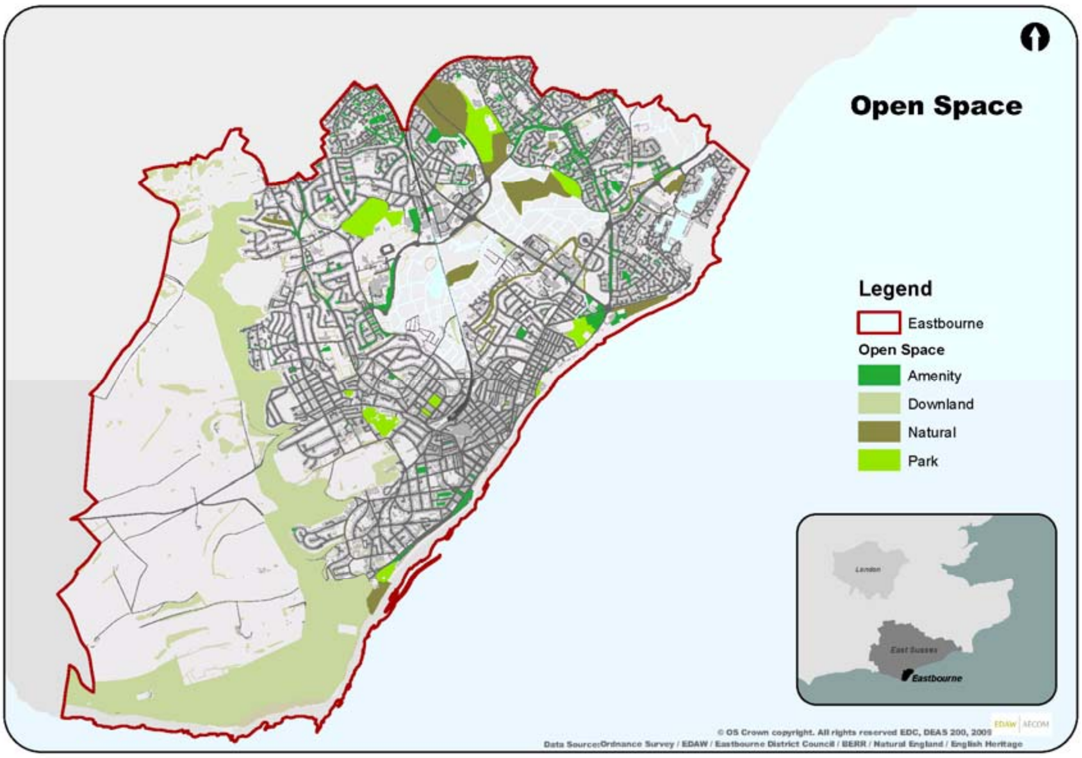

Figure 26 Parks and other open space biomass resource Eastbourne

Green and Wood Waste

Municipal waste streams, as well as construction and demolition, produces wood waste. A large proportion is currently disposed of in landfill but could be diverted for use as a fuel with the right organisational structures and incentives in place. The waste transfer station at Roselands depot provides an opportunity to segregate the wood waste stream from that destined for landfill. Furthermore, the Council has started to collect green waste at 'bring' sites and at the kerbside.

Translating resource potential of the green waste and wood waste streams is difficult with limited information available at borough level. We have used DEFRA figures for the breakdown of household waste arisings combined with East Sussex statistics for Eastbourne waste arisings to estimate a quantity of wood waste and green waste that could be secured for biomass. It has been assumed that:

- Total waste arisings from Eastbourne in 2007 were 36,335 tonnes;
- 4% of this by weight was comprised of wood waste;
- 1942 tonnes of household green waste was collected in 2007;
- Conversion factor of 45% moisture content wood and green waste to oven dried equivalent was 0.55.

Assuming that all of this can be supplied to a biomass plant, this would be expected to generate around 3,757 MWh per year of heat (saving 93.9 tonnesCO_2, equivalent to that emitted by 26 homes).

Wet Biomass Resource

Other sources of biomass include animal waste, such as poultry litter and manures. Statistics from the Agricultural and Horticultural Survey in 2007[25] indicated that there are 13 farms in Eastbourne, they each control land of less than 5 hectares. There are nearly 3,000 sheep but no poultry in farms in the borough. The number of cattle, goats and horses was not available.

Due to lack of data, we have omitted the potential resource from wet biomass from this study.

6.4.3 Financial implications of biomass

Establishment of energy crops is estimated to cost approximately £2000/hectare [Table 9]. Detail on grants available for establishing crops are presented in Chapter 10.

Activity	Cost per hectare
Ground preparation (herbicides, labour, ploughing and power harrowing)	£133
Planting (15,000 cuttings, hire of planter and team)	£1,068
Pre-emergence spraying (herbicide and labour)	£107
Year 1 management costs (cut back, herbicides, labour)	£112
Harvesting	£170
Local use (production, bale shredder, tractor and trailer)	£378
Total	**£1,968**

Table 9 Indicative costs of establishing willow SRC energy crops, exclusive of payments from grants or growing on set aside land. (Source: Energy Crops, CALU and Economics of Short Rotation Coppice, Willow for Wales) [26], [27]

A recent analysis of the potential income from both willow SRC and miscanthus suggested that for medium yield land (i.e. Grade 3), the average annual income would be £187 to £360 per hectare [22]. Energy crops are relatively expensive compared to some other biomass fuels but do have the potential to provide very significant volumes of fuel. Currently the market price of miscanthus and willow is not yet considered economically viable in the South East of England [Figure 27]. It is expected that supply of energy crops would be developed later than biomass from other sources. Eastbourne should firstly seek to harness waste wood and aboriculture arisings before supplementing supply with local energy crops. Where local supply-chains are not in place, fuel can be imported from elsewhere.

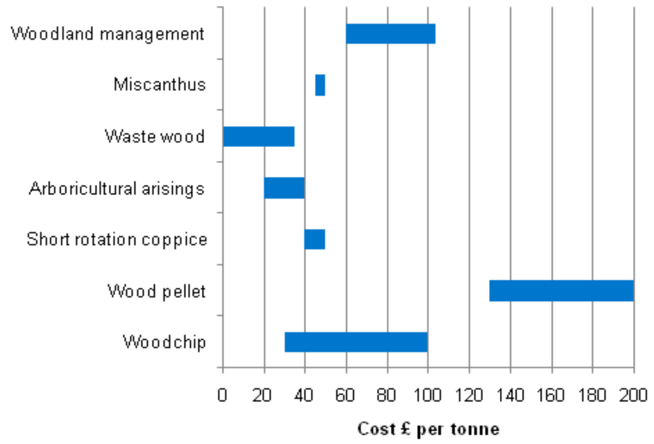

Figure 27 Guideline costs for different biomass fuels. (Source: Biomass heating A practical guide for potential users) [1]

[25] Agricultural and Horticultural Survey (DEFRA, 2007)
[26] Economics of short rotation coppice (Willow for Wales, July 2007)
[27] Energy Crops, Economics of miscanthus and SRC production (CALU, November 2006)

Type of Biomass	Source	Recoverable Biomass	Area in Eastbourne	Useful Proportion	Useful amount	Moisture Content	Calorific Value	Annual generation	CO_2 savings
		odt/hectare	hectares	%	odt	%	GJ/odt	MWh	tonnes
Energy Crops	Agricultural Land Grade 1 (SRC)	13	-	0%	-	30%	18.60	-	0.0
	Agricultural Land Grade 2 (SRC)	13	-	0%	-	30%	18.60	-	0.0
	Agricultural Land Grade 3 (SRC)	9	1,475	75%	9,954	30%	18.60	51,431	1,285.8
	Agricultural Land Grade 4 (SRC)	9	467	20%	841	30%	18.60	4,345	108.6
	Agricultural Land Grade 5 (SRC)	9	109	0%	-	30%	18.60	-	0.0
Aboriculture	Forest management South Downs	2	88	50%	88	45%	9.28	227	5.7
	Forest management Hampden Park	2	19	50%	19	45%	9.28	49	1.2
Park and Highways Waste	Parks	2	487	20%	195	high	15.76	853	21.3
	Allotments	2	192	20%	77	high	15.76	336	8.4
	Downland	2	379	20%	152	high	15.76	664	16.6
Waste Wood	Household and Commercial waste	-	-	-	360	50%	18.30	1,829	45.7
Green Waste	Household and Commercial waste	-	-	-	1,068	n/a	6.50	1,929	48.2
Wet Biomass	None assumed	-	-	-	-	40%-81%	0	-	0.0
TOTAL								**61,662**	**1,541.6**

Table 10 Biomass resource in Eastbourne

6.5 Energy From Waste Resource

The previous section showed that the local biomass resource is not sufficient to satisfy the energy demand of the building stock. When used in conjunction with district heating networks, Energy from waste schemes are a low carbon form of energy generation that could make up part of the shortfall.

Municipal waste from the borough is sent to landfill sites at Beddingham or Pebsham, that accept most of the non-inert waste and some inert waste generated in East Sussex. The existing land disposal availability is expected to run out within the next two years. Both sites have facilities to capture landfill gas and generate electricity. Approximately 9,302 tonnes of household waste was sent for energy recovery in 2007, this corresponds to 26% of total household waste.[28]

The water industry produces both wet and dry sludge in large quantities which can be diverted for energy recovery. Anaerobic digestion produces a sewage gas which contains methane and can be used to fuel gas CHP. There may be the potential to generate electricity from methane captured from decommissioned landfill sites in the borough [Figure 28].

The East Sussex and Brighton and Hove Waste Local Plan[29] records that there are no existing landfill sites or waste stations within Eastbourne from which energy could be recovered. The Plan acknowledges the need for new Energy from Waste facilities to be provided to deal with waste which cannot otherwise be managed except by landfill. The feasibility of energy from waste schemes is heavily dependent on existing waste management arrangements and is likely to be delivered at a county level. Such schemes are beyond the scope of this study.

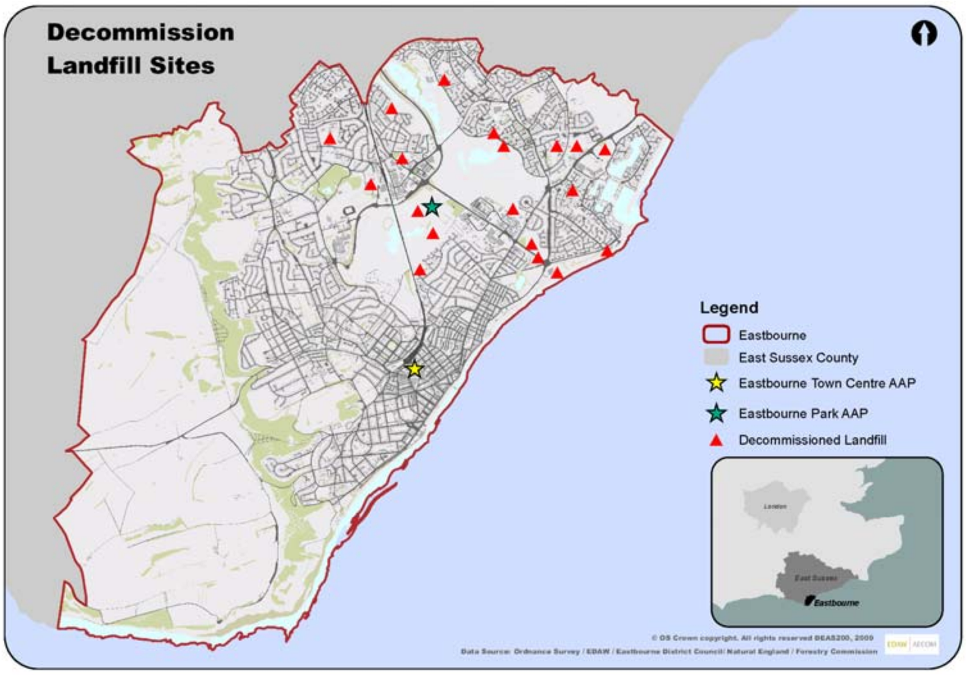

Figure 28 Decommissioned landfill sites in Eastbourne (Source: Eastbourne Borough Council, September 2009)

6.6 Geothermal Energy

Geothermal energy is derived from the very high temperatures at the Earth's core (and is a different type of technology to ground source heat pumps). The exploitation of geothermal resources in the UK continues to be minimal. Most of the hot dry rocks resource is concentrated in Cornwall; studies have concluded that *"generation of electrical power from hot dry rock was unlikely to be technically or commercially viable…in the UK, in the short or medium term."*[30] This technology has therefore not been considered further.

[28] Household waste arisings (East Sussex in Figures website, accessed September 2009)
[29] East Sussex and Brighton & Hove Waste Local Plan (adopted February 2006)
[30] Sustainable Energy — without the hot air (Mackay, D.J.C, November 2008)

6.7 Hydro Energy

There are no significant water courses running through the borough and so this technology has not been considered further.

6.8 Tidal Energy

6.8.1 Local Potential for Tidal Energy

Tidal energy converts the energy of tides into electricity. Tidal streams are fast-moving currents created as water flows between areas of differing tidal height. The potential resource from tidal streams in Eastbourne is below 1000 MWh/year, which is too low for commercial exploitation. [31]

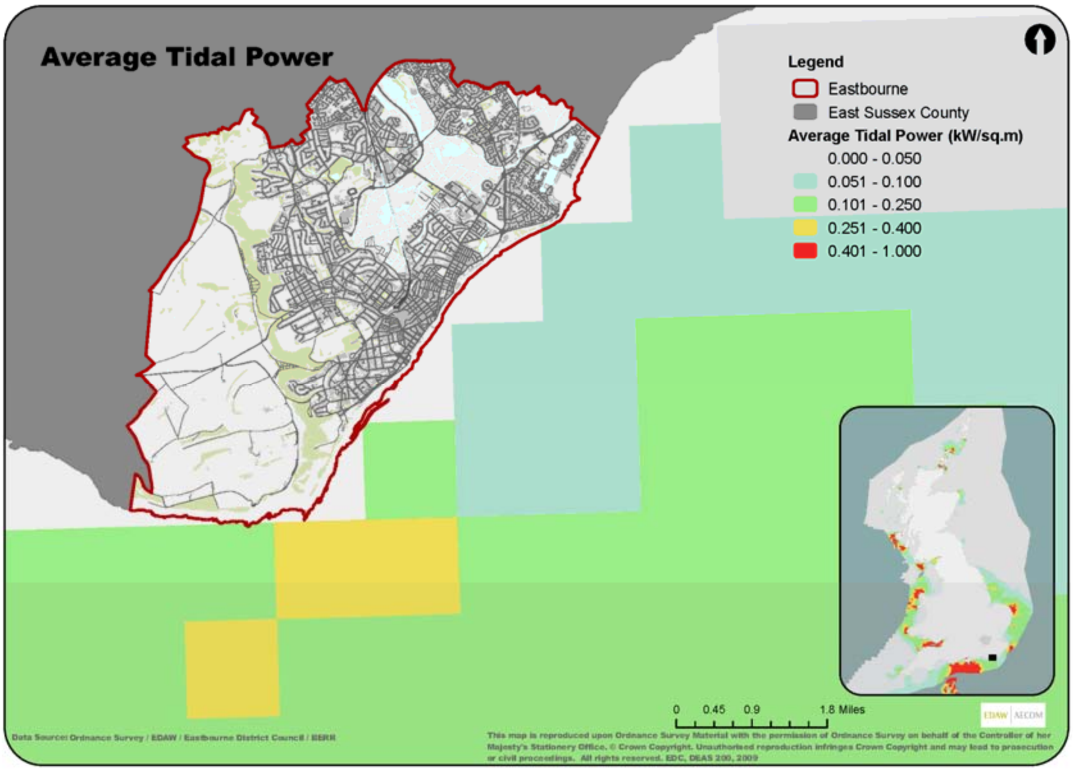

Figure 29 Potential mean power generation for areas of significant tidal stream resource. The data presented is an approximate value of the electrical power that a twin-rotor tidal turbine might deliver in one year (Source: Atlas of the Tidal Energy Resource on the South East Coast of England, Marine and Technical Marketing Consultants) [31]

Tidal range generators exploit the changes in height of the water level between high and low tides. The mean spring tidal range in Eastbourne is 6.7m which is sufficient for energy generation[32].

There are two methods of extracting energy from the tidal range. The first is to use a tidal barrier placed at a strategic point in an estuary. As Eastbourne is not located on an estuary there is limited potential to use a tidal barrage to harness the tidal range. The coastline has a shallow curvature and so any opportunity to utilise a bay instead of an estuary is not present.

The second method is to use a tidal lagoon, which is an artificial device constructed in shallow waters where there is a high tidal range. Tidal lagoons are thought to be achievable from an engineering perspective but there is no example of a tidal lagoon development anywhere in the world, which makes evaluation of the technology difficult. This technology has therefore not been considered further, but the technology should be periodically reviewed to ascertain whether there is potential for use in Eastbourne.

[31] Atlas of the Tidal Energy Resource on the South East Coast of England (Produced for SEEDA by Marine and Technical Marketing Consultants, May 2007)

[32] Renewables in Scotland website http://www.esru.strath.ac.uk/EandE/Web_sites/01-02/RE_info/Tidal%20Power.htm#introa (University of Strathclyde, accessed September 2009)

6.9 Wave Energy

Energy from ocean surface waves can be captured to generate renewable electricity. Energy generation from waves is considered to be an emerging technology and to date, attempts to design and deploy cost efficient devices have met with limited success.

Unlike the UK tidal resource, no definitive analysis has been carried out recently on the capacity limits for the UK wave resource.[33] Wave power in the Eastbourne region is between 1.1 and 5.0 kW/m of wave crest [Figure 30]. Discussion with a manufacturer of a wave energy device indicated that areas with annual averages of over 15kW/m of wave crest have the potential to generate wave energy at competitive prices.[34] This suggests that with current technologies there is little potential for wave power off the coast of Eastbourne and this technology has not been considered further.

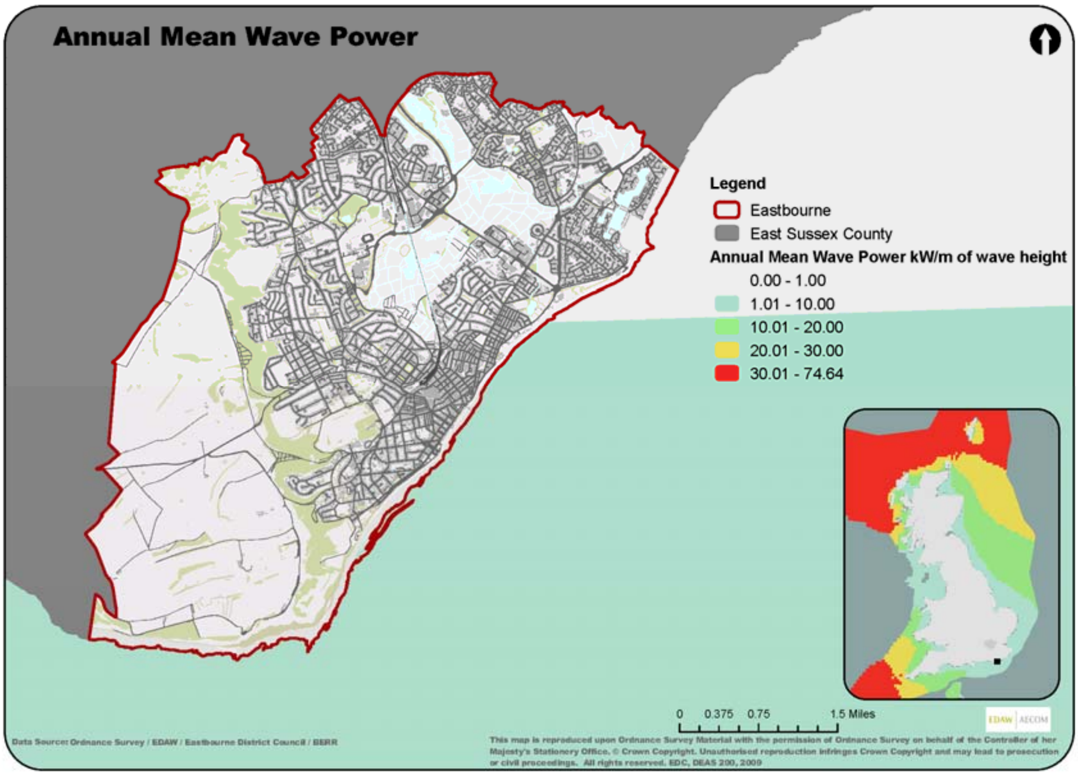

Figure 30 Annual mean wave power in the UK - full wave field (Source: Atlas of the Tidal Energy Resource on the South East Coast of England)[31]

6.10 Microgeneration technologies

The term “microgeneration” is used to describe the array of small scale technologies (typically less than 50 kW electricity generation and 100 kW heat generation) that can be integrated as part of the development of individual sites, or retrofitted to existing buildings. These technologies tend to be less location specific and therefore have little influence on the spatial arrangement of sites.

