North Hampshire Renewable Energy and Low Carbon Development Study

March 2010

Amendment

Please note that Table A1 in Appendix A is incorrect in the North Hampshire Renewable Energy and Low Carbon Development Study (March 2010). The final column heading should not state 'per square metre'.

Table A1 should read as follows:

Building Type	Building Regulations 2006 TER (annual tonnes CO_2)	Building Regulations 2010 TER (annual tonnes CO_2)	Policy Required 2010 TER (annual tonnes CO_2)	Emissions covered by Levy (annual tonnes CO_2)	Payment Required (£)
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 A1: Building Regulations Baseline TER, Building Regulations 2010 updated TER and required TER, and the maximum payment chargeable for a selection standard dwelling types.

Executive Summary

SCOPE OF THE STUDY

AECOM were appointed by the three Local Planning Authorities (LPAs) in North Hampshire; Basingstoke and Deane Borough Council, Hart District Council and Rushmoor Borough Council, to develop an evidence base to inform the development of sustainable construction and renewable energy policies to support their emerging Core Strategies. This study forms an evidence base to support the requirements of the Supplement to PPS1 on Climate Change, which states:

"Planning authorities should have an evidence-based understanding of the local feasibility and potential for renewable and low carbon technologies, including micro-generation, to supply new development in their area."

This has been done by developing an understanding of the current situation and expected growth in North Hampshire, reviewing policy direction and analysing the area's energy resource potential.

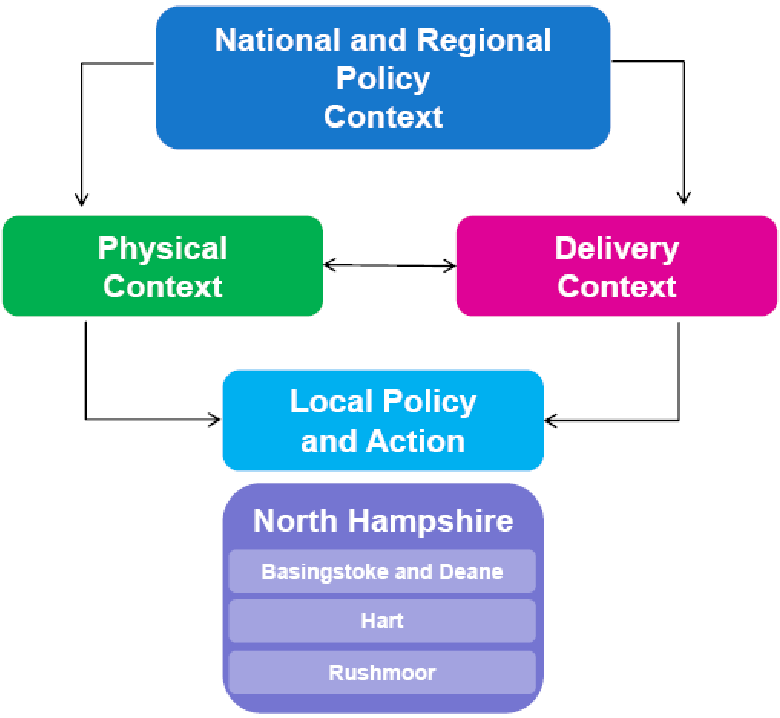


Figure E1: Policy Development Process

This study also includes an evidence base for water use in North Hampshire, which is used in support of wider policies in Sustainable Design and Construction.

POLICY CONTEXT

National policy in this area sets out very challenging targets for reduction of CO_2 emissions, the accelerated installation of renewable and low carbon technologies and sustainable design of new development. These drivers are reinforced by targets and policy at a regional level, though to some extent regional targets are out-of-date due to recent advances in National policy. The local planning documents and emerging Core Strategies of the LPAs provide a useful framework for the implementation of policy relating to building related CO_2 emissions. This study is being conducted at a stage where it can directly recommend policy for inclusion in Core Strategies.

The Supplement to PPS1 requires LPAs to investigate the potential for the inclusion of renewable and low carbon technologies in their LPA area, and to identify opportunities to exceed LPA area-wide targets on strategic sites where there is good potential for additional CO_2 reductions. Therefore LPAs need to both consider policies on an area-wide scale and policies for specific sites where additional opportunities exist for additional CO_2 reductions.

Over the period of the Core Strategies, expected changes in Building Regulations will significantly decrease CO_2 emissions from new development, therefore removing some emphasis in this role from planning authorities. The changes to Building Regulations are likely to create demand for 'Allowable Solutions' which involve the development of solutions outside of the site boundary that can further reduce CO_2 emissions associated with new development. LPAs are likely to need to play a role in coordinating and delivering effective Allowable Solutions. Planning authorities are also able to influence the improvement of existing buildings, and support the delivery of community-wide and stand-alone renewable and low carbon infrastructure that isn't related to new development.

PHYSICAL CONTEXT: ENERGY DEMAND FROM THE BUILT ENVIRONMENT

Current Performance of Existing Buildings

To effectively reduce carbon associated with energy use, it is important to firstly understand the current and evolving energy demand profile of the three LPA areas. Due to the varying nature of the LPA areas, the performance of existing buildings varies both between and within the areas. The table below compares the average residential electricity and gas demand for each LPA area with the average for the South East and Britain. The following figures also show the spatial distribution of electricity and gas demand.