Combinations of technologies can be applied but it is important to note that some combinations can lead to competition between systems and therefore sub-optimal performance, which will affect both output and maintenance. Generally, conflict occurs where multiple technologies are competing to provide heat, as opposed to electricity which can be exported if excess is generated.

Deleterious effects of competition can be avoided through appropriate sizing and design of the systems. For example, two heat supplying technologies could work effectively together if one is

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[33] Variability of UK Marine Resources (Carbon Trust, July 2005)

[34] The Resource (Pelamis Wave Power website http://www.pelamiswave.com/content.php?id=155, accessed September 2009)

sized to meet the annual hot water demand while the other is sized and operated to meet only the winter space heating demands. Figure 31 shows potential combinations of high conflict (red), no conflict (green) and conflicts that can be avoided through appropriate design (yellow).

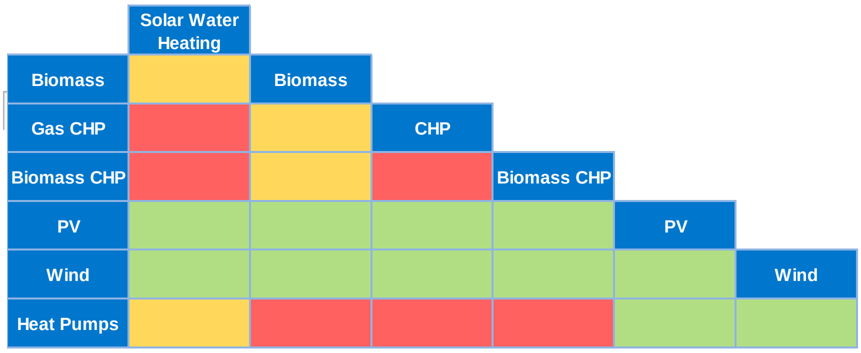

Figure 31 Potential conflicts between microgeneration technologies

Feed-in-tariffs are to be introduced in April 2010 to replace the support provided by the Low Carbon Buildings Programme. The technologies must be below 5MW and include wind, solar PV, hydro, anaerobic digestion, biomass and biomass CHP, and non-renewable micro CHP. The tariff levels are to be set at a level that encourages investment in small scale, low carbon electricity generation and should ensure that as well as the energy saving benefits, the installation will provide a reasonable rate of return on the initial investment.

6.10.1 Solar Energy

The two main solar microgeneration technologies are solar photovoltaics (PV) and solar water heating. Figure 32 shows the solar resource in Eastbourne which, compared with the rest of the UK, is good. This will not be factored in the national modelling tools used to assess Building Regulations compliance, which do not take into account geographical constraints when calculating solar energy generation. However, Eastbourne's favourable location in terms of solar resource will obviously affect the real life output and associated payback of any installations. Table 12 shows the potential for CO_2 savings from solar energy technologies.

Figure 33 shows how the output of solar systems varies by orientation and tilt of the installation. Panels should be mounted in a south-facing location, although south-east/south-west orientations will generate with only a small reduction in performance. The optimum angle for mounting panels is between 30º and 40º, although this is often dictated by the angle of the roof. Careful consideration should be given to placing the systems so that they are not over shaded by adjacent buildings, structures, trees or roof furniture such as chimneys.

Solar PV panels use semi-conducting cells to convert sunlight into electricity. The output is determined by the brightness of natural light available (although panels will still produce electricity even in cloudy conditions) and by the area and efficiency of the panels. PV is expensive in comparison to other renewable energy options, but is one of the few options available for renewable electricity production and are often one of the only on-site solutions to mitigate CO_2 reductions associated with electricity use. Panels have been developed that look similar to roof tiles and may be more attractive in areas where aesthetics are important or where unobtrusive design may reduce the risk of theft. At present these are up to £2,000/kW more expensive than conventional PV[35].

In homes, most electricity is generated during the day when consumers are not at home. This could bring benefits to the householder when feed-in-tariffs are introduced and could make roof mounted PV of interest to investors [Table 11]. The tariff is also expected to have a significant impact on the cost of PV and other renewable technologies.

[35] The Growth Potential for Microgeneration in England, Wales and Scotland (Element Energy for BERR, June 2008)

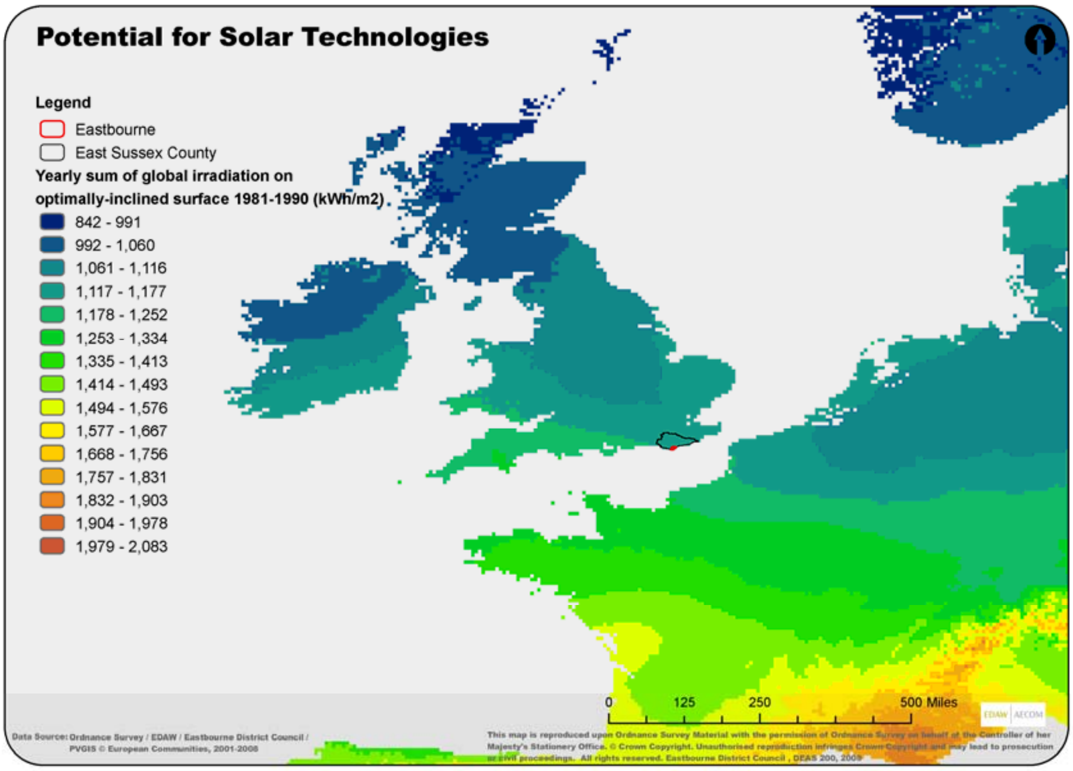

Figure 32 Solar Resource in Eastbourne (Source: Photovoltaic Geographical Information System (PVGIS), JRC European Commission)[36]

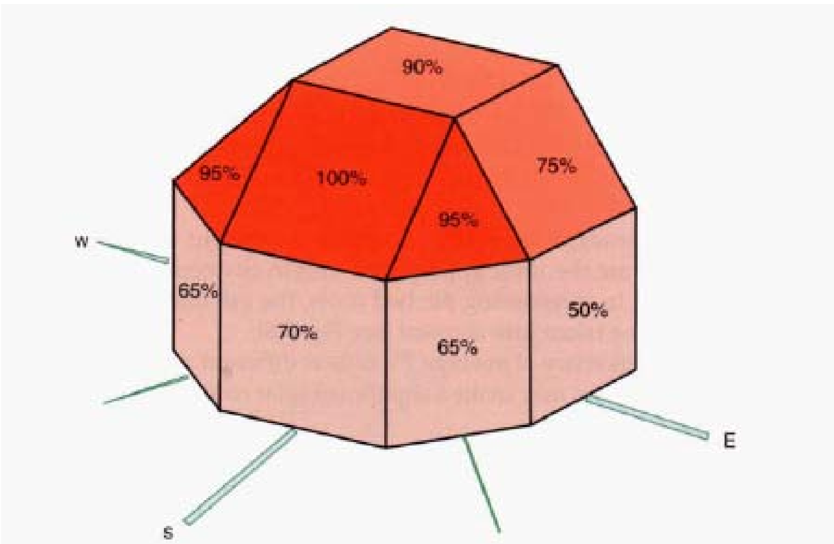

Figure 33 Optimum orientation for solar panels in the UK (Source: Sustainability at the Cutting Edge) [37]

PV Scale	Potential initial tariff (£/kWh)	Annual degression %
<4kW new build	0.31	7
<4kW retrofit	0.36	7
4-10kW	0.31	7
10-100kW	0.28	7
100kW-5MW	0.26	7
Stand alone system	0.26	7

Table 11 Feed in tariff for PV, to be introduced in April 2010. The tariff rates are still under consultation.

36 Photovoltaic Geographical Information System (PVGIS) (JRC Commission website, accessed October 2009)
37 Sustainability at the Cutting Edge (Smith , F, 2007)

Solar water heating panels are used primarily to provide hot water. Output is constrained by the amount of sunlight available, panel efficiency and panel area. Devices are most cost effective when sized to meet 50-70% of average hot water requirements, which avoids wasting heat in the summer. It should be noted that solar water heating supplements and does not replace existing heating systems.

There are two standard types of solar water heating collectors: flat plate and evacuated tube collectors. Historically, flat plate collectors have dominated due to their lower cost per unit of energy saved. However, recent advances in evacuated tube collector design have achieved near parity in terms of cost per $kgCO_2$ saved. Generally, evacuated tubes are more expensive to manufacture and therefore purchase, but achieve higher efficiencies and are more flexible in terms of the locations they can be used [Table 12].

Where solar water heating systems are to serve flats, it is recommended that direct supply serves only the two floors immediately below the roof or a communal system should be specified. Beyond two floors, direct individual systems require extensive pipe work and riser space, resulting in access issues for maintenance, higher heat losses and the need for increased riser space.

Technology	Solar Hot Water	Solar Photovoltaics (PV)
Approximate size required	~4 m^2 per dwelling	~8 m^2 per dwelling
Total cost of system	£2,500 for new build homes (2 kW system) £5,000 for existing homes (2.8 kW system) £1,000/kW for new build non-domestic £1,600/kW for existing non-domestic	£5,500 for new build homes (1 kWp system) £6,000 for existing homes (1 kWp system) £4,500/kW for new build non-domestic £5,000/kW for existing non-domestic
Annual Generation Potential	396 kWh/m^2 for flat plates 520 kWh/m^2 for evacuated tubes	850 kWh/m^2 for high performing systems
Potential for CO_2 savings	13% of total emissions for existing homes 23% of total emissions for new build homes	26% of total emissions for existing homes 38% of total emissions for new build homes

Table 12 Potential CO_2 savings for solar energy technologies. Buildings are assumed to have good practice energy efficiency (Eastbourne Stock Energy Model, AECOM)

Promotion of Eastbourne as a favourable location for solar energy generation would be a good marketing tool for increasing the uptake of PV and solar water heating. As one of the few electricity generating, truly renewable technologies, uptake of PV is particularly desirable. Chapter 10 discusses options for increasing uptake.

6.10.2 Heat Pumps

Heat pumps are low carbon rather than renewable devices since they require electricity to run. They can provide significant CO_2 savings in comparison to standard electrical heating systems, since they require around a third less electricity. However, due to the carbon intensity of the grid, CO_2 emissions from heat pumps are similar to those of an efficient gas heating system. As electricity is currently around four times more expensive than gas, running costs are also comparable with, and often higher than an equivalent gas system.

Heat pumps are primarily space-heating devices and the best efficiencies are achieved by running systems at low temperatures. For this reason, they are ideally suited for use in conjunction with under floor heating systems.

This creates a significant challenge for heat pumps installed in future homes, where hot water demands are likely to be comparable to the (reduced) space heating requirements. In such cases, heat pumps might be well complemented by other microgeneration systems that are sized in relation to domestic hot water requirements, for instance, solar hot water systems.

The performance of heat pumps is related to the average air temperature. The geographical location of Eastbourne means that they should perform relatively well in comparison to the rest of the UK. Table 13 shows the potential carbon savings from installing a heat pump to a new or existing building. The high cost of ground works for ground source heat pumps means that air source heat pumps are around half the installed cost, albeit with a lower efficiency. For air source heat pumps, retrofit costs are slightly higher than new build to allow for increases in plumbing and electrical work. For ground source heat pumps, the cost for retrofit is higher to allow for modifications to existing plumbing and removal of existing heating system, plus ground works costs when digging up an established garden.

There is a wide variation in costs for ground source heat pumps at the 20-100kW scale, principally due to differences in the cost of the ground works. The cost of the heat pumps themselves is also dependent on size as commercial systems are usually made up of multiple smaller units rather than a single heat pump. Due to these variations, heat pumps in the 20-100kW range are shown with an indicative cost of £1,000 per kW installed.

Technology	Air Source Heat Pump	Ground Source Heat Pump
Approximate size required	5 kW	5kW trench system for new build 11kW trench system for existing
Total cost of system	£5,000 for new build £7,000 for existing £500/kW for non domestic	£8,000 for new build £12,000 for existing £1,000/kW for non domestic
Potential for CO_2 savings	5% of total emissions for existing homes 0.25% of total emissions for new build homes	12% of total emissions for existing homes 8% of total emissions for new build homes

Table 13 CO_2 saving potential of heat pumps (based on 2007 costs) A borehole Ground source heat pump system is more costly due to a high drilling cost of £30 per metre. A typical 70m borehole provides 3-5kW of heat output, giving a drilling cost of £4200 for an 8kW system (Source: The Growth Potential for Microgeneration in England, Wales and Scotland (Element Energy for BERR) [35]

6.10.3 Biomass Heaters

Biomass heating is most appropriate lower density situations due to fuel supply and storage issues. The most common application is as one or more boilers in a sequenced (multi-boiler) installation where there is a communal i.e. a block of flats or district heating system.

There is potential for small scale biomass heating in Eastbourne, particularly in parts of the borough where housing is prevalent rather than flats. Ideally, there would be a local and adequate supply of material, with arrangements in place to ensure that the fuel was delivered on a regular basis. As discussed in section 6.4.2, there is potential for existing woodland to be managed in a way which would add to the provision of wood-fuel to supply local heating systems.

Table 14 shows the CO_2 savings potential of biomass boilers. Existing building costs are considerably higher than new build costs due to the extra building and plumbing work. Costs are generally installation based and not size variable; this is because the actual boiler makes up a small proportion of the overall cost [Figure 34].

Technology	Small scale biomass boiler
Approximate size required	8.8 kW for homes
Capital cost of system	£9,000 for new build homes £11,000 for existing homes
Potential for CO_2 savings	34% of total emissions for existing homes

	33% of total emissions for new build homes

Table 14 CO_2 savings from biomass technologies

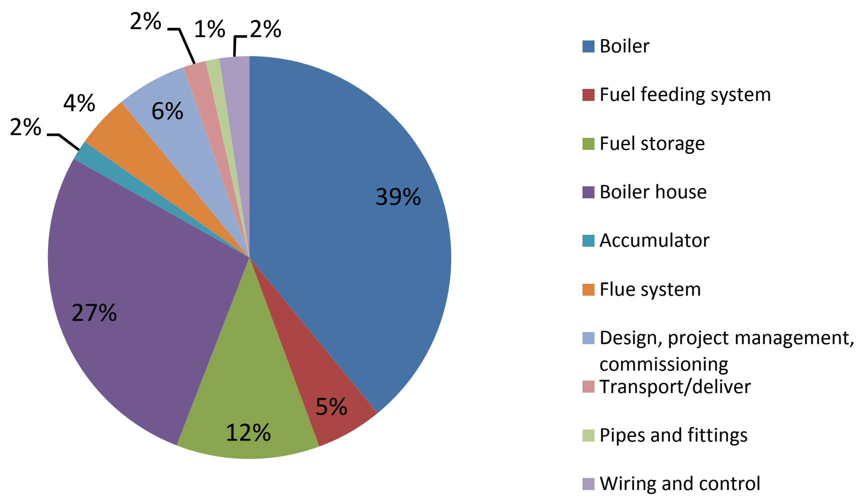

Figure 34 Capital cost/kW breakdown for example biomass heating project, based on a recently designed project of 500 kW_{th} capacity. The total system cost was £187,000. (Source: Biomass heating A practical guide for potential users) [38]

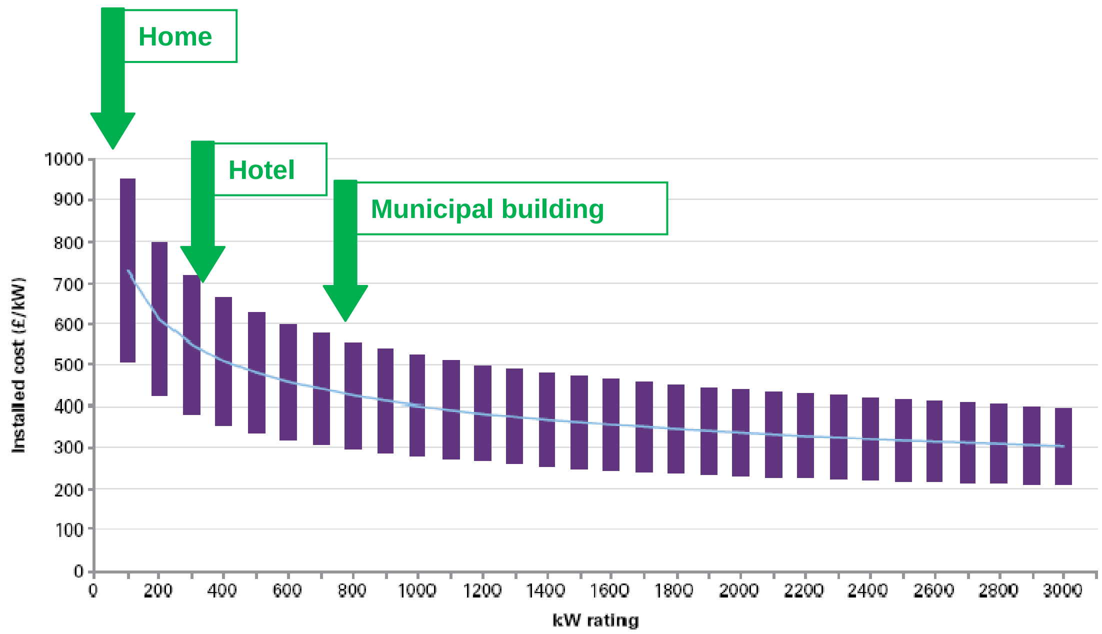

Figure 35 Capital cost ranges for a biomass heating system. Graph is inclusive of all required construction and other balance of plant. (Source: Biomass heating A practical guide for potential users, Biomass Energy Centre website)[38]

6.10.4 Building Mounted Wind turbines

Over the last few years, a number of companies have started to market wind turbines designed specifically for building mounted applications. The relatively high wind speeds in Eastbourne mean that turbines should perform well. However, early feedback suggests that building mounted turbines located in urban areas suffer from lower and much more disrupted wind speeds than larger turbines mounted in open sites and this has a significant impact on their energy generation potential. [39] There is limited data on energy generation from building mounted wind turbines in urban locations but early examples appear to have generated significantly less than was predicted by manufacturers. This is not necessarily a problem if costs can be reduced to a level where lower performance is balanced by their low cost.