Table E1: Energy consumption per consumer (BERR, 2006)

	Average electricity sale per consumer	Average gas sale per consumer
	Residential kWh	Residential kWh
Basingstoke and Deane	4,890	17,389
Hart	5,146	21,204
Rushmoor	4,329	17,965
South East Average	4,780	18,322
Britain Average	4,457	18,241

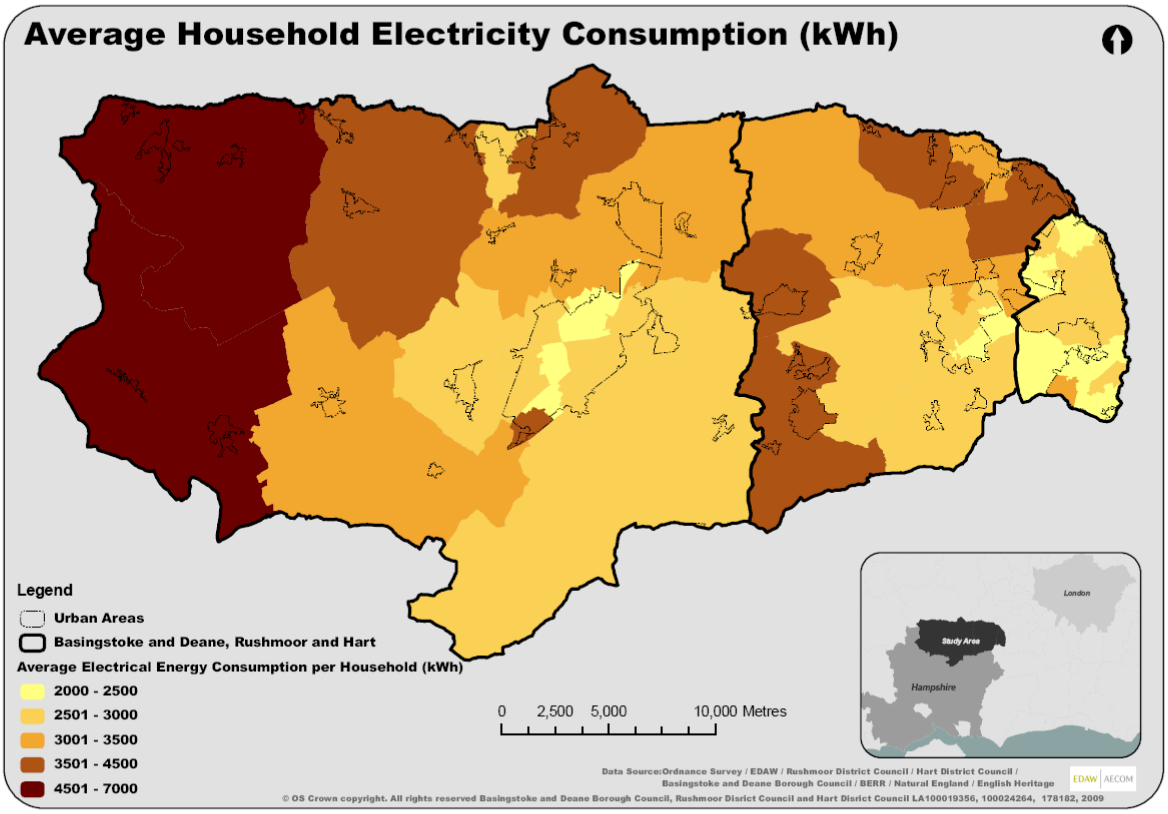


Figure E2: Electricity Consumption per Household in North Hampshire

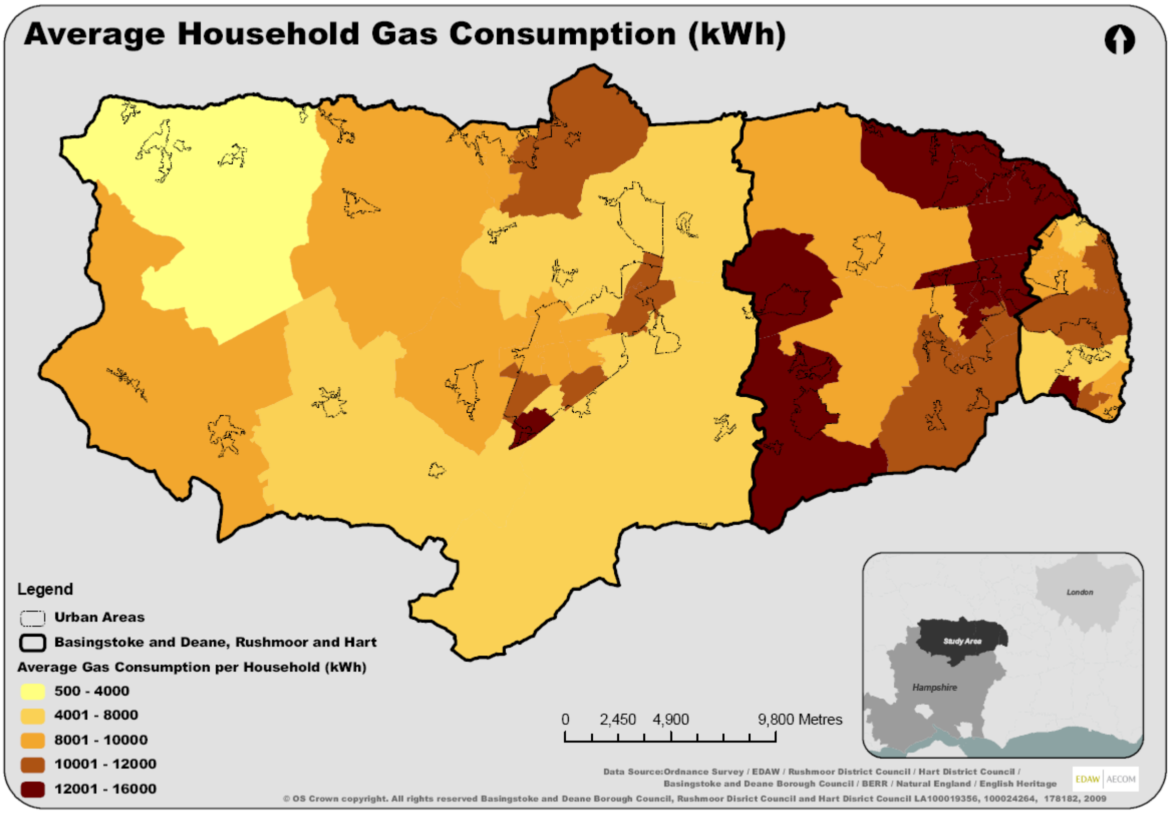


Figure E3: Gas consumption per household in North Hampshire

Of the three LPA areas, Rushmoor has the lowest carbon profile. The predominant reason for this is the urban nature of the Rushmoor area, with higher proportions of terraced housing and flats, which naturally have lower energy demands. However, the average Standard Assessment Procedure (SAP) rating of Rushmoor homes is the worst of the three LPA areas, and hence there is significant potential to improve existing stock. Basingstoke and Deane has the best average SAP rating, though due to the more rural nature of the area, there is a larger proportion of detached housing with higher energy demands and the use of high-carbon fuels for heating (electricity, coal and oil) where a gas network is unavailable. Hart has the highest current energy demands in North Hampshire, and also has a fairly low density housing mix along with fairly high use of high-carbon fuels.

LPAs play a key role in increasing energy efficiency of existing buildings, through coordination and promotion of initiatives. Existing buildings make up the bulk of the future energy demand, and hence efforts must be made to reduce energy demand of existing stock. Existing non-residential buildings often receive less focus than existing homes. LPAs should support initiatives to increase energy efficiency in non-residential buildings in their area, particularly large energy users. The figure below compares the energy demand for residential and non-residential buildings.

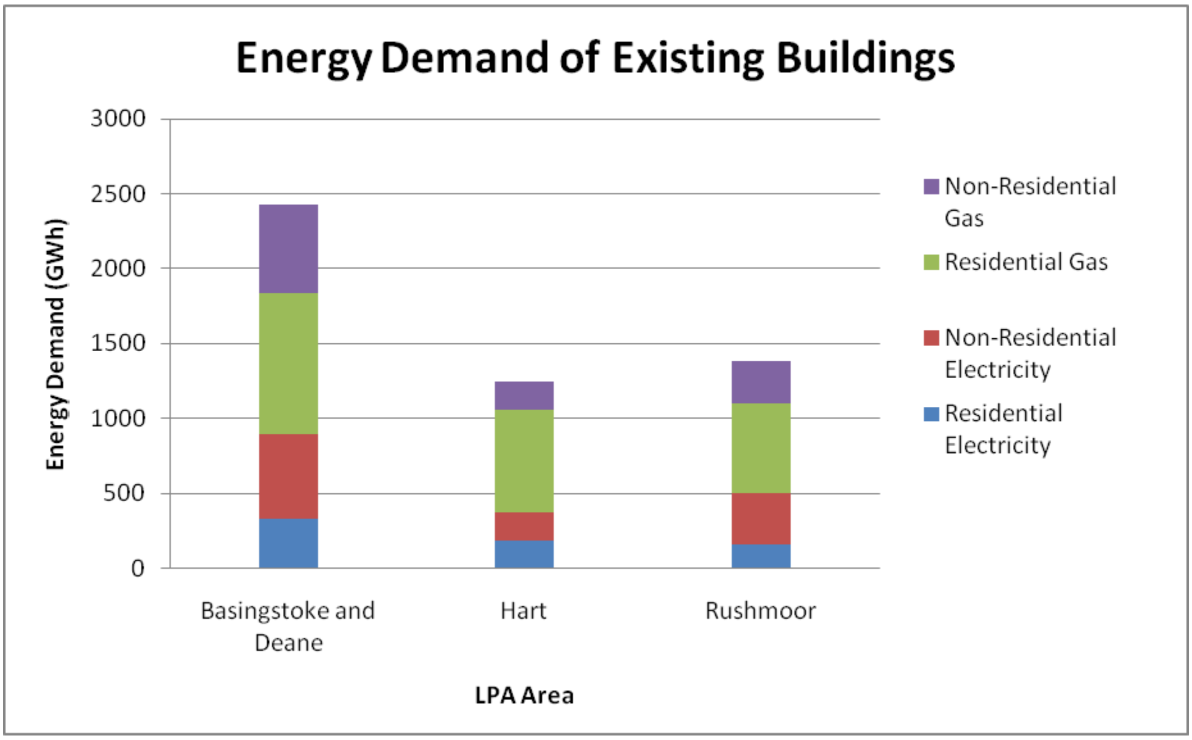


Figure E4: The electricity and gas demand of the three LPA areas, showing residential and non-residential breakdown.

Future Performance of Existing Buildings

As part of this study, the likely increase in energy performance of existing buildings over the period of the emerging Core Strategies is considered. Through both national and local drivers, it is expected that the heat demand of existing buildings will decrease significantly, due to a range of relatively simple and cost-effective measures that can be applied to building structures. However, electricity demand is expected to remain fairly static, if not increasing slightly, due to additional demand from new technologies and appliances. The graph below shows the modelled make-up of energy demand from existing buildings over the period of the Core Strategies.

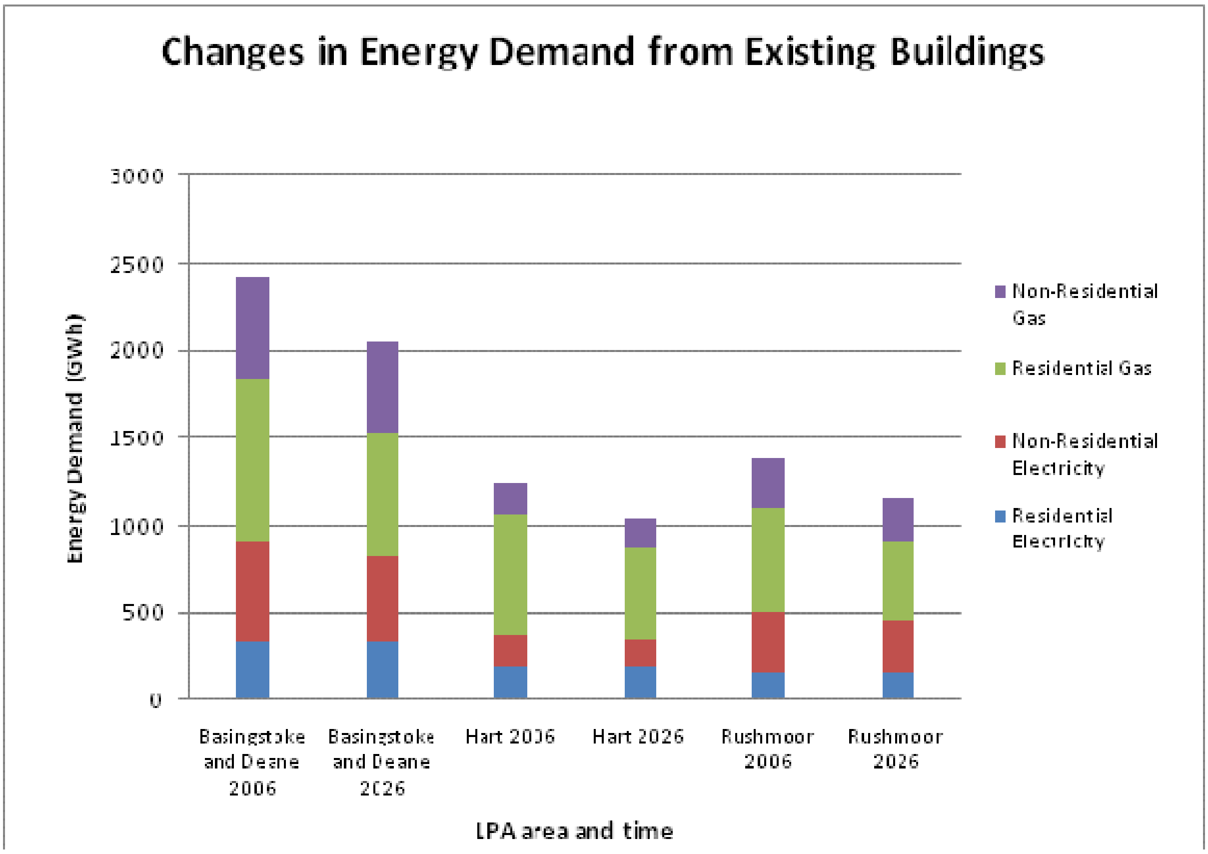


Figure E5: Expected change in electricity and gas demand over Core Strategy period

Energy Demands of New Buildings

Significant growth is expected in North Hampshire over the period of the Core Strategies. This study has modelled the likely energy demand of new buildings over time to complete an overall profile of evolving energy demand over time. New development will be subject to emerging Building Regulations that are likely to enforce increasing levels of energy efficiency and carbon reduction. The energy demands from new development compared with those of existing buildings are shown in the graph below.