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[38] Biomass heating A practical guide for potential users (Carbon Trust, January 2009)
[39] Micro-wind turbines in urban environments: an assessment (BRE, 2007)

AECOM are following the progress of monitoring studies and intend to include small scale wind turbines in their renewable feasibility assessments when performance data is available to make accurate estimates of likely performance. An assessment of their potential for CO_2 reduction has been excluded from this study.

6.10.5 Fuel Cells

Fuel cells can be used as CHP systems in buildings but are considered to be an emerging technology. They are similar to batteries in that they produce electricity from a chemical reaction. However, whereas a battery delivers power from a finite amount of stored energy, fuel cells can operate indefinitely provided that a fuel source is continuously supplied; this is currently natural gas which is reformed to produce hydrogen.

There is debate as to whether electricity generation from hydrogen is better than generating electricity directly from renewable sources such as PV and wind. The virtue of fuel cells is that they guarantee continuity of supply and clean, quiet, and very efficient electricity generation.

The capital cost of fuel cells is currently much higher than most other competing microgeneration technologies. Commercial models currently available cost approximately £3,000/kW. Fuel cell prices are expected to drop to £500-£1500/kW in the next decade with further advancements and increased manufacturing volumes. [35]

6.11 The Energy Opportunities Plan

An Energy Opportunities Plan has been prepared [Figure 36], showing opportunities for low carbon and renewable energy generation in Eastbourne. The following opportunities have been mapped:

- Expected residential and non-residential development in Eastbourne, including sites identified in the draft SHLAA (which may or may not come forward for development).
- Approximate location of Town Centre AAP;
- Approximate location of Eastbourne Park AAP;
- Areas where district heating with CHP is viable (Potential for CHP);
- Suitable locations for large scale wind turbines (Potential Wind Turbine Locations);
- Areas where energy crops could be grown as biomass for energy generation (Biomass - Grown);
- Areas of forestry where biomass could be sourced through woodland management (Biomass – Woodland Management);
- Parks and open spaces where biomass could be sourced through waste arisings (Biomass – Parks);
- Existing waste recycling sites which could be used for sorting of biomass waste arisings.

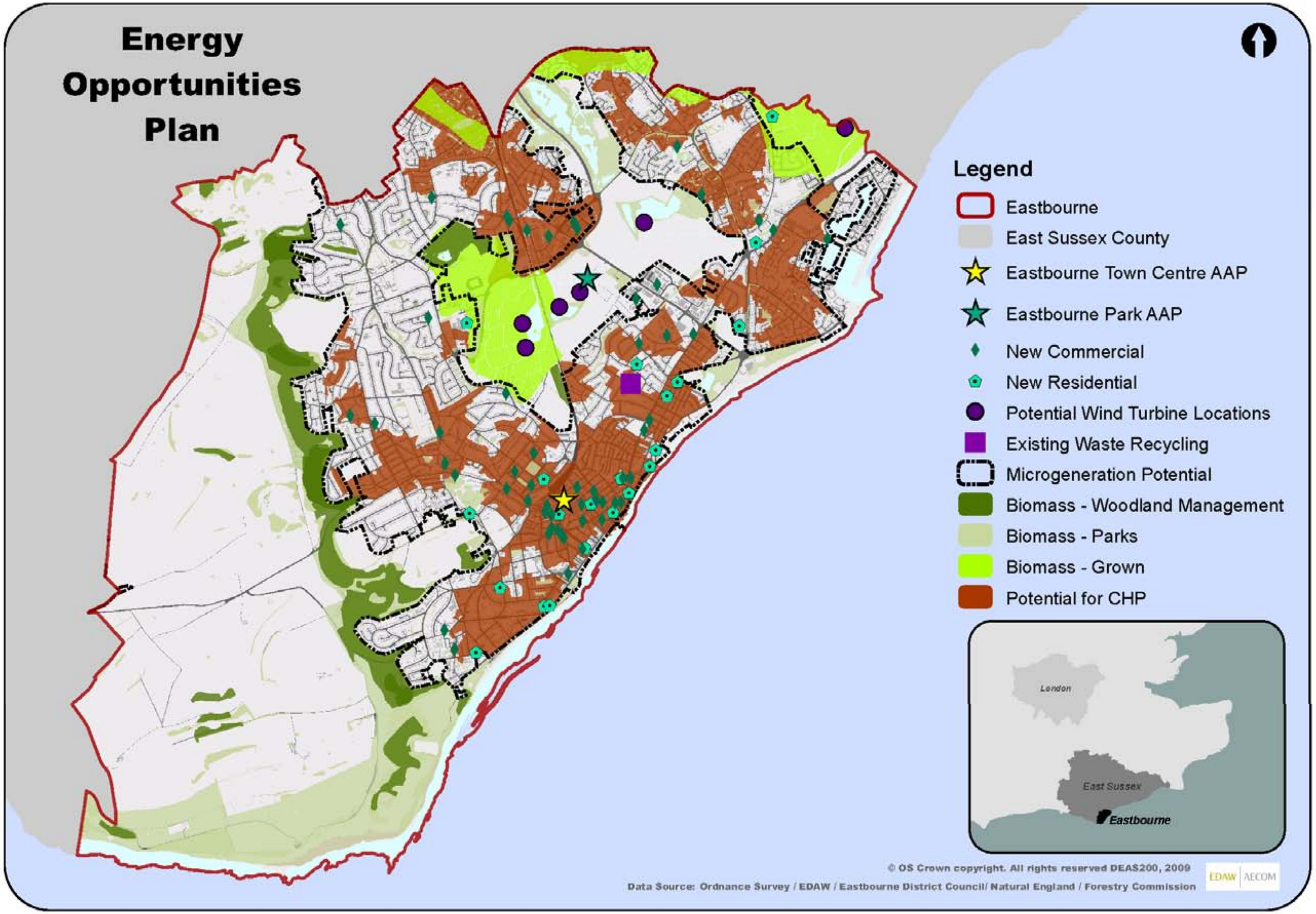

Figure 36 Eastbourne Energy Opportunities Plan

6.12 Scenarios for Reducing CO_2 Emissions with Low Carbon Technologies

The annual resource for community-scale, low carbon and renewable technologies has been estimated to be 61,662 MWh of heat energy and 32,522 MWh of electrical energy, which could save 20,014 tonnesCO_2 per year. This is comprised of:

- Large scale wind – 31,536 MWh or 17,912 tonnes CO_2 saved. This is equivalent to CO_2 emissions from 5,887 typical detached houses.
- Small scale wind – 986 MWh or 560 tonnes CO_2 saved. This is equivalent to CO_2 emissions from 157 typical detached houses.
- Biomass – 61,662 MWh or 1,541 tonnes CO_2 saved. This is equivalent to CO_2 emissions from 434 typical detached houses.

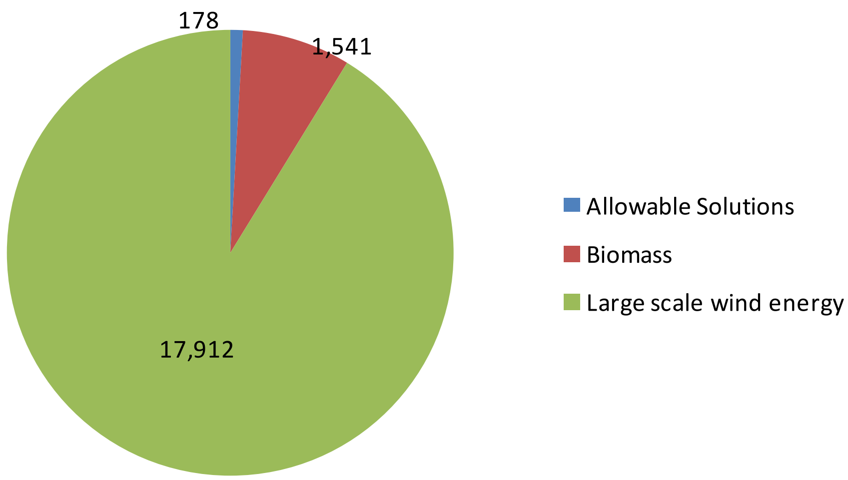

Figure 37 Distribution of renewable energy resource in Eastbourne, in tonnesCO_2 saved (Source: Eastbourne Stock Energy Model, AECOM)

Figure 37 compares the local renewable energy resource (large scale wind and biomass) with the resource needed for developers to achieve zero carbon status through off-site solutions. The graph suggests that if large scale wind is excluded, allowable solutions obligations will use about 10% of the available resource. This presumes that the biomass resource supply chain has been established by the time allowable solutions are needed. The results suggest that the Council should encourage as much on-site CO_2 reduction as possible, to enable the off-site renewable resource to be used as efficiently as possible.

The question remains as to whether the Council should aim to reduce CO_2 emissions from regulated sources (primarily comprised of emissions for space-heating and hot water) through an approach where heat is supplied from low carbon, solid fuel sources (i.e. biomass, waste) or an approach where heat is supplied from electricity. The former will require the instigation of extensive district heating networks and collaboration at the local and regional level to ensure a constant fuel supply. The success of the latter will depend on the direction of national climate change policy and the future grid mix. It is not a straightforward decision and requires the wider national and regional context to be taken into account, as well as a commitment to take a strategic approach to development and infrastructure planning. Planning is unique in that is the only activity that is able to build up a comprehensive spatial understanding of the opportunities and constraints for decentralised low carbon and renewable energy.

Figure 39 shows the effect that low carbon and renewable technologies will have on the borough's emissions (excluding the effect on increased energy efficiency measures). The tightening Building Regulations mean that beyond 2013, it is likely that microgeneration technologies will need to be installed in order to demonstrate compliance. It has therefore been assumed that the uptake of microgeneration technologies in new development will progress under a "business as usual" scenario, i.e. according to Building Regulations compliance. The dashed yellow line represents a 40% reduction in total emissions from buildings, equivalent t o achieving Core Strategy proposed spatial objective 33.

It can be seen that Biomass CHP is the only solution that can feasibly achieve the objective. PV and biomass are the most effective microgeneration technologies, heat pumps are the least effective. The results are based on the current grid mix and increased renewable energy generation in the UK should enable greater CO_2 savings from heat pump. On the other hand, renewable electricity is likely to be a limited and precious resource in the UK for some time. By 2020, only 15% of the country's electricity demand is expected to be generated from renewable sources. [3]

Based on the findings of this study and the renewable resource available, we recommend that the borough aims to reduce reliance on electricity and supply heat through district heating networks fuelled by low carbon fuels such as biomass and waste. This approach, in conjunction with the need to reduce emissions as far as possible onsite and consider the wider sustainability perspective is reflected in the policies presented in the next chapter.

The sectors that the Council has most influence over are buildings and transport; an analysis of whether the borough should aim to use its limited renewable energy resource to reduce CO_2 emissions from the building stock or from transport is beyond the scope of this study. It is recommended that it is accompanied by an assessment of opportunities for low carbon and renewable energy generation to reduce CO_2 emissions from transport in order to have a fully comprehensive picture.

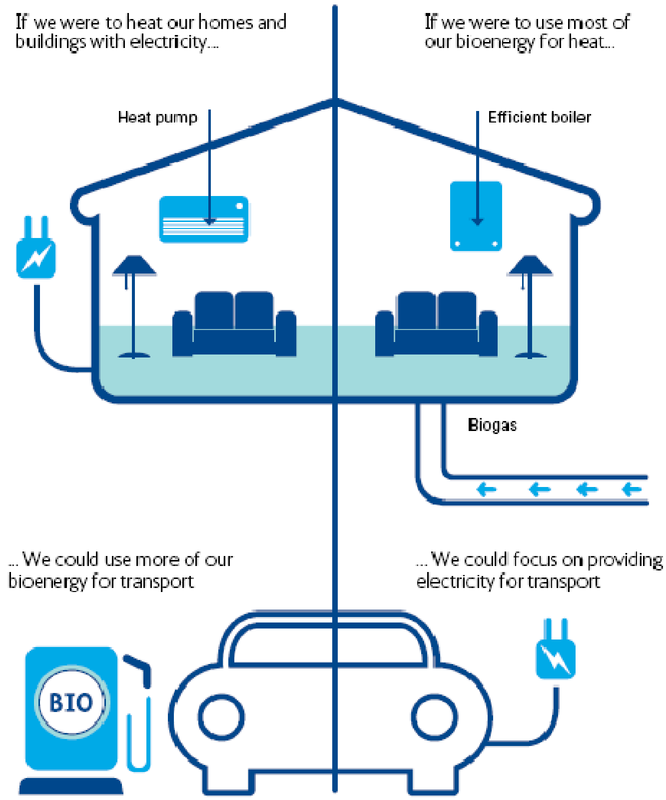

Figure 38 Options for using local renewable energy (Source: Low Carbon Transition Plan, DECC) [2]

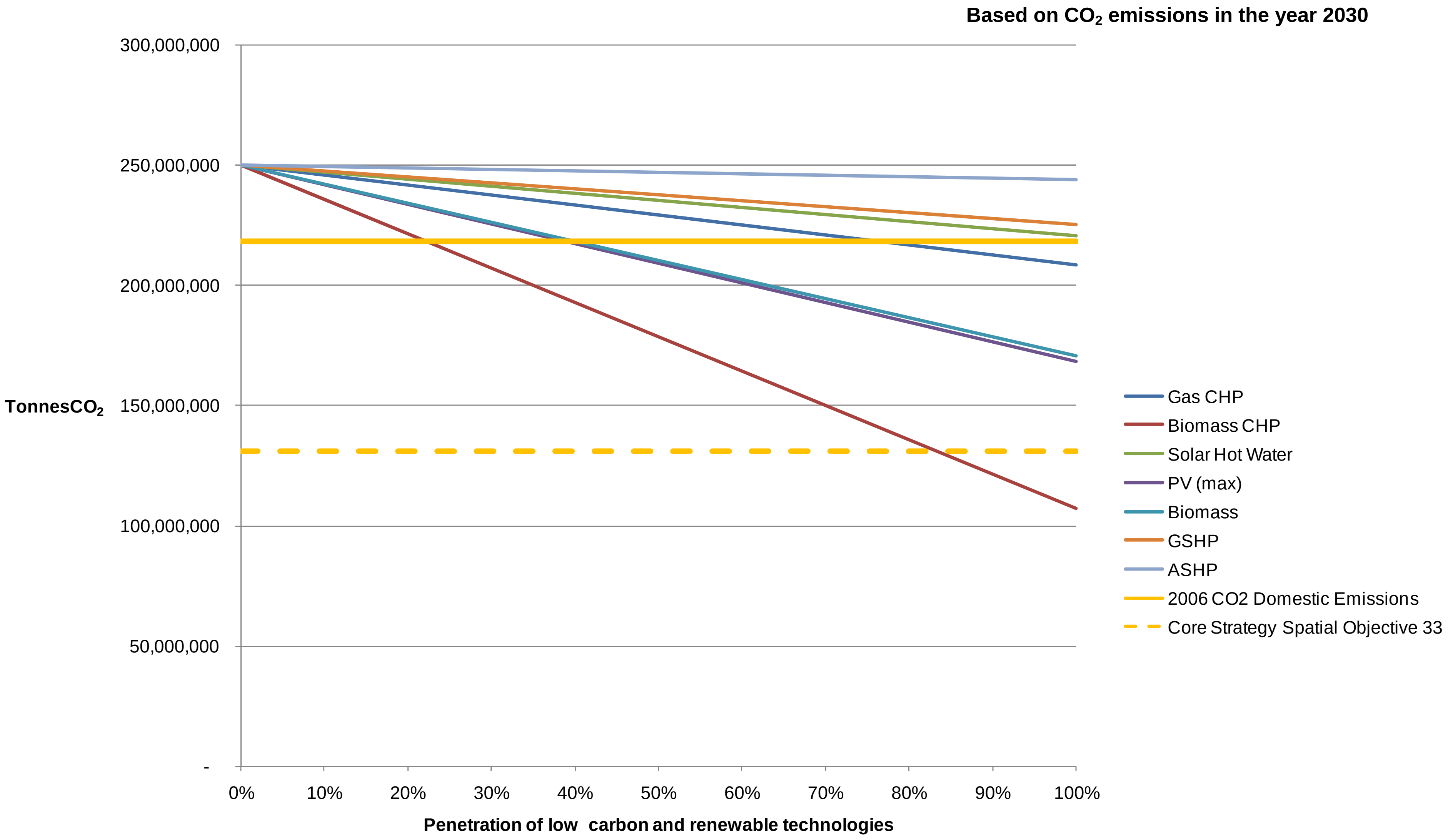

Figure 39 Effect of microgeneration on domestic CO_2 emissions in Eastbourne. Emissions at 0% penetration are predicted emissions for the year 2030. The effect of increased energy efficiency measures has not been included. (Source: Eastbourne Stock Energy Model, AECOM).

6.13 Key Considerations Emerging from this Chapter

Key considerations emerging from the assessment of low carbon and renewable energy resources are:

- There are a number of low carbon and renewable resource opportunities across the borough, these are wind (large and small scale), biomass and microgeneration technologies. There is currently no potential from marine technologies. An assessment of the potential for energy from waste was not considered in this study;
- The Council should periodically review the development of emerging technologies, in particular, those with the capability to generate renewable electricity such as marine technologies, building mounted wind turbines and fuel cells.
- The renewable energy resource is limited in comparison with the level of development expected. Without large scale wind turbines, Eastbourne will struggle to generate sufficient renewable and low carbon energy to enable developers to meet their 2016 and 2019 zero carbon buildings obligations, let alone make reductions in CO_2 emissions from the existing stock;
- The available renewable energy resource will be under demand from other sectors, such as transport, agriculture, industry and commerce;
- Policy should support the increase in energy for regulated uses sourced from fuels such as biomass and waste, rather than from electricity;
- Planning policy and delivery mechanisms should focus on driving uptake of on-site microgeneration as high as possible in new and existing buildings to supplement Eastbourne's limited off-site capacity, perhaps to standards beyond those required by the Building Regulations;
- Promotion of Eastbourne as a favourable location for solar energy generation would be a good marketing tool for increasing the uptake of PV. This should not exclude support of other microgeneration technologies, which have the potential to make comparable CO_2 savings;
- A mechanism should be developed to enable CO_2 emissions to be reduced elsewhere in the borough where on-site installation is not possible. This could include investment in community scale generation, such as district heating;
- An Energy Opportunities Plan has been produced as a planning resource which will allow assessment and prioritisation of delivery of opportunities;
- All opportunities are delivery dependant – resource potential in itself does not contribute to targets, therefore focus should be on enabling delivery.

AECOM

Code for Sustainable Homes and BREEAM

7 Code for Sustainable Homes and BREEAM

The PPS1 Supplement states that requirement for sustainable building should be specified in terms of achievement of national standards such as the Code for Sustainable Homes or BREEAM. This chapter focuses on the local circumstances which may affect a development's ability to achieve credits in the water, waste and recycling, ecology and land use, and pollution sections of the Code and BREEAM. Other sections of the Code and BREEAM, including management, health and wellbeing, materials and transport depend more on the design and construction of the proposed development, or the specific constraints of a given site. It has been assumed that these credits can be achieved at the discretion of the developer.

The assessment is based on the Code Technical Guide, May 2009, Version 2. There are versions of BREEAM for different types of building. The BREEAM requirements are taken from the BREEAM Bespoke 2008 Assessor Manual.

7.1 Water

The high population and low average rainfall in the South East means that the region has less water available per capita than anywhere in the UK. This situation is likely to be exacerbated by climate change, as the predicted hotter, drier summers described by the UKCP09 projections result in increasing demand for water and more frequent droughts.

According to South East Water's Draft Water Resource Management Plan, most aquifers in East Sussex are already significantly utilised for public water supply abstraction and few viable or high yielding options remain. Analysis undertaken by the Environment Agency indicates that in the Eastbourne area there is no water available for abstraction at low flows.[40]

The overall availability of water resources in Eastbourne in 2007-08 was positive, with the Environment Agency reporting a surplus in supply compared to demand [Figure 40]. The Eastbourne area is forecast to remain in surplus in terms of water supply and demand until 2016. From this point onwards, the development of the new winter storage reservoir at Clay Hill, near Lewes will provide a surplus supply of water which can be transferred to the Eastbourne area, maintaining sufficient supplies until 2026. From this point, additional supply is proposed to be transferred via a new strategic main from another new winter storage reservoir at Broad Oak.

Average per capita water consumption in the South East Water area, which includes Eastbourne, is 175 litres per person per day for unmetered and 150 litres per person for metered properties. The South East's State of the Environment Report reported a 3% increase in water used per person from the public water supply compared to 2007, reversing a downward trend observed over the preceding three years.[41] However, when other water uses are taken into account, overall water use in the region was lower in 2008 than in previous years. Future Water, the Government's water strategy for England[42], has set out an ambition for new homes to use 130 litres per person per day by 2030. This is expected to be accomplished through the introduction of water efficiency standards in the Building Regulations and through the influence of the Code.

Minimum water efficiency targets for the higher levels of the Code are significantly lower than future consumption rates assumed by South East Water. Code Levels 3 and 4 require a maximum water use of 105 litres per person per day; this can generally be achieved solely by specifying water efficient sanitary ware and appliances at relatively low cost (around £125 per home) such as dual flush toilets, low flow showers and taps, a smaller bath and water efficient washing machine and dishwasher.

[40] Water Resources in England and Wales - Current State and Future Pressures (Environment Agency, 2008)
[41] South East State of the Environment (Environment Agency, 2008)
[42] Future water: the Government's water strategy for England (February, 2008)

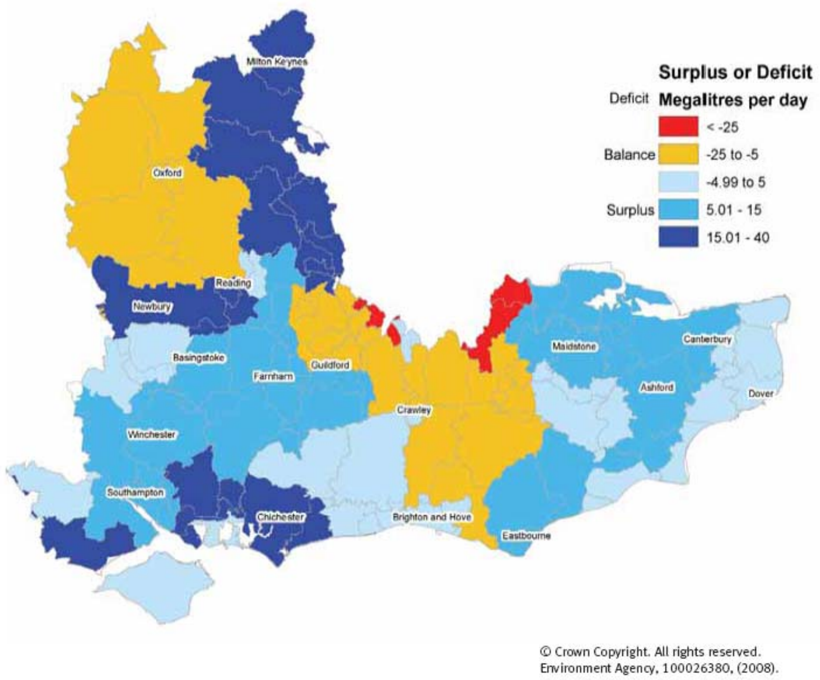

Figure 40: Water resources surplus and deficit demand balance in the South East (Source: South East State of the Environment) [41]

Achieving the mandatory standards of less than 80 litres per person per day would typically require the installation of greywater recycling and/or rainwater harvesting system for internal water use. Costs of these are dependent on the scale of system, with individual house costs quoted at £2,650 but reducing to £800 for communal systems in flats. Communal systems can act as sustainable drainage systems (SUDS), for example, by holding and therefore slowing down the speed at which stormwater enters the drainage system. This can help to reduce the threat of flash floods caused by intense rainfall: events which UKCIP09 expects to increase with climate change.

In BREEAM, the only mandatory requirements relating to water use are for water efficiency measures and water meters. Unlike the Code, there has not been a formal assessment of the cost of meeting BREEAM standards. However the mandatory requirements for efficiency measures and pulsed water meters should not incur significantly onerous costs.

There is support at the regional level to implement policies to promote water efficiency. The South East Plan Policy CC2 states that "*Adaptation to risks and opportunities will be achieved through… high standards of water efficiency in new and existing building stock.*" Homes that target any level of the Code will achieve higher standards of water efficiency than are currently expected.

7.2 Waste and Recycling

The Code has a mandatory requirement for all developments to implement a Site Waste Management Plan that monitors and reports on waste generated on-site in defined waste groups, complies with legal requirements and includes the setting of targets to promote resource efficiency in accordance with guidance from WRAP, Envirowise, BRE and DEFRA . This is now a legal requirement for all construction projects over £300,000 in value. Additional credits are available in both the Code and BREEAM for including procedures and commitments to reduce waste and divert waste from landfill, according to best practice.

Eastbourne has local targets for dry recycling and composting of municipal waste. The service offered by the Council would meet the requirements for the Recycling and Home Composting credits in the Code. Residents are offered a kerbside collection service for recycling of a variety of materials, including glass, paper, cardboard, tins and cans, textiles and shoes, plastic bottles and green garden waste. Houses have a recycling box for all dry materials, a separate container for green garden waste and a bin for general waste. Flats share larger bins for mixed recycling and general waste. Recycling is sorted on the collection vehicles, at the kerbside.

Achieving the Recycling and Waste credits in the Code and BREEAM should be feasible in most cases and is supportive of the Borough's objectives for recycling.

7.3 Ecology and Land Use

Eastbourne is in an area of significant ecological value, with its proximity to the South Downs National Park and numerous other locations with national, regional or local environmental designations. Figure 41 shows the Environmental Designations in the Borough.

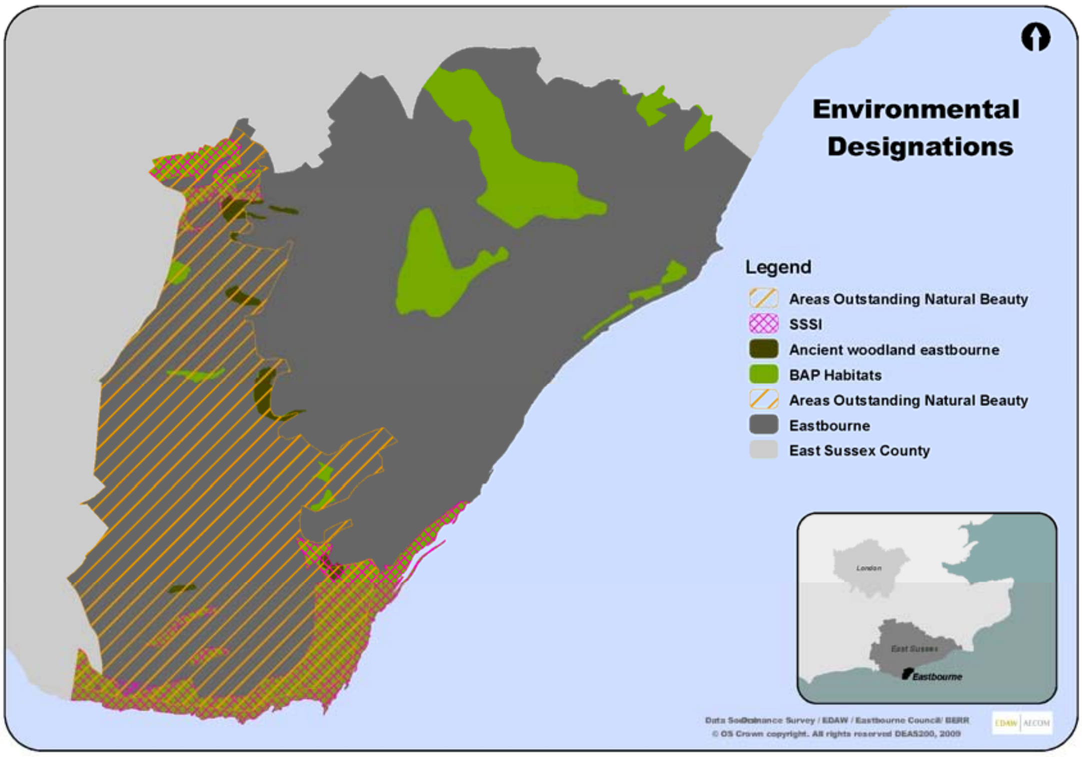

Figure 41 Environmental Designations in Eastbourne

The majority of new development is expected to be within existing development boundaries. In some cases, this should simplify the achievement of the Eco1 credit in the Code which encourages development on land of low ecological value. On the other hand, brownfield sites may well have acquired ecological value, for example if they have been cleared or vacant for over two years or feature mature trees. In order to achieve this credit, each site would need to be assessed by a suitably qualified ecologist.

Credits are available in the Code and in BREEAM for actions to enhance a development site's ecological value. As developments in most cases will come forward on brown field land, these should be achievable if some ecological features are included in new development. Recommendations for site enhancements could reflect some of the issues picked up in the Eastbourne Biodiversity Assessment, reviews the effectiveness of existing policies to determine whether they support the environmental designations in the borough, the presence of protected and/or uncommon species, and aspirations for a borough-wide green network.[43]

7.4 Pollution and Flood Risk

An Air Quality Assessment completed for Eastbourne in 2004 concluded that atmospheric concentrations of nitrogen dioxide (NO_2) and fine particulates (PM_{10}) were not likely to exceed the national air quality objective levels. As a result, the Council has not declared an Air Quality Management Area in the borough[44]. Achieving these credits in the Code and BREEAM may therefore not be a priority and may limit ability to use biomass fuel.

[43] Eastbourne Biodiversity Assessment (2008)
[44] UK Air Quality Archive (accessed September 2009)

The Eastbourne Strategic Flood Risk Assessment (SFRA)[45] mapped flood risk zones in the borough, both for the present situation and for the year 2115, taking into account the potential impact of climate change. The Core Strategy Preferred Options consultation [7] shows that some strategic development sites in the borough are located within or on the edge of areas of current flood risk or future flood risk. To mitigate the risk of flooding incidents, the SFRA makes recommendations for the location and design of new developments, including SUDS.

Developers should therefore be encouraged to target credits in the Code and BREEAM requiring the incorporation of SUDS, to reduce flood risk. Developments in flood risk zones 2 and 3a will only be able to achieve one out of the two credits available. They will be required to take action to reduce the impact of flooding, including designing ground floor levels and access roads to be at least 600mm about the design flood level.

As noted in the Eastbourne Biodiversity Assessment, there is considerable wetland interest, particularly in Eastbourne Park. This habitat is dependent on water supply and quality and is vulnerable to pollution incidents. Mains water supply is also dependent on groundwater abstraction, and there is a groundwater source protection zone across parts of the town. Prevention of water pollution from new development is therefore important and SUDS are recommended to support this.

7.5 Lifetime Homes

In comparison with East Sussex county, the region and the UK as a whole, Eastbourne has a higher percentage of the population that is of pensionable age. Stakeholders consulted for the Housing Market Assessment study expressed concern about the type of accommodation available for older people in the borough. It was made clear that older households require choice and quality options within the housing markets, including options within mainstream housing to take account of a variety of ages and circumstances. Those that do move house will do so early or late in old age with implications for the type of dwelling or services they will demand. [46]

The introduction of Lifetime Homes standards to new homes will help to improve the suitability of the housing stock to the needs of older people and disabled people. These credits should be targeted by all new residential homes in Eastbourne.

7.6 Key Considerations Emerging from this Chapter

Key considerations emerging from the assessment of sustainability issues of particular relevance to Eastbourne are:

- Local requirements for sustainable buildings should be expressed in terms of nationally described standards such as the Code or BREEAM;
- Although the region is classified as water stressed and the South East Plan encourages water efficiency, water supplies in Eastbourne are predicted to be in surplus beyond 2026. It is therefore considered unnecessary to expect residential developments to meet the challenging mandatory standards for water use at Code levels 5 and 6;
- National legislation for site waste management plans and local initiatives for recycling should make achieving credits in the Code and BREEAM Waste and Recycling sections relatively straightforward;
- As an area with significant ecological value, the impact of new development on land use and local flora and fauna should be a priority;
- Air pollution is not currently an area of concern for Eastbourne and should not inhibit biomass development;
- Flood risk is a significant issue for Eastbourne. New developments should incorporate SUDs in risk areas;
- Lifetime Homes standards should be targeted by all new homes in the borough;

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[45] Eastbourne Borough Council and Wealden District Council Strategic Flood Risk Assessment Level 2 (Scott Wilson, June 2009)

[46] Eastbourne and South Wealden Housing Market Assessment (DTZ, 2007)

Policy Options

8 Policy Options

A review of low carbon policy currently in use in England has been provided in Appendix C. The advantages and disadvantages of each or a combination has been assessed for this study. Earlier chapters have identified that the principal opportunities for low carbon and renewable energy generation in Eastbourne consist of:

- Increased energy efficiency and use of on-site, microgeneration technologies to reduce CO_2 emissions from the existing stock and new development.
- The installation of district heating networks with CHP throughout the urban parts of the borough to provide community heat and power from biomass (and if possible, waste);
- Large scale wind turbines in Eastbourne Park and in the north-west of the borough;

As well as these opportunities, policy should consider the wider sustainability issues beyond energy and carbon that are of particular relevance to Eastbourne.

8.1 The Policy and Delivery Framework for Eastbourne

In identifying and appraising policy options we have started from the basis that meeting the challenges of climate change and increasing renewable and low carbon energy capacity cannot and should not be delivered through planning alone. Understanding the role of planning as part of a wider set of national, regional and local delivery mechanisms is crucial. That said, planning is unique in that is the only activity that is able to build up a comprehensive spatial understanding of the opportunities and constraints for decentralised, low carbon and renewable energy. This enabled us to prepare the Energy Opportunities Plan (EOP) described in chapter 6.

Using the EOP as the starting point, the design of policy and delivery mechanisms have been assessed for their impact on three types of opportunity [Figure 37]:

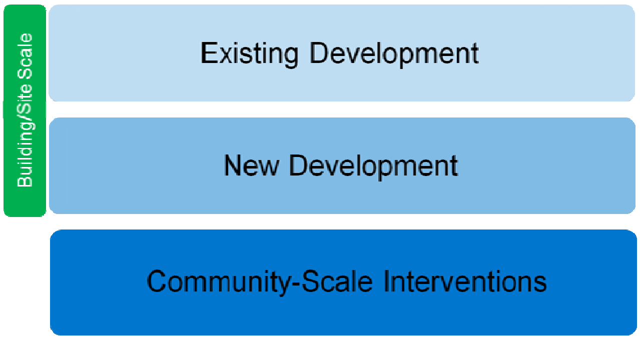

Figure 42 The three opportunities for CO_2 reduction in Eastbourne, encapsulated by the EOP

- Existing development:
  - Delivering improvements through energy efficiency;
  - Delivering fuel switches away from high-carbon sources such as electricity; and
  - Delivering on-site low carbon and renewable energy technologies;
- New development:
  - Delivering energy efficient new development;
  - Delivering on-site low carbon and renewable energy technologies;
  - Delivering allowable solutions off-site.
- Strategic community-wide interventions:

- Delivering decentralised low carbon and renewable energy through private investment, community investment, the public sector or a combination of the above in partnership.
- Delivering low carbon resource supply chains.

The breadth of this approach allows us to take advantage of the distinct merits of the planning system in promoting decentralised low carbon and renewable energy without unnecessarily stretching its remit where other regulatory or support regimes may be better placed to take a lead. Importantly, the focus on delivery mechanisms also allows us to address the difficult issue of developer viability by potentially shifting much of the additional cost burden away from developers and onto third parties

In drafting and recommending new policy, we have considered:

- A single target for the whole Borough which is realistic for all the neighbourhood areas;
- A single borough-wide, development integrated CO_2 target with the option to identify different targets for individual allocated sites;
- Separate targets for different parts of the Borough.

Since a high proportion of development coming forward is likely to be infill within existing development boundaries, we have suggested single targets for the whole borough and a specific policy relating to district heating on strategic sites.

Policy recommendations and predicted CO_2 savings are based on the assumption that the trajectory to zero carbon continues as described in section 2.1.9 and that as-built development matches design. Changes to national policy and construction that does achieve the CO_2 savings predicted for Building Regulations compliance will affect the success of the policies and in these situations, the policy recommendations described here should be reviewed.

8.1.1.1 Recommendation for new Policy 1: Delivering the Energy Opportunities Plan

Recommendation for new Policy 1: Delivering the Energy Opportunities Plan

Decentralised, low carbon and renewable energy is a priority for Eastbourne Council. Planning applications for new development in Eastbourne will need to demonstrate how they contribute to delivery of the current 'Energy Opportunities Plan'. To contribute towards national energy and CO_2 targets, applications for standalone energy generation and other CO_2 reductions in the borough will be considered favourably.

Connection to Energy Networks on Strategic Sites

Developments in areas designated as having potential for CHP should install the secondary elements of a district heating network (i.e. from the wider network to buildings).

Where appropriate, applicants may be required to provide land, buildings and/or equipment for an energy centre to serve existing or new development.

New development should be designed to maximise the opportunities to accommodate a district heating solution, considering: density, mix of use, layout and phasing.

Developments where this is shown to be unviable will be subject to a financial payment into a Carbon Buyout Fund. (Proposed Policy 2).

Policy Justification

The EOP acts as the key spatial plan for energy projects in Eastbourne. It underpins the policies and targets described here and sets out where money raised through mechanisms such as the CIL could be spent. The EOP should be used to inform policy making in the Sustainable Community Strategy and other corporate strategies, and investment decisions taken by the local authority and Eastbourne Strategic Partnership (see section 10 for further detail on delivery mechanisms). The EOP should be incorporated into supplementary planning guidance and corporate strategies so that it can be readily updated to reflect new opportunities and changes in feasibility and viability.

The PPS1 Supplement actively encourages opportunities to be sought to set higher standards on specific sites where it can be justified on viability and feasibility. The purpose of this policy is to prioritise district heating in areas where opportunities are the greatest. It should be applied in development plan documents for strategic sites where the Council expects district heating networks to be applicable. This approach reflects the fact that the small-scale infill nature of much of Eastbourne's future development does not lend itself well to district solutions without linking them with existing communities.

Criteria that can be used to define a strategic site are set out below.