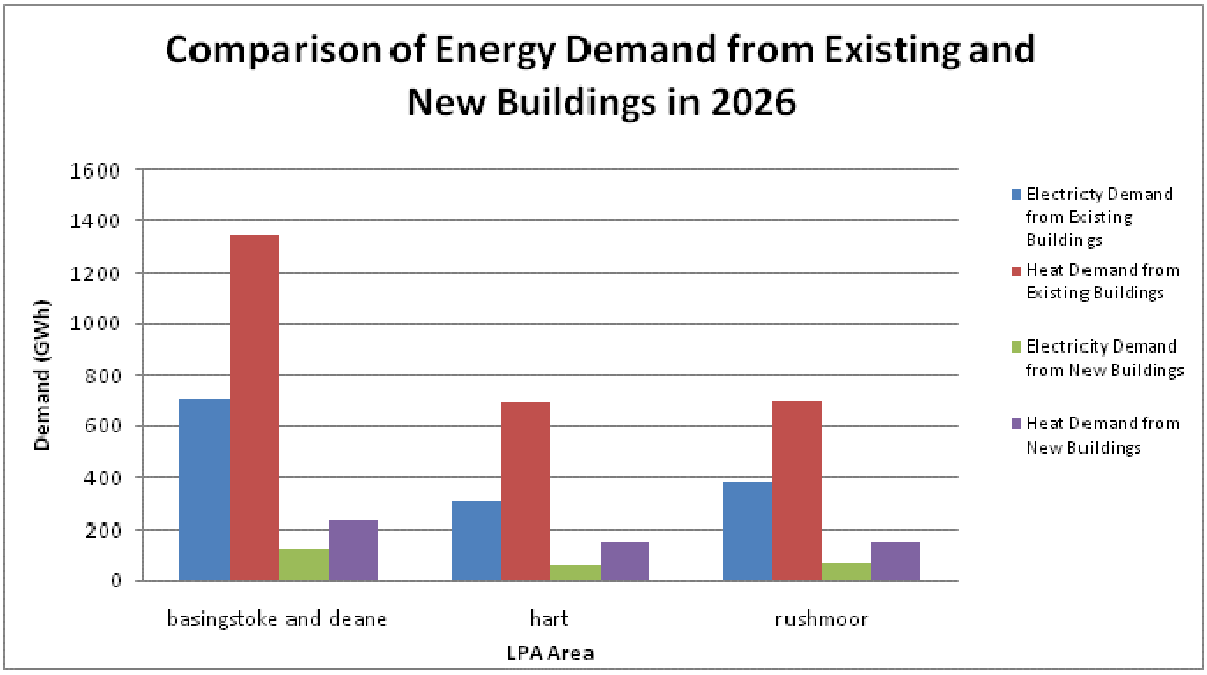


Figure E6: Comparison of energy demand from existing and new buildings

Key Emerging Considerations for the LPAs

An understanding of the current and future energy demand profile of North Hampshire highlights a number of considerations for the LPAs:

- It is important to realise the scale of energy demand in order to both set planning targets and measure planning targets for renewable energy delivery based on a percentage of demand. Current and future energy demands have been calculated in this study for use in policy and delivery;
- LPAs play a key role in increasing energy efficiency of existing buildings. Existing buildings make up the bulk of the future energy demand, and hence efforts must be made to reduce energy demand of existing stock.
- Existing non-residential buildings often receive less focus than existing homes. LPAs should support initiatives to increase energy efficiency in non-residential buildings in their area, particularly large energy users.
- Planning can affect CO_2 emissions by affecting the density of development and mix of house types. Higher densities should be encouraged where suitable.
- There is significant use of oil and coal fuels, especially in Basingstoke and Deane and Hart. Efforts should be made to switch these fuel users to lower carbon fuels, ideally biomass.

PHYSICAL CONTEXT: RENEWABLE AND LOW CARBON POTENTIAL

Complementary to an understanding of energy demand levels and locations, is an understanding of the potential for the local generation of renewable and low carbon potential. This helps to identify key opportunities and also highlight delivery mechanisms.

Existing Renewable and Low Carbon Energy Generation

Basingstoke and Deane Borough has two existing large-scale low carbon energy installations, an energy from waste incinerator (Chineham) and the utilisation of Landfill gas at Apsley. Hart also has a landfill gas installation at Bramshill. Otherwise, the renewable energy installations across North Hampshire are limited to small-scale building integrated micro-renewables such as photovoltaics and solar heating. The current take-up of micro-renewables is difficult to monitor as it is permitted development, however the level of installation in North Hampshire currently is unlikely to be making a significant contribution to overall carbon reduction.

Potential Sources of Renewable and Low Carbon Energy

This study assesses the scale of potential from different renewable energy sources across North Hampshire. The table below summarises the key renewable energy sources identified.