- New development:
  - Residential development of at least 55 dwellings per hectare
  - Large scale mixed use development (at least 500 homes and 10,000m^2 non-domestic) – enables good anchor load
  - Proximity to high heat density areas with gas grid – enables extension into existing development
  - Proximity to existing fuel sources (e.g. waste heat, managed woodland, waste treatment site) – enables easy access to renewable fuel sources
  - Proximity to good transport links – enables solid fuel delivery
- Existing development:
  - Proximity to sources of waste heat (e.g. industrial processes) – enables zero carbon energy source
  - Mixed use development – enables good anchor load
  - Proximity to existing fuel sources (e.g. waste heat, managed woodland, waste treatment site) – enables easy access to renewable fuel sources
  - Proximity to good transport links – enables solid fuel delivery

Developments in strategic sites designated as having potential for district heating networks with CHP should work closely with the network provider or ESCo to ensure compatibility of systems. Should development come forward prior to a district heating network being in place, developers can be required to provide a containerised energy centre to deliver temporary supply. Where appropriate, applicants may be required to provide land, buildings and/or equipment for an energy centre to serve proposed or multiple developments. In order to provide additional certainty to the installation of district heating networks it is recommended that Local Development Orders are defined for strategic areas.

8.1.1.2 Recommendation for new Policy 2: Additional Energy and CO_2 performance

Recommendation for new Policy 2: Additional Energy and CO_2 Performance

All new buildings in Eastbourne will be required to achieve an additional 15% reduction in residual CO_2 emissions after Building Regulations Part L compliance has been demonstrated. This can be achieved through "carbon compliance" i.e. a combination of energy efficiency measures, incorporation of onsite low carbon and renewable technologies and directly connected heat (not necessarily onsite);

Developments where this is shown to be unviable will be subject to a financial payment into a Carbon Buyout Fund.

More information and supporting guidance will be provided within the Sustainable Design and Construction SPD.

Policy Justification

Changes to the Building Regulations in 2010, 2013 and 2016 are expected to bring in tighter standards for CO_2 emissions. After 2016 it will be necessary for all new residential buildings to be delivered as zero carbon homes, with the equivalent standard for non-residential buildings due to be introduced in 2019. The role of planning in requiring new development to incorporate such technologies should therefore be limited to a supporting one.

Eastbourne Council has proposed the following objectives for its Core Strategy preferred options report:

- Spatial Objective 32: for all planning applications to incorporate on site renewable energy technology by 2026 so that 20% of Eastbourne's energy requirements for buildings is provided by onsite renewables.
- Spatial Objective 33: to deliver a reduction in the total CO_2 emissions generated by heating and the supply of electricity to buildings across the whole of Eastbourne by 40% compared to 1990 levels.

If development continues to progress according to the proposed Building Regulations trajectory to zero carbon, it is unlikely that the spatial objectives will be achieved. Since Eastbourne is constrained in terms of its opportunities for larger scale energy generation, it is important to maximise delivery of low carbon and renewable energy as part of new developments. Proposed Policy 2 seeks to achieve this and to accelerate the move towards zero carbon ahead of Building Regulations, as shown in Table 15. All new buildings, both residential and non-residential, will be expected to achieve an additional 15% reduction on the residual CO_2 emissions after Building Regulations compliance. This should be met through a combination of energy efficiency measures, incorporation of on-site, technologies and directly connected heat (not necessarily on-site).

% Reduction in regulated CO_2 Emissions			
Period	**Building Regulations requirement**	**Proposed Policy 2 additional requirement**	**Total requirement**
2010-2013	25%	11.25%	36.25%
2013-2016	44%	8.40%	52.40 %
Post 2016	70%	5.00%	75.00%

Table 15 Comparing proposed policy 2 with Building Regulations standards

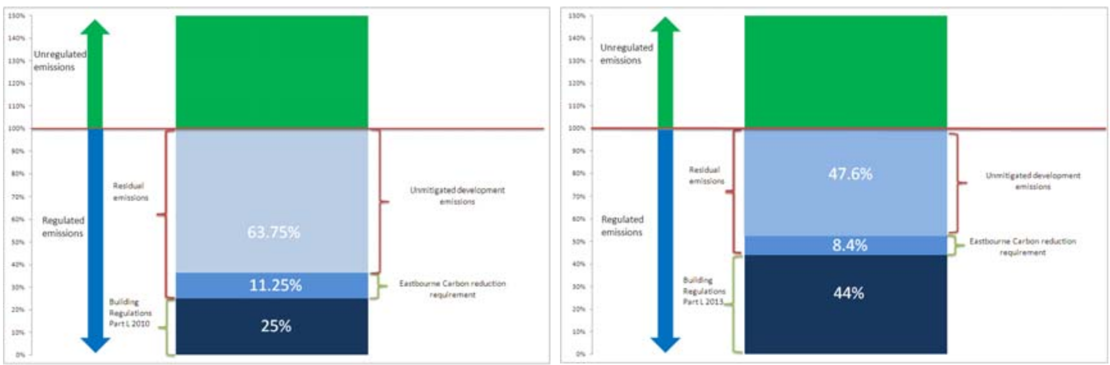

Figure 43 comparing proposed policy 2 with Building Regulations requirements in 2010 (left) and 2013 (right)

The proposed policy provides flexibility in proposing low carbon and renewable solutions. However, the most cost-effective method of achieving the targets is likely to be biomass and CHP technologies (Chapter 11).

The proposed policy should be simple to operate for both development managers and developers. Local authorities can assess compliance by checking whether design stage and as-built Building Control Compliance documentation has been supplied.

In setting the minimum level of energy performance that all new homes are required to meet, we need to be confident that we are not setting technical standards or development costs that are unacceptably high. Government has decided that, based on the assumptions in the consultation document on zero carbon, a reduction of 70% in regulated energy use is as ambitious as possible for on-site carbon mitigation, while being technically achievable on most sites [47]. The additional 15% reductions proposed for Eastbourne Borough Council will thus be technically feasible on the majority of developments.

Nonetheless, there may be circumstances when it is not possible or desirable. An example might be in a conservation area, where there is no district heating network available to connect to and microgeneration technologies such as solar panels may be considered unacceptably intrusive. For such cases the proposed policy introduces a Carbon Buyout Fund, with contributions dependent on a levy that would apply to every building constructed within Eastbourne at a flat rate. The amount to be paid could be linked to the CO_2 emitted per square metre over the building lifetime of 30 years. This will allow the fund to be operated as part of the CIL, in order to fund energy infrastructure identified in the energy opportunities plan.

Developers will be expected to demonstrate that they have explored all low carbon and renewable energy options for a particular development. Strong justification will be required if the policy cannot be achieved. Developers will be expected to explain their reasoning to planners and to include in their proposals the proportion they judge is feasible, as well as make up the shortfall by payment into a Carbon Buyout Fund.

Diverting these payments into a Carbon Buyout Fund could provide the borough with funds for investment in low carbon and renewable energy projects identified by the Energy Opportunities Plan. The fund should allow Eastbourne Borough Council to strategically coordinate and phase the infrastructure required to deliver community scale energy generation installations such as district heating networks. The Carbon Buyout Fund and a possible mechanism for coordinating spending is described further in chapter 10.

8.1.1.3 Recommendation for new Policy 3: Sustainable Design and Construction

Recommendation for new Policy 3: Sustainable Design and Construction

Proposals for sustainable buildings, including those that meet PassivHaus standards will be encouraged in Eastbourne.

All new residential developments in Eastbourne are required to meet full Code for Sustainable Homes standards or equivalent.

- **At least Code Level 3 will be required for all new homes from April 2010;**
- **At least Code Level 4 will be required for all new homes from April 2013;**

All new non-domestic developments in Eastbourne over 1000 square metres are required to achieve BREEAM “Very Good” standard or equivalent, with immediate effect (relevant versions of BREEAM are available covering offices, retail, industrial, education and healthcare).

More information and supporting guidance will be provided within the Sustainable Design and Construction SPD.

Policy Justification

The PPS1 Supplement allows local authorities to require levels of building sustainability in advance of those set nationally where local circumstances warrant. Issues around waste and recycling, ecology and land use, pollution and Lifetime Homes sections should be prioritised by the Council as being of particular relevance to Eastbourne. The borough will be disproportionately affected by climate change; rises in river levels, frequent summer droughts and winter flooding, as well as changes in habitats and species composition, habitat fragmentation and changes in soils, agricultural land use, recreation and tourism and cultural

[47] Eco-towns and zero carbon homes statement (Minister for Housing & Planning, July 2009)

heritage.[48] Actions must not only be taken to reduce the impacts of climate change by reducing CO_2 emissions, but also to adapt development to the effects of climate change and other environmental damage.

Proposed policy 3 does not require homes to meet standards beyond Code Level 4. At higher levels of the Code, the current mandatory criteria for water use create strong drivers for greywater recycling or rainwater harvesting systems. Despite being in a water-stressed area, Eastbourne is forecast to remain in surplus in terms of water supply and demand until 2016. The development of the new winter storage reservoir near Lewes should maintain sufficient supplies until 2026. In our judgement, it is not clear that the installation of rainwater and greywater systems in new homes is a cost-effective or proportionate contribution to reducing water stress in Eastbourne. The proposed policy 3 Code targets could be reviewed in response to any future changes in Code water criteria for Code Levels 5 and 6.

Period	Building Regulations Part L requirement	Proposed Policy 3 requirement
2010-2013	Equivalent to Code Level 3 mandatory Energy criteria	Full Code Level 3 required
2013-2016	Equivalent to Code Level 4 mandatory Energy criteria	Full Code Level 4 required
Post 2016	Equivalent to Code Level 6 mandatory Energy criteria (although definition of zero carbon different to Code)	Full Code Level 4 required

Table 16 Comparing proposed policy 3 with Building Regulations standards

8.2 Key Considerations Emerging from this Chapter

- Opportunities exist for planning to facilitate CO_2 reductions and installation of decentralised, low carbon and renewable energy technologies identified in the EOP across the existing development; new development; and strategic community-wide interventions;
- The primary opportunities include: improving the energy performance of the existing stock, improvements for on-site energy performance ahead of the Building Regulations, promoting high levels of sustainability in new developments using the Code for Sustainable Homes and BREEAM, support for large-scale wind energy and biomass, and support for wider mechanisms designed to deliver strategic district heating by requiring new development to connect, or be able to connect in the future, to a network;
- In order to provide flexibility for developers in meeting planning policy requirements and targets, policy should be supported by allowing developers to pay into a Carbon Buyout Fund rather than meet targets on-site. It is likely that this would be operated through the forthcoming Community Infrastructure Levy.

[48] Eastbourne Landscape Character Assessment (Chris Blandford Associates, July 2007)

AECOM

Testing of targets and policy

9 Testing of targets and policy

Development viability is a function of both technical feasibility and financial viability. A key issue for testing policy is whether or not a policy requirement for CO_2 emissions places an "undue burden" on developers, primarily in terms of additional build cost – the financial implications of the recommended targets and policies are presented in this chapter.

What constitutes an undue burden will vary from site to site, and development to development. In the short term, in situations where the developer has bought the land before the policy existed and so was unable to take account of any additional build cost, there are aspects of a development which may affect the overall viability of a development.

9.1 Proposed Policy 2: Additional Energy and CO_2 performance

The following scenarios were modelled using our Eastbourne Stock Energy Model to compare the financial implications of a range of policy options. The highlighted policy below represents our proposed policy for Eastbourne. Further details of the modelling are contained in Appendix D. 'Business as usual' refers to the scenario when construction progresses according to minimum Building Regulations Compliance.

1. 15% reduction in total CO_2 emissions beyond Building Regulations (any method allowed);
2. **15% reduction in residual CO_2 emissions beyond Building Regulations (any method allowed);**
3. 15% reduction in total CO_2 emissions, must be met through renewables;
4. 20% reduction in total CO_2 emissions beyond Building Regulations (any method allowed);
5. 20% reduction in residual CO_2 emissions beyond Building Regulations (any method allowed);
6. 20% reduction in total CO_2 emissions, must be met through renewables;
7. 25% reduction in total CO_2 emissions beyond Building Regulations (any method allowed);
8. 25% reduction in residual CO_2 emissions beyond Building Regulations (any method allowed);
9. 25% reduction in total CO_2 emissions, must be met through renewables;

The following charts [Figure 44 to Figure 47] show the impact of the range of policies on Eastbourne's annual heat demand, electricity demand and overall CO_2 emissions, as well as capital cost uplift in meeting compliance. Proposed policy 2 results in a relatively low heat demand, although it also results in a higher electricity demand which produces relatively high CO_2 emissions as a result.

The capital costs and associate CO_2 savings with each policy type are presented in Figure 48 to Figure 55. It should be noted that capital cost is not the only factor affecting the viability of a low carbon solution. On certain sites for example, the developer may also be the building occupant, or, in the case of a housing association, will have an interest in reducing the running costs for tenants as well as their own management costs for energy services, and energy for communal areas, etc. They may also be able to take advantage of feed-in-tariffs from microgeneration technologies [section 6.10]. For rented commercial property, developers may also have an interest in reducing energy costs for communal areas.

Developments with lower energy demands and shared infrastructure such as community heating can potentially offer savings in running costs in relation to alternatives such as individual boilers, and may offer attractive whole life costs. Building occupiers will also benefit from reduced risk and security of supply.

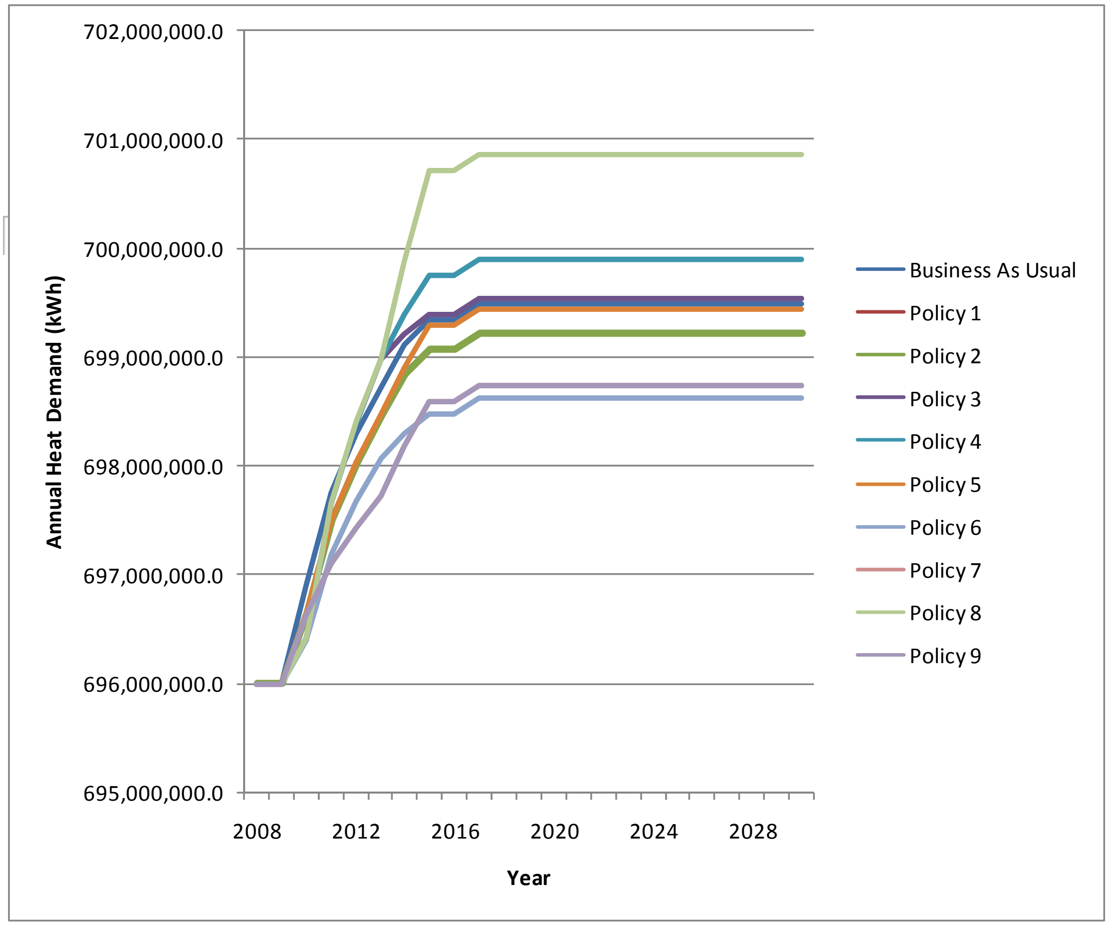

Figure 44 Annual heat demand of Eastbourne in kWh (Source: Eastbourne Stock Energy Model, AECOM)

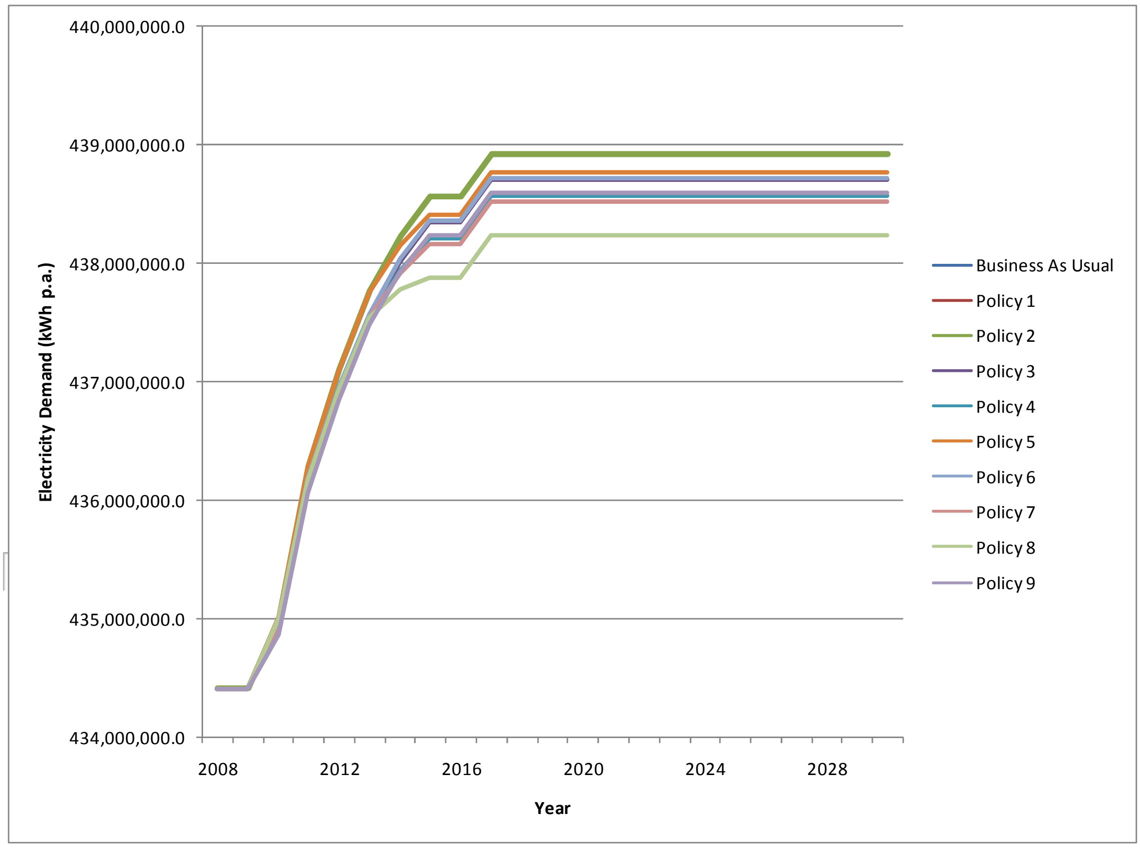

Figure 45 Annual electricity demand of Eastbourne in kWh (Source: Eastbourne Stock Energy Model, AECOM)

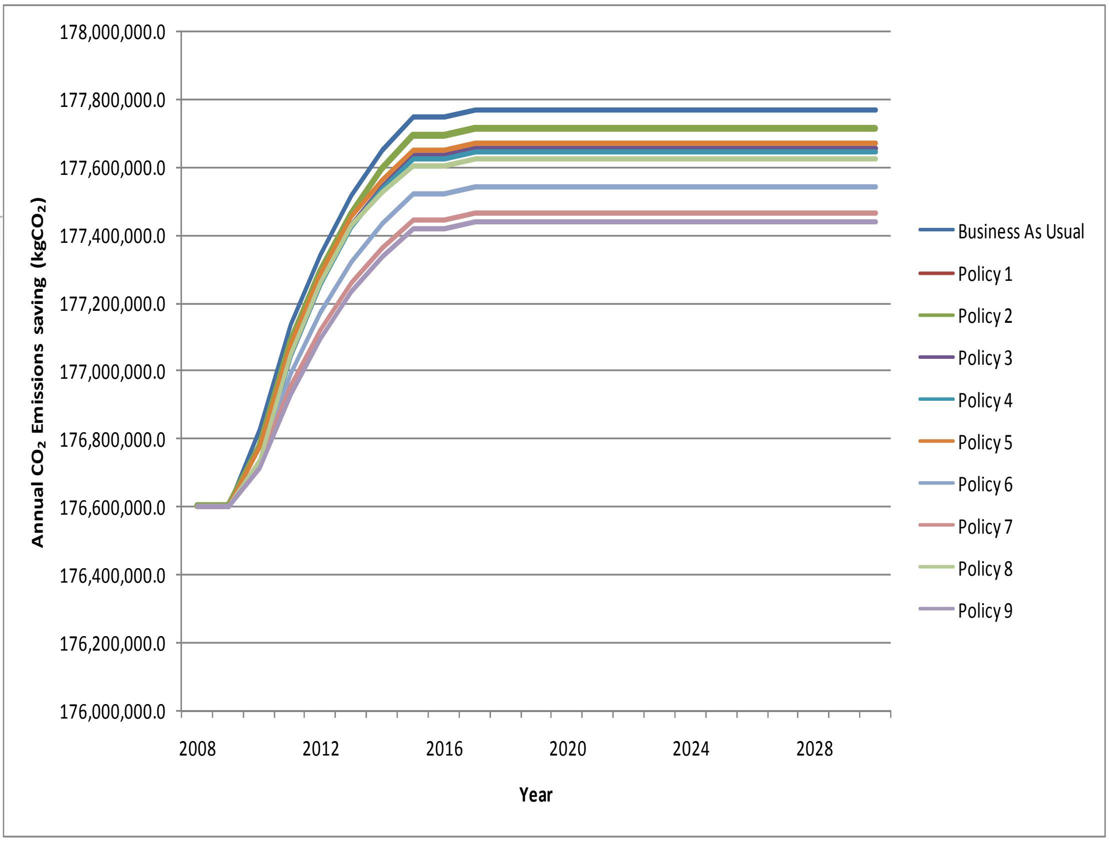

Figure 46 Annual CO_2 emissions of Eastbourne (Source: Eastbourne Stock Energy Model, AECOM)

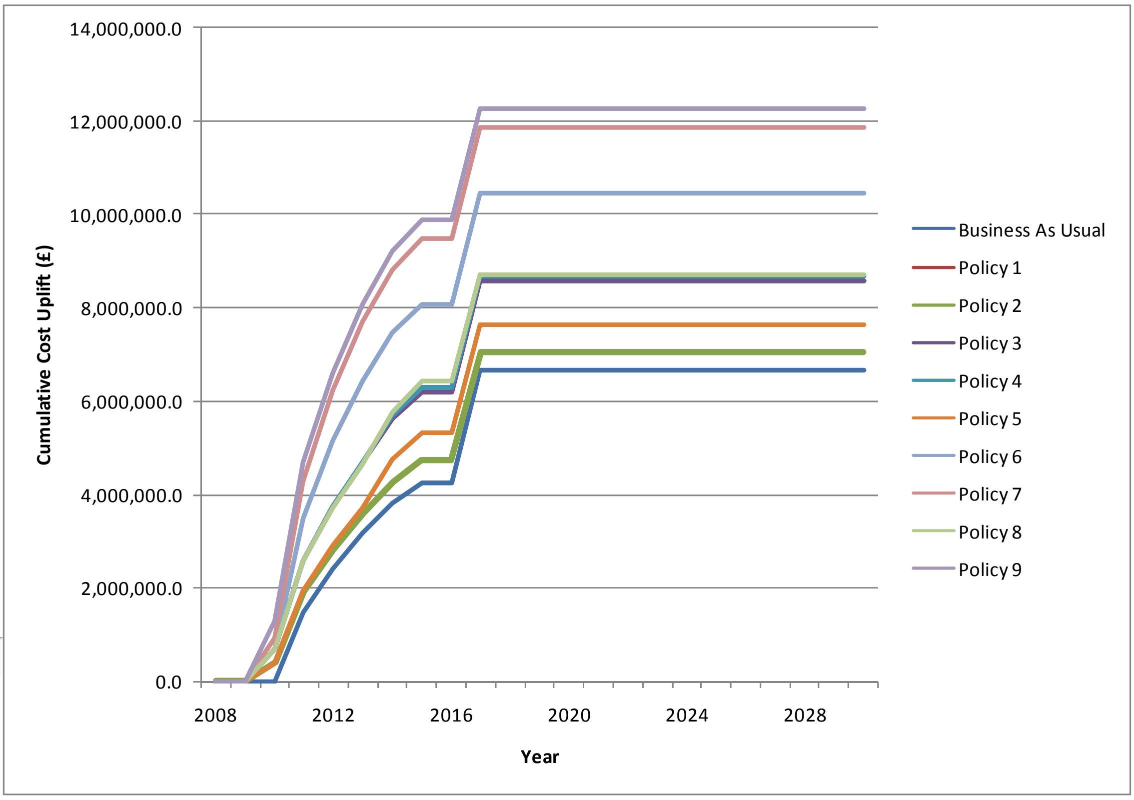

Figure 47 Total cost uplift of solutions installed to comply with policy (Source: Eastbourne Stock Energy Model, AECOM)

9.1.1 *Period from 2010 to 2013*

From 2010, the Building Regulations will require an improvement of 25% in the regulated CO_2 emissions of residential buildings on 2006 levels. Figure 48 to Figure 51 show the capital costs and associated CO_2 savings of meeting each type of policy, based on a representative selection of building types.

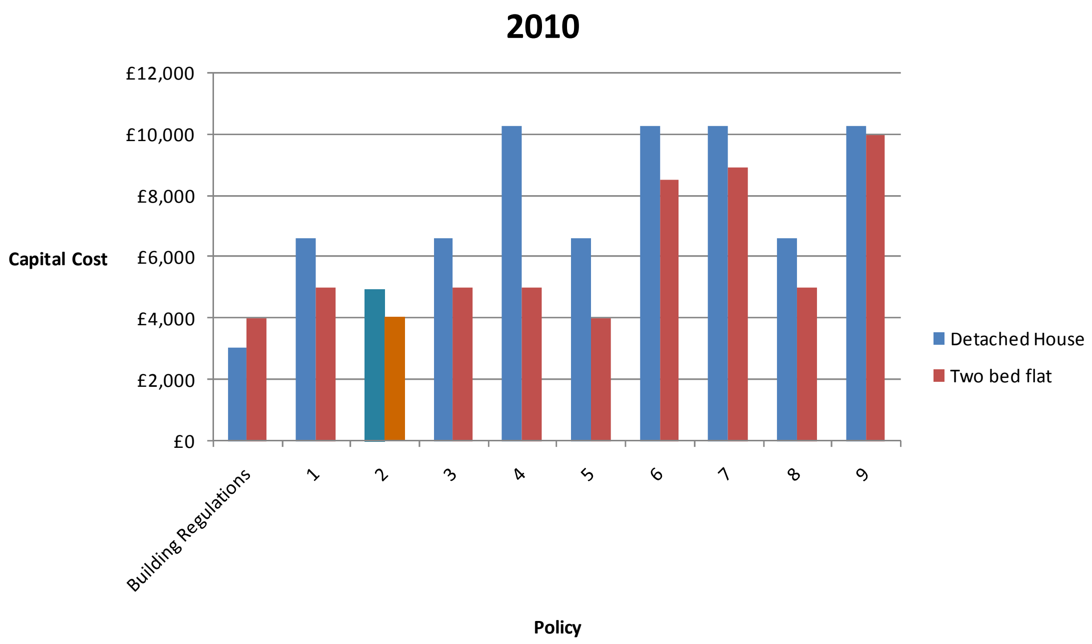

Figure 48 Cost per building type of meeting 2010 targets for a detached house and a two bed flat under different policy scenarios(Source: Eastbourne Stock Energy Model, AECOM)

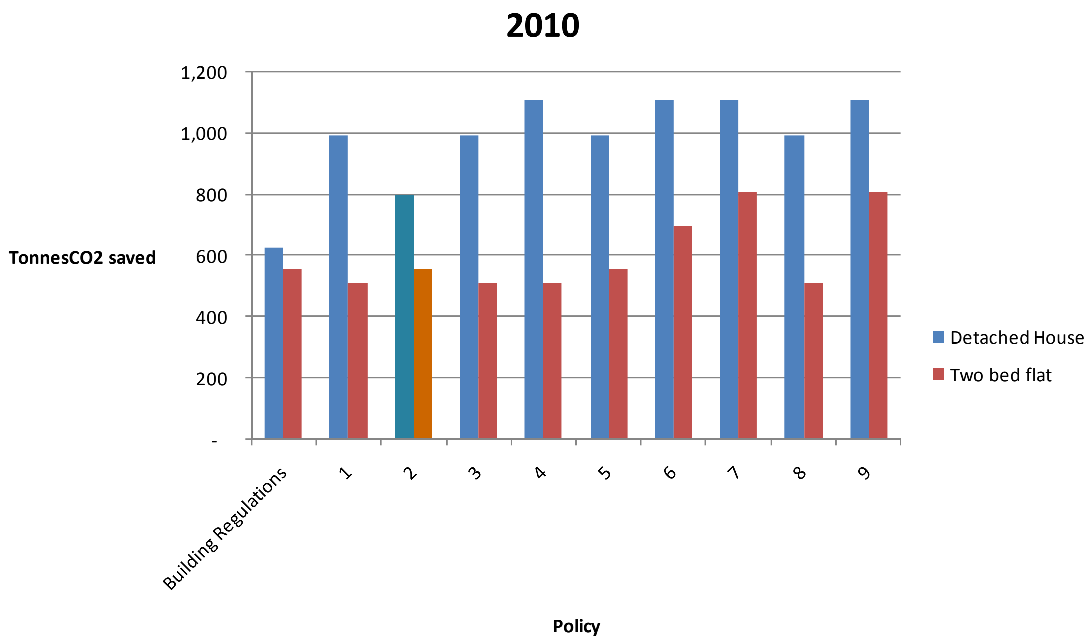

Figure 49 CO_2 savings of meeting 2010 targets for a detached house and a two bed flat under different policy scenarios. (Source: Eastbourne Stock Energy Model, AECOM)

Proposed policy 2 results in comparable CO_2 savings to the other policies, but it is relatively cheap for a new retail unit or office to comply, compared with the other policies.

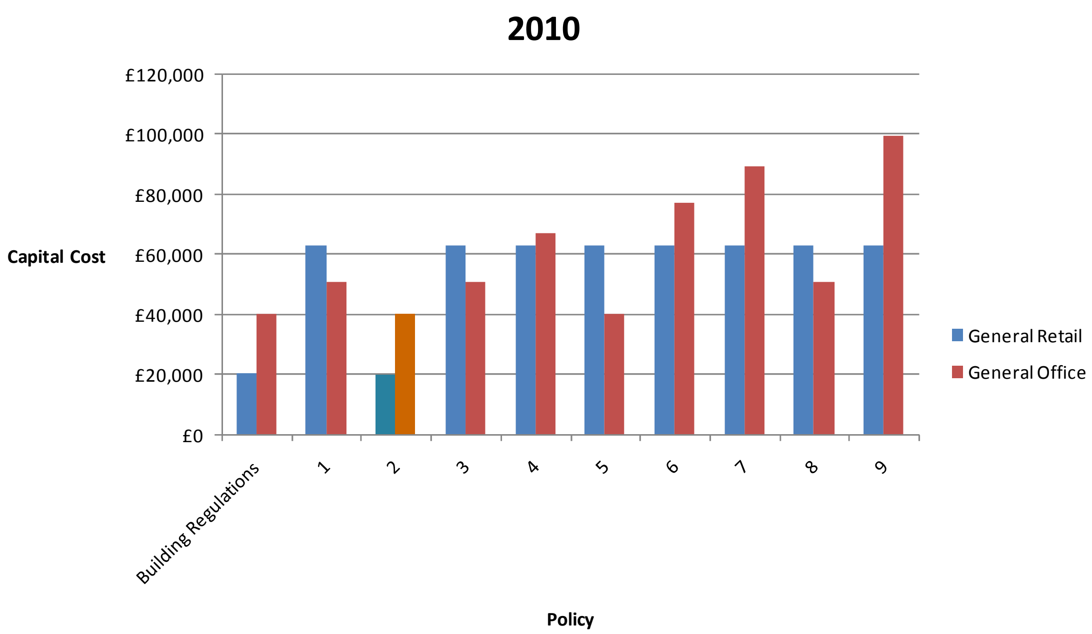

Figure 50 Cost per building type of meeting 2010 targets for an office and a retail unit under different policy scenarios(Source: Eastbourne Stock Energy Model, AECOM)

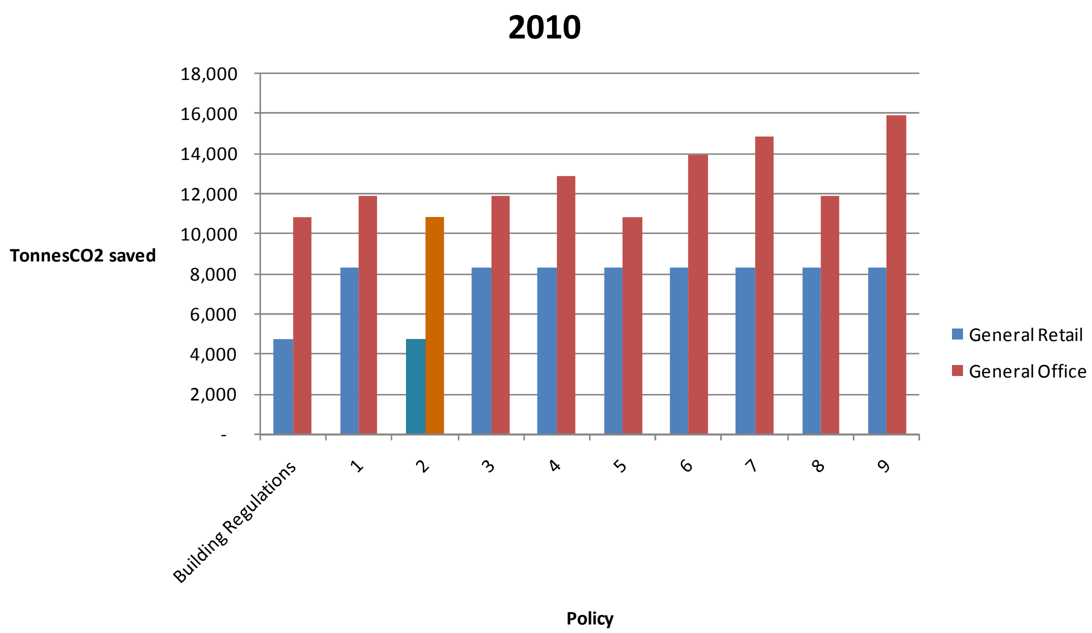

Figure 51 CO_2 savings from meeting 2010 targets for an office and a retail unit under different policy scenarios (Source: Eastbourne Stock Energy Model, AECOM)

9.1.2 Period from 2013 to 2016

From 2013, the Building Regulations will require an improvement of 44% in the regulated CO_2 emissions of residential buildings compared to 2006 levels. There are no proposals for changes to the standards for non-residential buildings in the period 2013 to 2016. The costs and CO2 savings associated with a range of policy types are shown below in Figure 52 and Figure 53. Whilst there is not much difference in capital cost between the policy options for a detached house, the proposed policy 2 is significantly cheaper to achieve for a two bed flat. This is because energy efficiency measures supplemented with PV would be sufficient to achieve proposed Policy 2 for a two bed flat in 2013.

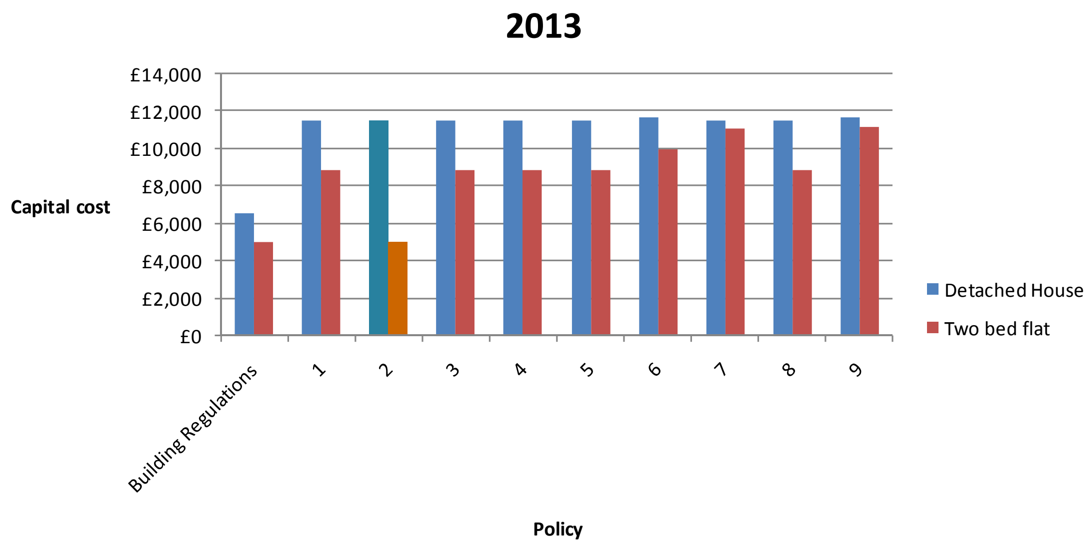

Figure 52 Cost per building of meeting 2013 targets for a detached house and a two bed flat under different policy scenarios. (Source: Eastbourne Stock Energy Model, AECOM)

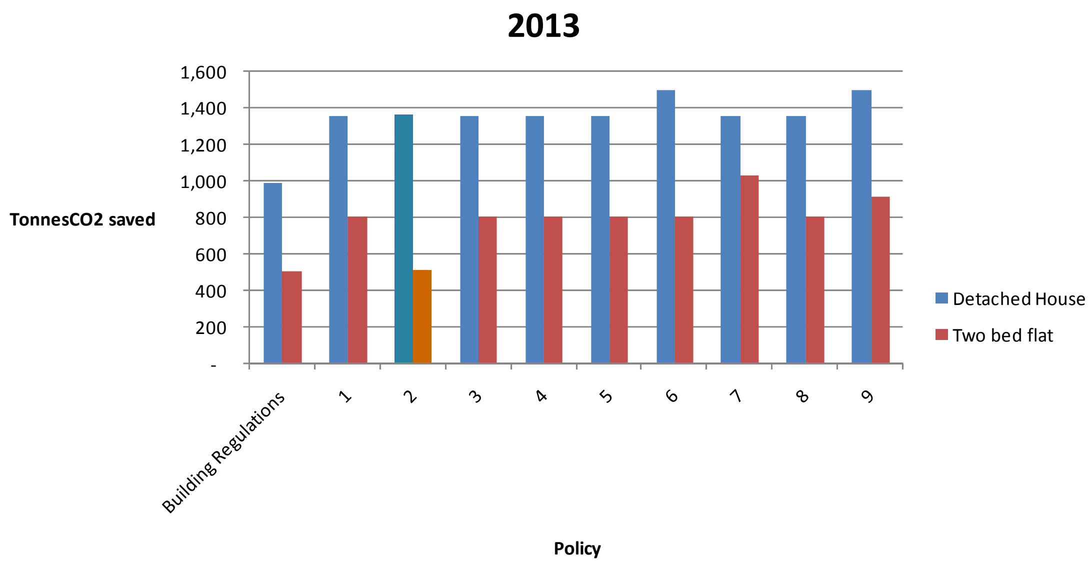

Figure 53 CO_2 savings of meeting 2013 targets for a detached house and a two bed flat under different policy scenarios. (Source: Eastbourne Stock Energy Model, AECOM)

9.1.3 Post 2016

All new residential buildings will be zero carbon. Developers will have to reduce both regulated and unregulated CO_2 emissions by up to 70% "carbon compliance" i.e. improved energy efficiency measures or onsite low carbon and renewable energy generation. The remaining 30% will have to be offset through allowable solutions. This is proposed as national legislation and therefore the costs of meeting this policy have not been assessed.