Technology	Resource in Basingstoke and Deane	Resource in Hart	Resource in Rushmoor
Large Scale Wind	Significant resource identified	Significant resource identified	Limited resource identified
Medium Scale Wind	Significant resource identified	Significant resource identified	Limited resource identified
Biomass for Direct Combustion	Significant resource identified across North Hampshire		
Biomass for Anaerobic Digestion	Significant resource identified across North Hampshire		
District Heating with CHP	Significant resource identified	Significant resource identified	Significant resource identified
Micro-generation in Existing Development	Significant resource identified	Significant resource identified	Significant resource identified
On-Site generation in New Development	Significant resource identified	Significant resource identified	Significant resource identified
Hydro Energy	No resource identified	No resource identified	No resource identified
Energy from Waste	Existing Utilisation	Consideration outside scope of this study	Consideration outside scope of this study
Energy from Sewage	Consideration outside scope of this study	Consideration outside scope of this study	Consideration outside scope of this study
Geothermal Energy	No resource identified	No resource identified	No resource identified

Table E2: Summary of low carbon and renewable energy resource in North Hampshire

The potential for renewable and low carbon energy generation across North Hampshire has both wide scope and scale of potential. The more rural areas in Basingstoke and Deane and Hart are able to support development of wind energy, while also providing a range of potential for the utilisation of waste streams as biomass, along with the growth of dedicated bio-crops. The urban centres in each LPA area also have significant potential for the installation of district heating systems, fed by combined heat and power, along with building integrated micro-generation alongside both existing and new development. Energy Opportunity Plans have been developed for each LPA area, which can be used as a planning tool to both demonstrate and focus opportunities for low carbon energy in spatial planning.

The Low Carbon Buildings Programme (managed by DECC) will keep a record of grant-funded renewable installations in each Local Authority area in order to monitor uptake of installations.