9.1.4 Effect of Carbon Buyout Fund

We have tested the effect of setting the amount to be paid to the Carbon Buyout Fund at a rate of £100 per tonne of CO_2 per square metre over the building lifetime of 30 years; this equates to a lump sum of £3,000 per tonne of CO_2 per square metre and is in accordance with the central option costs for allowable solutions in the Zero Carbon consultation [5], reflecting the cost of off-site renewable electricity.

Table 17 gives an indication of the maximum payments that are likely to be incurred in 2010 by a selection of building types if built to minimum Building Regulations standards. Examples of the payments that are likely to be incurred by standard dwelling types from 2013 are presented in Table 18.

Building Type	Building Regulations 2006 TER (annual tonnesCO_2)	Building Regulations 2010 TER (annual tonnesCO_2)	Eastbourne 2010 TER (annual tonnesCO_2)	Emissions covered by Levy (annual tonnesCO_2)	Payment Required per square metre
Detached	2.20	1.65	1.40	0.25	**£740.84**
Semi	1.61	1.21	1.03	0.18	**£544.01**
End terrace	1.48	1.11	0.94	0.17	**£499.09**
1 bed flat	1.06	0.79	0.67	0.12	**£356.29**
2 bed flat	1.30	0.97	0.83	0.15	**£438.03**
General office	26.48	19.86	16.88	2.98	**£8,937.08**
General retail	6.27	4.70	4.00	0.71	**£2,115.01**

Table 17 Building Regulations 2006 Baseline TER, Building Regulations 2010 updated TER and Eastbourne required TER, and the maximum payment chargeable for a selection standard dwelling types.

Building Type	Building Regulations 2006 TER (annual tonnesCO_2)	Building Regulations 2013 TER (annual tonnesCO_2)	Eastbourne 2013 TER (annual tonnesCO_2)	Emissions covered by Levy (annual tonnesCO_2)	Payment Required (£)
Detached	2.20	1.23	1.04	0.18	**£553.16**
Semi	1.61	0.90	0.77	0.14	**£406.19**
End	1.48	0.83	0.70	0.12	**£372.65**
1 bed flat	1.06	0.59	0.50	0.09	**£266.03**
2 bed flat	1.30	0.73	0.62	0.11	**£327.06**
General Office	26.48	19.86	16.88	2.98	**£8,937.08**
General Retail	6.27	4.70	4.00	0.71	**£2,115.01**

Table 18 Building Regulations 2006 Baseline TER, Building Regulations 2013 updated TER and Eastbourne required TER, and the maximum levy chargeable for some standard dwelling types.

9.2 Proposed Policy 3: Sustainable Design and Construction

The Cyril Sweet report on the costs of building homes to full Code levels has been used to show the financial implications of achieving proposed policy 3. [49] The costs were predicted, and are not yet fully supported by the development industry. Only a handful of real Code assessments have been completed so there is not yet sufficient final cost data to establish robust cost benchmarks.

The updates to the Building Regulations commence in April 2010, with all buildings required to achieve a 25% reduction in regulated CO_2 emissions (compared to 2006). This is equivalent to achieving the mandatory Energy criteria for Code level 3.

From 2013, all buildings will be required to achieve a 25% reduction in regulated CO_2 emissions (compared to 2006). This is equivalent to achieving the mandatory Energy criteria for Code level 4.

From 2016, all new homes are required to be zero carbon, which will be equivalent to achieving the mandatory Energy criteria for Code level 6, if the current definition for zero carbon in the Code is revised in line with Government consultation [5].

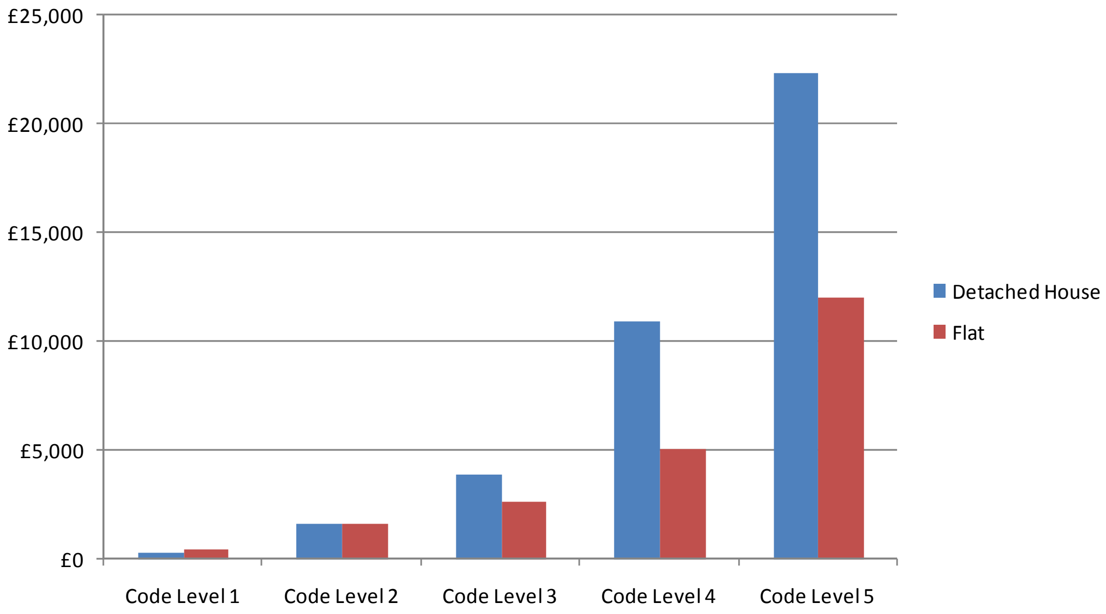

Figure 54 Cost of meeting the mandatory Energy criteria in the Code for a detached house and a flat. Code Level 6 has been excluded (Source: Cost Analysis of The Code for Sustainable Homes, Cyril Sweett, 2008)

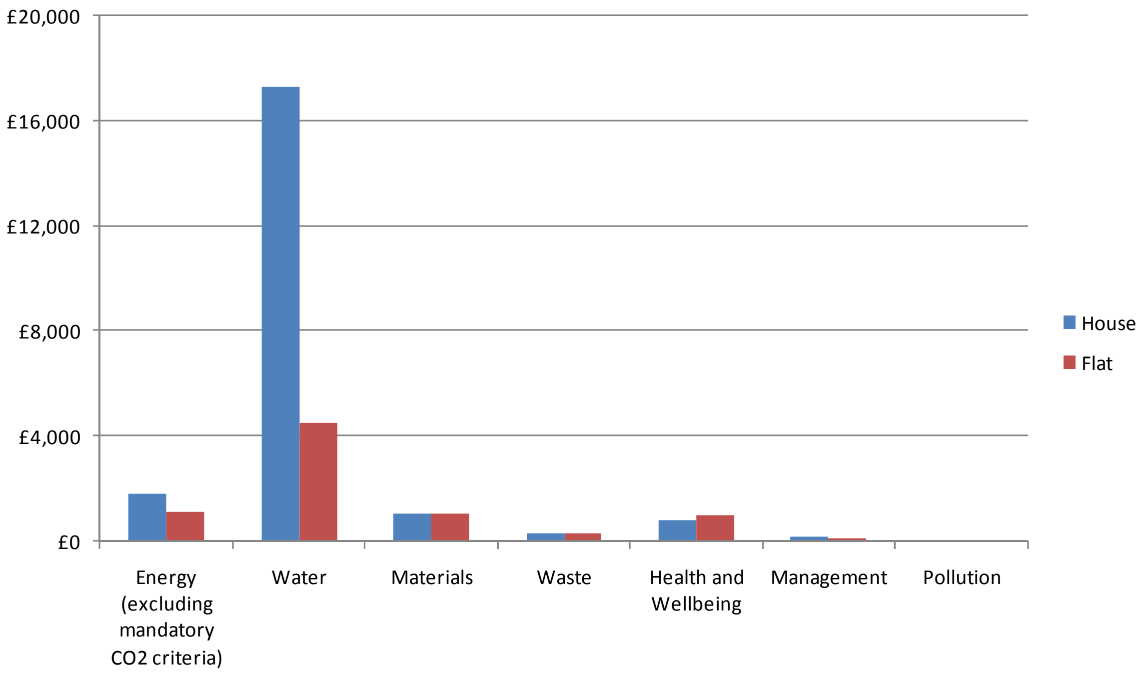

Figure 55 Cost of meeting all Code credits in each issue excluding the mandatory Energy for a detached house and a flat Homes must achieve 57% of available credits to achieve Code Level 3 and 68% of available credits to achieve Code Level 4 (Source: Cost Analysis of The Code for Sustainable Homes, Cyril Sweett, 2008).#

Predicted costs show that costs associated with meeting advanced Code for Sustainable Homes levels are relatively modest for most elements. A significant proportion of the costs of delivering Code levels is in meeting the standards for CO_2 emissions, which after 2010 will become necessary for meeting Building Regulations. It is likely that these costs could be reduced further through effective supply chain management, economies of scale from the bulk purchase of materials and fittings, and innovation in design within the housing sector, as the Code becomes standard practice.

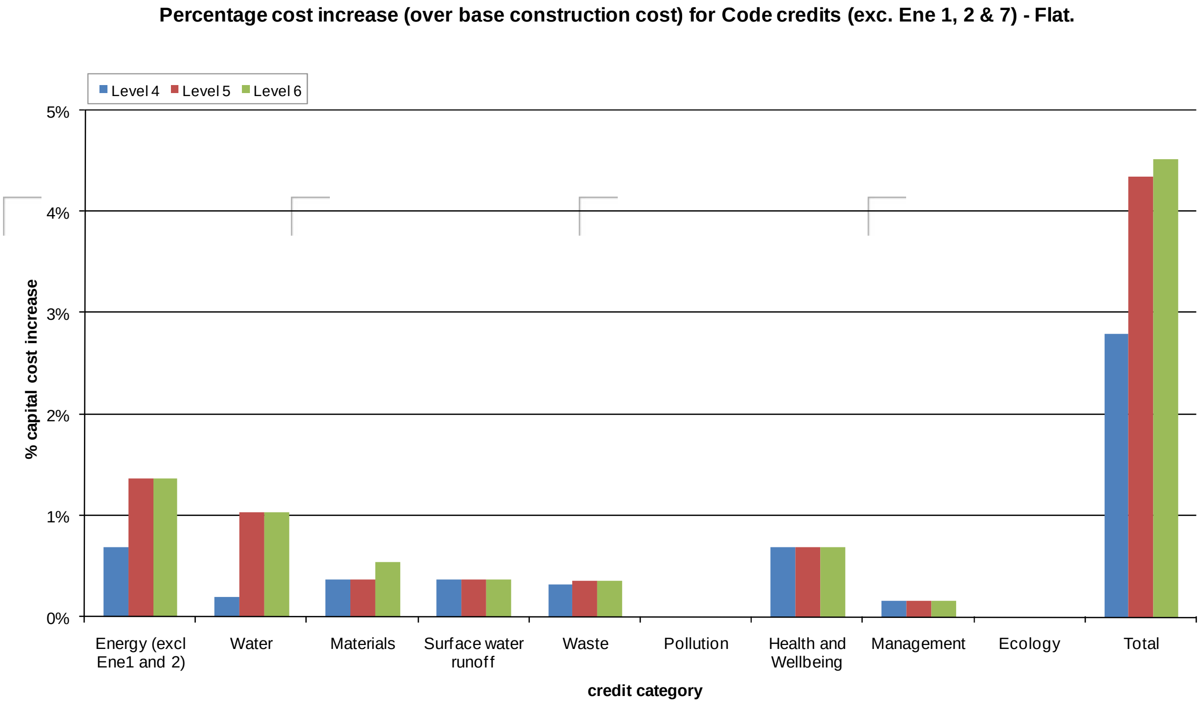

Figure 56 Costs (over base construction cost) for delivering Code credits as required to Code levels 4, 5 & 6 for a flat

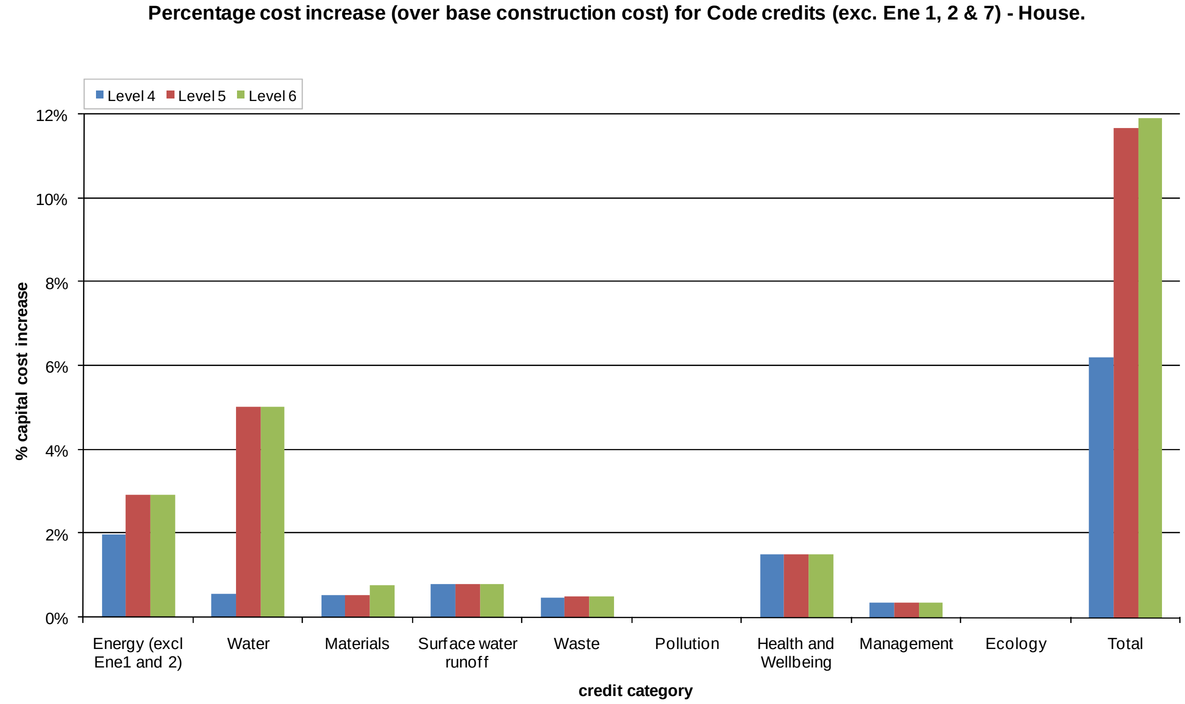

Figure 57 Costs (over base construction cost) for delivering Code credits as required to levels 4, 5 & 6 for a house

The percentage uplift in build costs arising from the additional Code requirements (i.e. all Code criteria excluding the energy and CO_2 requirement) is around 3% for flats and around 5% for houses for Code Level 4. This relates to achieving **all** additional Code credits; homes must actually achieve 57% of available credits to achieve Code Level 3 and 68% of available credits to achieve Code Level 4. There is a significant jump in cost when moving from Code Level 4 to Code Level 5 due to the need for water re-use and recycling systems in order to meet the mandatory water requirements for Code Level 5 and above.[50] The percentage uplift in build

[50] Cost analysis of the Code for Sustainable Homes (produced for department for Communities Local Government by Cyril Sweett , July 2008)

costs for Code Level 5 (excluding the mandatory energy criteria) is around 4.5% for flats and nearly 12% for houses.

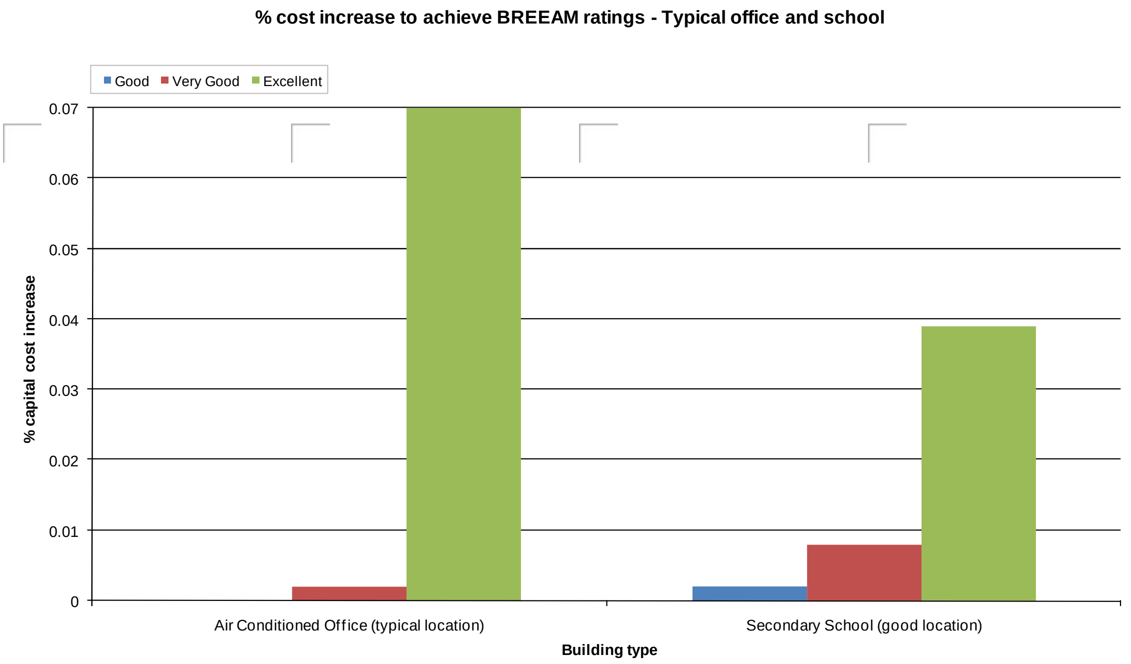

Figure 58 Costs (over base construction cost) for delivering BREEAM Offices (2004) and BREEAM schools ratings.

Figure 58 shows the percentage increase on the base build cost to deliver Good, Very Good and Excellent ratings under BREEAM Offices (2004) and BREEAM Schools. [51],[52] The cost analysis shows that the 'Very Good' level of BREEAM is achievable with a small increase to build costs, while the costs associated with BREEAM 'excellent' are much more significant.

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.

9.3 Key Considerations Emerging from this Chapter

The sections above have tested a range of percentage target based policy options for Eastbourne. Key considerations emerging from this chapter are:

- The proposed policy 2 has a greater effect on the borough's heat demand than electricity demand. This reduces the potential CO_2 savings, since today's grid mix means than electricity produces more CO_2 emissions than equivalent use of gas;
- The proposed policy 2 results in comparable CO_2 savings, but has lower capital costs than a number of other policies;
- Updates to the Building Regulations will introduce requirements for CO_2 emissions equivalent to levels of the Code. Subsequently, achieving the mandatory Energy and CO_2 criteria for the Code should be considered part of base build cost;
- The percentage uplift in build costs arising from construction to full Code, excluding the energy and CO_2 requirement) is around 3% for flats and around 5% for houses for Code Level 4;
- There is a substantial jump in cost when moving from Code Level 4 to Code Level 5, due to the need for water re-use and recycling systems in order to meet the mandatory water requirements for Code Level 5 and above;
- Achieving the BREEAM 'Very Good' standard level incurs a relatively small increase to build costs. The costs associated with achieving BREEAM 'Excellent' are much more significant.

[51] Putting a price on sustainability (BRE Trust and Cyril Sweett, 2005)
[52] Putting a price on sustainable schools (BRE Trust and Faithful & Gould, 2008

AECOM

Delivering low carbon energy in Eastbourne

10 Delivering low carbon energy in Eastbourne

Along with planning policy, targets provide a useful mechanism for articulating to stakeholders the extent of the challenge around low carbon and renewable energy. They also enable us to assess progress and, if necessary, to revise targets in order to meet agreed objectives. However, to be effective, policies and targets need to have a strategy for delivery. This strategy should address:

- What the objectives of the policy or targets are;
- What is the appropriate mechanism for delivery;
- Who is responsible for their delivery; and
- An action plan.

This chapter describes the mechanisms available to Eastbourne to deliver the principal opportunities for decentralised, low carbon and renewable energy opportunities identified on the Energy Opportunities Plan. It is not intended to be an exhaustive list, nor does it reach definitive conclusions about which mechanisms are most suited to Eastbourne. Rather it seeks to clarify the importance of considering delivery at the same time as planning policy and provide guidance on what opportunities exist and where further work is required. Making clear recommendations on what approach will be suitable for Eastbourne will require a more detailed study involving discussions across the Council and with partners.

10.1 Delivery Mechanisms for Existing Buildings

The CO_2 savings that can be achieved through improvements to existing buildings are substantial and this should be a priority across all neighbourhoods. In addition to energy efficiency measures, there is potential to retrofit low carbon and renewable energy microgeneration technologies within existing development. This cannot easily be required by planning, but can be encouraged by the Council, which can seek to engage communities and highlight the benefits of microgeneration, especially with the introduction of the feed-in-tariff [section 6.10].

In addition to central government grants and subsidised energy efficiency offered by utility companies. Local authorities have access to low interest loans and have the powers to deliver energy opportunities in the existing stock using the Wellbeing Power.

There are funding sources already available to homeowners and businesses to assist with the capital cost of installing CO_2 reduction solutions. These include Warm Front, CERT, the Big Lottery Fund Community Sustainable Energy Programme (CSEP) and the Energy Saving Trust Low Carbon Communities Challenge. Further details are contained in Appendix D. Other mechanisms to stimulate the uptake of microgeneration technologies are described below.

- *Discount provision* – available finance could be used by the Council to bulk buy technologies, enabling them be sold on at a discount to households and businesses.

- *Householder or business hire purchase* –A local authority body, such as an ESCo, could lease appropriate technologies to householders and businesses. Rental costs could be charged as a proportion of the feed-in-tariff received by the beneficiary. After a period of time, ownership of the panels would transfer to the householder or business.

- *Householder or business rental* – a third model could be for the ESCo to retain ownership of the technologies and to rent roof or other suitable space from homeowners, businesses and other organisations. Again, rental costs would be set as a proportion of income from the feed-in-tariff. As with the hire purchase option, this approach would give benefits of low carbon and renewable energy to communities without the up-front expense. The advantage of this option would be the retention of control over phasing and technology choice, and greater flexibility to respond to changes in technology and demand.

Delivery options for CO_2 reductions in existing development	
CO_2 reduction measures	**Delivery option**
Increased energy efficiency Increased microgeneration	Provision of discounted CO_2 reduction solutions Hire purchase of CO_2 reduction solutions Rental of space for CO_2 reduction solutions Awareness and education campaign for householders and businesses. Salix Finance Warm Front Carbon Emissions Reduction Target Big Lottery Fund Community Sustainable Energy Programme (CSEP) Energy Saving Trust Low Carbon Communities Challenge

Table 19 Delivery options for existing development. Details of schemes mentioned above are provided in Appendix D.

10.2 Delivery Mechanisms for New Buildings

Building Regulations are the primary drivers for higher energy performance standards and low carbon and renewable energy generation in new developments. The role of Eastbourne Council is therefore limited beyond specifying more stringent policy to achieve this.

Another option is to apply conditions to sales of local authority owned land, whereby a lower than market value sale price is agreed with the developer in return for a commitment to meet higher specified sustainability standards. Rules governing this are contained within the Treasury Green Book which governs disposal of assets and in within the Best Value - General Disposal Consent 2003 'for less than best consideration' without consent. It is our understanding that undervalues currently have a cap of £2 million without requiring consent from Secretary of State.

Delivery options for CO_2 reductions in new development	
CO_2 reduction measures	**Delivery option**
Lower CO_2 emissions standards Higher sustainability standards	Conditions attached to local authority owned land sales Policy requiring high sustainability standards Policy requiring connection to district heating networks Policy requiring lower CO_2 emissions

Table 20 Delivery options for existing development.

10.3 Delivery Mechanisms for Community-Scale Interventions

The Energy Opportunities Plan (EOP) shows that the principal opportunities for installing technologies and infrastructure at this scale are large scale wind turbines, biomass and district heating powered by CHP. They are distinct from the other energy opportunities in the existing stock and in new development, in that they do not need to be delivered in association with the building stock, although the two are not mutually exclusive. Schemes are likely to be larger and may significantly contribute towards delivery of local authority-wide, regional or national energy generation targets rather than primarily mitigating increases in CO_2 emissions resulting from new development. It should be noted that post 2016, allowable solutions will place emphasis on local authorities to identify and support delivery of community scale solutions.

Some of the options for delivering the EOP are described in the following sections and listed in Table 21, with more detail provided in Appendix D. Many of the options for funding offer relatively small amounts of money which are unlikely to make significant inroads into delivery of the EOP. One solution is both a planning and a delivery mechanism, that is to prioritise delivery of energy opportunities through spending of money raised through a proposed Carbon Buyout Fund introduced in section 8.1.1.2 . It is likely that such a fund will be operated through the CIL, which unlike Section 106 contributions can be used ‘to support the development of an area’ rather than to support the specific development for which planning permission is being sought. Therefore, contributions collected from development in one part of the charging authority can be spent anywhere in the borough. It is our understanding that CIL money can be spent on infrastructure projects (the definition of infrastructure includes renewable and low carbon energy technologies) delivered by the public or private sectors or partnership between the two. This flexibility will enable the Council, as a ‘charging’ authority, to fund energy infrastructure identified in the energy opportunities plan. Eastbourne Council will need to:

- Develop a charging schedule that is subject to the same level of scrutiny as a development plan document.
- Set out the proposed amount to be levied, expressed as a cost per meter squared.
- Consider the impact of a levy on scheme viability.

10.3.1.1 Wind energy

The local capacity for large scale wind turbines is unlikely to attract commercial developers. Additionally, securing planning permission for wind turbine locations could prove difficult for commercial developers and projects may be constrained by local archaeological and hydro geological factors (for example, sites identified in Eastbourne Park or that have an impact on local view corridors).

In such instances, the Council could take forward the opportunities, perhaps in partnership with the community. Project finances could be raised by the issuing of bonds to residents and businesses. Returns on investments could be based on energy sales, ROCs and feed-in tariffs. Further community incentives could include discounts on Council tax. A co-operative venture, possibly with the involvement of the local authority is another option that should be explored. Merchant wind is a wind-specific mechanism that the Council could use for delivering large scale wind energy. Alternatively, to ensure that sufficient expertise and resource is devoted to making local authority-led delivery initiative a success, Eastbourne could explore establishing a local authority-led ESCo.

10.3.1.2 District heating with CHP

A district heating network of the scale identified in the EOP would not be deliverable through individual developments or planning applications. A strategic approach will be necessary to successfully manage and co-ordinate delivery. A local authority ESCo would be ideally placed to plan, deliver and operate part or all of a district heating network.

- *Financing* – the different elements of a network can be treated differently. The operating costs of the insulated pipes that move heat between the energy centre and customers are relatively low. The main cost is installing the pipeline at the start. The pipe work, therefore, could be competitively tendered by a local authority-led ESCo and, since the Council may have access to low interest rates and repayments over a long time period using prudential borrowing, repayments can be kept to a minimum. Repayments could be serviced by energy sales and income from the renewable heat incentive and for a CHP system generating both heat and electricity, from ROCs and/or the proposed feed-in-tariff.

Energy centres tend to have lower upfront costs. The expense comes with ongoing operation and maintenance, a shorter life span (around 15 years) and exposure to fluctuations in energy prices. While ownership of the sites and buildings may be retained by the local authority, the plant itself could be operated by a private sector ESCo. To simplify things further for the Council, the billing and customer service elements could be contracted out to a third party.

Delivery of networks as part of new development could also be undertaken by a local authority-led ESCo, leaving the secondary network to be installed by the developer. The developer could then be charged a connection fee to the primary network.

The PPS1 Supplement presents opportunities at the local level in the form of an LDO, which can be applied by local authorities to extend permitted development rights across whole local authority areas or to grant permission for certain types of development. Although there is little experience of local planning authorities having used LDOs, the PPS suggests that the government is keen on them being used stating that: "*planning authorities should give positive consideration to the use of Local Developments Orders to secure renewable and low-carbon energy supply systems*". Should the Council agree to lead installation of a district heating network then it is recommended that they explore the option of establishing an LDO in order to add certainty to the development process and potentially speed up delivery.

- *Phasing* – the neighbourhood analysis in Appendix A gives an indication of potential anchor loads around which to start a district heating system. Installing a district heating network is a major capital investment. The cost depends on the number of buildings to be connected, how close together they are and how much heat they require. District heating infrastructure also requires long-term investment to maintain the network over a period of at least 25 years.

  In order to minimise risk, a general strategy for developing a scheme would be to secure the connection of a large anchor load within close proximity to the generating plant. Suitable anchor loads are often public sector owned facilities such as swimming pools and leisure centres, therefore much of the co-ordination will fall upon the Council.

10.3.1.3 Establishing biomass supply chains

This study has identified biomass as a resource for delivering CO_2 reductions in the borough. Similar studies for nearby boroughs are likely to reach the same conclusions and since the available resource is finite and relatively limited, it is useful to take a county or even region-wide approach to sourcing and supply to ensure that sufficient biomass is available, but also that its use is managed and sustainable.

There is currently no supply chain set up to collect, process or distribute the biomass resource. It is recommended that the Council liaises with adjacent boroughs and the County Council to enable the set up of a local supply chain. More woodland could be put into management as commercial forestry for woodchip production. This would require a management plan and major investment in the woodland resource and increase in the number of foresters working in the area. Grants are available for the establishment of energy crops, discussed in detail in Appendix C.

Greater use of biomass as fuel raises some concerns which need addressing. Biomass is generally transported by lorry, and therefore transport CO_2 emissions should be taken into account. There is conflicting evidence as to the environmental impact of transporting biomass. A recent report by the Environment Agency provides data which suggests a increase in CO_2 emissions of between 5% (wood chip) and 18% (wood pellets) for European imports, but the data is not clear for transport within the UK.

The South East Renewables Review reported that "most of the wood fuel projects coming forward are of a relatively modest scale and have so far not given rise to severe difficulties through the planning system in the region. Impacts that are of concern relate to: emissions, stack size/ height, extra transport movements, access issues, smell and potential fire hazards from stored fuel".

Delivery options for community-scale CO_2 reduction solutions	
CO_2 reduction measure	**Delivery Option**
Wind energy	Local authority-led ESCo established through Powers of Wellbeing Privately owned ESco Merchant wind (e.g. Partnerships for Renewables, EDF) Local Development Orders Cooperatives CIL Allowable solutions
District Heating with CHP	Local authority-led ESCo established through Powers of Wellbeing Privately owned ESco Local Development Orders Carbon Trust Investments Carbon Emissions Reduction Target CIL Cooperatives Allowable solutions
Biomass energy	Local authority-led ESCo established through Powers of Wellbeing Privately owned ESco Eastbourne and county-wide development and coordination of biomass supply chains Single Farm Payment DEFRA Grant Rural Development Programme Allowable solutions Cooperatives Renewable Energy Fund Carbon Emissions Reduction Target EST Low Carbon Communities Challenge

Table 21 Delivery options for community-wide CO_2 reduction solutions. Details of the schemes mentioned above are provided in Appendix D.

10.4 Delivery Partners

It is clear that a planned approach is necessary, with targets complemented by spatial and infrastructure planning. The implications of this for the Council are significant. We are no longer simply talking about a set of planning policies; rather success depends on coordination between planners, other local authority departments (including the corporate level) and local strategic partners.

A coordinated relationship between planning, politicians, the Eastbourne Strategic Partnerships (ESP) and other local authority departments will be crucial. To be effective, leadership will be needed by the Eastbourne Environment Partnership with support from the ESP to provide strategic direction for energy policy and delivery of the EOP.

The two central documents for coordinating delivery of low carbon and renewable energy projects at the local level are the Eastbourne Community Strategy, prepared by the ESP and Local Development Frameworks (LDF) prepared by the planners. The current community strategy makes very little mention of energy and climate change. Both need to set out a clear delivery plan for policies and targets.

Consideration will need to be given to the extent of private sector or community involvement. Where market delivery is not forthcoming, Eastbourne Council can lead delivery of energy infrastructure, potentially with support from the private sector, investors or even communities. Communities may also want to join together to deliver energy infrastructure, investing and in capital cost and receiving income from selling energy.

Dialogue between AECOM and the Council has indicated that there is enthusiasm for exploring options for setting up a local authority ESCo. The skills needed to do this are likely to need to be developed. This does not need to be an insurmountable barrier and there are a growing number of local authorities engaging in similar activities both in energy and other areas. They key to success is likely to be leadership: leadership from senior local authority management or, at least initially, from committed individuals in planning or other departments.

ESCo models range from fully public, through partnerships between public, private and community sectors to fully private. Broadly speaking, the greater the involvement of third parties the lower the risk to the authority but, importantly also, the less control the authority will have over the company. Whichever route is chosen, it is recommended that the ESCo should be put in place as early on in the development process as possible, so that its technical and financial requirements can be fed through into negotiations with potential customers.

	Private Sector Led ESCo	Public Sector Led ESCo
Advantages	▪ Private sector capital ▪ Transfer of risk ▪ Commercial and technical expertise	▪ Lower interest rates on available capital can be secured through Prudential Borrowing ▪ Transfer of risk on a district heating network through construction contracts ▪ More control over strategic direction ▪ No profit needed ▪ Incremental expansion more likely ▪ Low set-up costs (internal accounting only)
Disadvantages	▪ Loss of control ▪ Most profit retained by private sector ▪ Incremental expansion more difficult ▪ High set-up costs	▪ Greater risk ▪ Less access to private capital and expertise, though expertise can be obtained through outsourcing and specific recruitment

Table 22 Advantages and disadvantages of ESCo models

10.5 Monitoring

Through the Comprehensive Area Assessment (CAA) process, Eastbourne Council has a requirement to demonstrate overall reductions in CO_2 emissions. National Indicator (NI) 185 monitors the percentage CO_2 reduction from local authority operations and NI186 monitors per capita CO_2 emissions in the borough.

> Merton is a local authority that is developing new ways to monitor overall CO_2 emissions. In their 2009 Climate Change Strategy[1] they state that they are proposing to use GIS mapping to calculate what the overall carbon 'footprint' is and to measure progress. The system will be known as "City Knowledge" and will capture individual emissions from all buildings.

It is recommended that the Council maintain a database of all planning applications showing the planning targets relating to CO_2 reductions have been set and the results reported on completion. This approach will record how effective planning policy is in reducing CO_2 emissions from new buildings. The database could also be used to capture information about the microgeneration systems installed, allowing Eastbourne to report against regional and national targets for renewable energy. This should be linked to GIS, allowing spatial representation of progress.

The information will be available from the same set of documents provided by the developer to confirm compliance with building regulations. Coordination and data sharing will be necessary between the planning department and the Building Control department.

The Council should monitor overall reductions in CO_2 emissions, covering not just new development, but all existing buildings and transport. The database for planning applications suggested here could be extended to capture information from these other sectors. In this case the database would need to be made available to other departments who are responsible for gathering this type of information.

10.6 Key Considerations Emerging from this Chapter

The sections above have considered the options for delivering the low carbon and renewable energy resource in Eastbourne. Key considerations emerging from this chapter are:

- Opportunities exist for the Council to take a lead role across the three energy opportunities: existing development; new development; and community-scale interventions;
- The primary opportunities include: promoting faster uptake of energy efficiency measures and microgeneration technologies than could be expected by relying on national support measures alone; development of wind energy delivered by the Council and/or community, development of a district heating networks and creation of a biomass supply chain;
- The opportunities identified in the EOP will not all be deliverable through individual developments or planning applications. A coordinated approach between the planning, other Council departments, the Eastbourne Environment Partnership, the Eastbourne Strategic Partnership and the local community will be crucial to effective delivery;
- The implications for the Council and its operations of some of the options are significant, particularly the option of establishing an ESCo. Further work will be needed to assess their suitability;
- A monitoring database should be developed to capture information about measures to reduce CO_2 emissions from development (including microgeneration), allowing Eastbourne to report against local, regional and national targets for renewable and low carbon energy.

AECOM

Recommendations

11 Recommendations

The recommendations made throughout the report have been summarised below.

Recommendations 1-3: Once clarity is gained over the CIL regulations and the remaining issues specific to this project, appropriate planning policy should be prepared for implementation in the Core Strategy, with supporting SPD guidance.

Recommendations 4: The planning and Development Control departments of the Council collaborate to draw up appropriate compliance criteria and validation checklists for new policy, for example, based on submission of Building Control documentation or Code for Sustainable Homes certificates.

Recommendation 5: Further work is undertaken to establish the most appropriate type of ESCo and its remit.

Recommendation 6: Local Development Orders are defined for strategic areas where it is considered that district heating networks with CHP would be advantageous.

Recommendation 7: The Eastbourne Council website is updated to include a guidance section on the Code for Sustainable Homes, to aid developers in complying with policy and targets. This guidance should be reflected in the SPD.

Recommendation 8: A detailed energy Masterplan and strategy is carried out for the Town Centre AAP, with particular focus on the potential for a biomass and/or waste fuelled, CHP district heating system.

Recommendation 9: Local initiatives are implemented to drive improved energy efficiency standards in both existing homes and non-domestic buildings, particularly schemes to encourage private landlords to invest in whole house energy efficiency.

Recommendation 10: Further work is undertaken to confirm the best approach for delivering microgeneration technologies in Eastbourne.

Recommendation 11: Reviews of the Sustainable Community Strategy should address energy and climate change, with consideration given to preparing a dedicated, decentralised and low carbon and renewable energy strategy.

Recommendation 12: The Council demonstrates leadership by investing in its own buildings to improve energy performance. Corporate strategies should reflect the need for energy efficiency in procurement, operation and maintenance (for example, by requiring energy efficient appliances in public stock). The Council could commit to the 10:10 campaign to cut it's own carbon emissions, or emissions in the borough by at least ten per cent in 2010 (http://www.1010uk.org/organisations).

Recommendation 13: Further work is undertaken to confirm the low carbon and renewable energy opportunities for reducing CO_2 emissions from transport in the borough.

Recommendation 14: A database is developed of all planning applications showing the energy/CO_2 reduction targets met for new development. This should be linked to GIS, allowing spatial representation of progress against CO_2 and renewable energy targets and should be accessible by other departments outside planning (such as Transport).

Recommendation 15: Periodic reviews are carried out into the development of emerging technologies, in particular, those with the capability to generate renewable electricity such as marine technologies, building mounted wind turbines and fuel cells.

Recommendation 16: Further work is undertaken to investigate ways of adapting the borough's building stock to climate change effects, for example, those predicted by the UKCIP models.

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