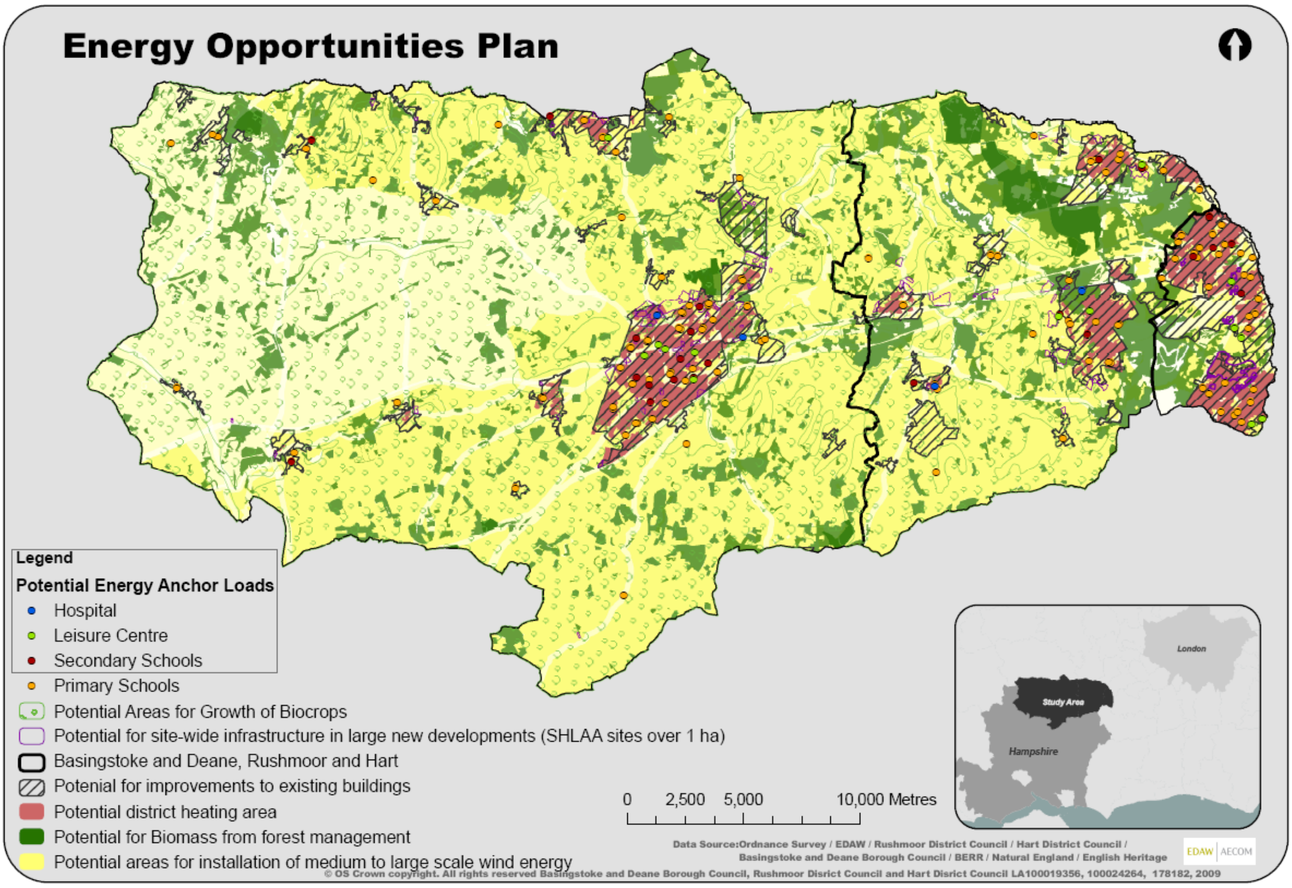


Figure E7: Energy Opportunities Plan for North Hampshire

Using the scale of potential for the varying renewable and low carbon resources in each LPA area, suitable overall targets for renewable energy generation have been recommended. In alignment with national targets, a 12% target for renewable heat by 2020 has been applied to all three LPAs. Modelling undertaken for this study shows that this is achievable due to the strong potential for district heating in urban areas along with a significant local biomass supply. The South East Plan sets a target of 10% of electricity from renewable sources by 2020 (and 16% by 2026), and background studies show Hampshire is well placed to meet its share. A 10% target is believed to be achievable across all the LPA areas.

The renewable electricity target for Basingstoke and Deane could however be raised form a 10% target to a 20% target as the scale of potential in the Borough is such that this target is achievable, and could contribute further carbon reduction, adding to the already existing large-scale installations.

Key Emerging Considerations for the LPAs

The consideration of resource potential has highlighted several key opportunities for the LPAs:

- All LPA areas have good opportunities to generate and supply renewable and low carbon heat, and these opportunities should be supported through planning;
- There is significant biomass potential across North Hampshire, however the supply chains are not currently in place. The supply of local low carbon fuel is essential for future development in the area, and LPAs should take steps to coordinate and enable such supply chains.
- The three LPAs could also work together to prioritise areas for renewable energy development and to implement programmes to encourage and support micro-generation in existing and new development areas.
- All opportunities are delivery dependent – resource potential in itself does not contribute to targets, therefore focus should be on enabling delivery; and
- An Energy Opportunity Plan has been produced as a planning resource which will allow assessment and prioritisation of delivery of opportunities.

DELIVERY CONTEXT IN NORTH HAMPSHIRE

To ensure that opportunities are delivered, the LPAs play an essential role. Delivery opportunities relate to three broad energy opportunities; existing development, new development and strategic community-wide interventions:

- Existing development:
    - Delivering improvements through energy efficiency;
    - Delivering fuel switches away from high-carbon sources; 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 increased on-site carbon reductions or near-site generation; and
    - Delivering allowable solutions off-site.
- Strategic community-wide interventions:
    - Delivering decentralised low carbon and renewable energy through
        - private investment;
        - community investment;
        - public sector; or
        - a combination of the above in partnership.
    - Delivering low carbon resource supply chains.

The role and influence of LPAs in the delivery of the energy opportunities associated with each varies, as shown in the figure below. The nature of planning for energy at the local level is such that the planning process cannot deliver the opportunities alone; it will require a collaborative approach between local authority departments, the Local Strategic Partnership (LSPs), private developers and communities.

Energy Opportunity	Delivery Mechanism	Likely Delivery Partner	Planning Policy
Existing development	LA support for microgeneration Powers of Wellbeing Local Development Orders	Local authorities Local Strategic Partners Home / building owners ESCo	Consequential improvements
New development	Building regulations CIL and S106 Local Development Orders Conditions to Public Sector land sales Allowable Solutions	Local authorities Local Strategic Partners Energy developers Housebuilders/ developers/ RSLs ESCo	Increment on target emission rate Full Code target Policies for strategic sites Design and layout
Strategic community-wide interventions	Powers of Wellbeing CIL Local Development Orders Public sector policy and targets Allowable Solutions	Local authorities Local Strategic Partners Energy developers Housebuilders/ developers/ RSLs ESCo Community organisations	Generation target Supporting/criteria policy Install District Infrastructure Connect to District Infrastructure Set aside land Design and layout

Figure E8: Overview of delivery mechanisms, partners and planning policy for energy opportunities in North Hampshire

Delivering carbon reduction in existing buildings

Improving the energy performance of existing buildings should be undertaken in three ways:

- Increase the uptake of energy efficiency measures with concentrated funding and a programme of improvement. The LPAs can encourage higher energy efficiency in existing buildings by working with partner organisations to distribute and focus funding.
- Converting properties that rely on oil, coal and electric heating to biomass. Efforts should be made to convert these systems to wood burning stoves and biomass boilers utilising wood as a lower carbon fuel.
- Installing micro-generation technologies to a large proportion of existing properties. Delivery of low carbon and renewable technologies within existing buildings and communities cannot be required by planning, but can be encouraged by the LPAs.

Delivering carbon efficient new development

Carbon efficient new development will be delivered through a combination of energy efficiency measures and development driven renewable and low carbon energy infrastructure in-line with the Government's commitment to zero carbon development in 2016. A proportion of carbon reduction is likely to be met 'on-site' with the remaining carbon reduction potentially being picked up through a range of 'allowable solutions'. As part of the allowable solutions, developers can look for opportunities to reduce carbon further either on-site or off-site. The scope and governance of allowable solutions is yet to be confirmed by Government, however, LPAs are in a unique position to both encourage maximum carbon reduction associated with new development through planning and to coordinate and highlight priority opportunities for delivery of allowable solutions.

The key opportunities for LPAs in North Hampshire are:

- Setting local planning policies for new development that capitalise on local opportunities for carbon reduction.

- Requiring specific investigations and targets on strategic sites where significant carbon reduction opportunities exist (three strategic sites have been considered as part of this study).
- Using spatial planning to locate and design new development areas that optimise potential for carbon reduction and integration of renewable or low carbon energy generation.
- Leading, partnering or coordinating the development of key renewable and low carbon energy generation opportunities associated with 'allowable solutions' funding.

Delivering Strategic Community-Wide Interventions

Two key delivery areas were considered on a strategic level within this study to aid the prioritisation of deliver across North Hampshire:

- Delivery of district heating schemes;
- Delivery of community-owned wind power schemes.

The figure below highlights the key areas where district heating schemes are likely to be deliverable in North Hampshire. There is significant opportunity for carbon reduction through the installation of district heating, and delivery of some of these opportunities is essential to North Hampshire's contribution to mitigation of climate change. LPAs should consider how these can be enabled through leadership from the LPAs or private sector energy services companies (ESCos). There are various funding and ownership models that have been delivered, and the most suitable opportunities for North Hampshire should be given urgent consideration by the LPAs.

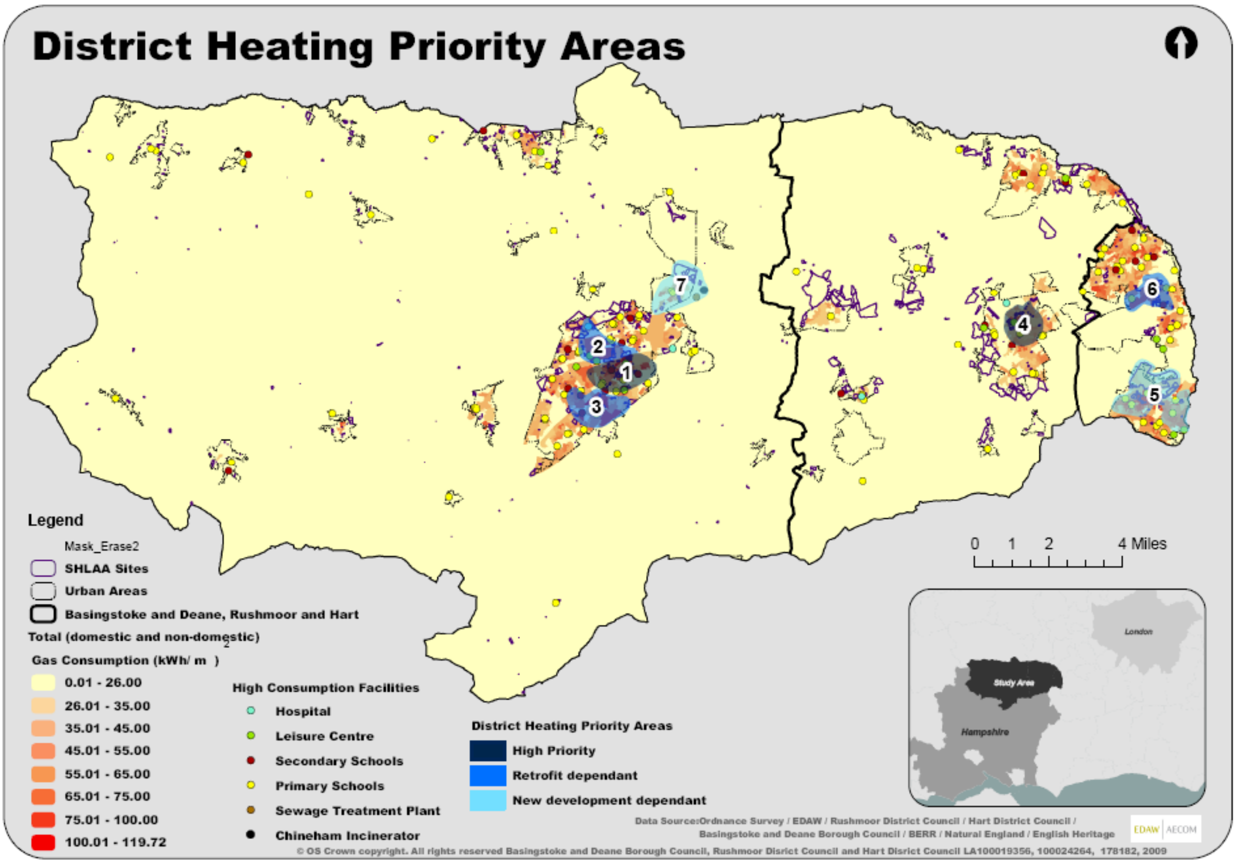


Figure E9: District heating priority areas

There is currently very limited development of wind energy in North Hampshire. Local communities can both assist in delivery of significant installations and reap considerable benefits from the revenue associated with local renewable energy generation. The figure below prioritises areas where, in planning terms, the development of community sponsored wind schemes is most favourable. The LPAs should support the delivery of appropriate wind developments across North Hampshire by encouraging community wind schemes.

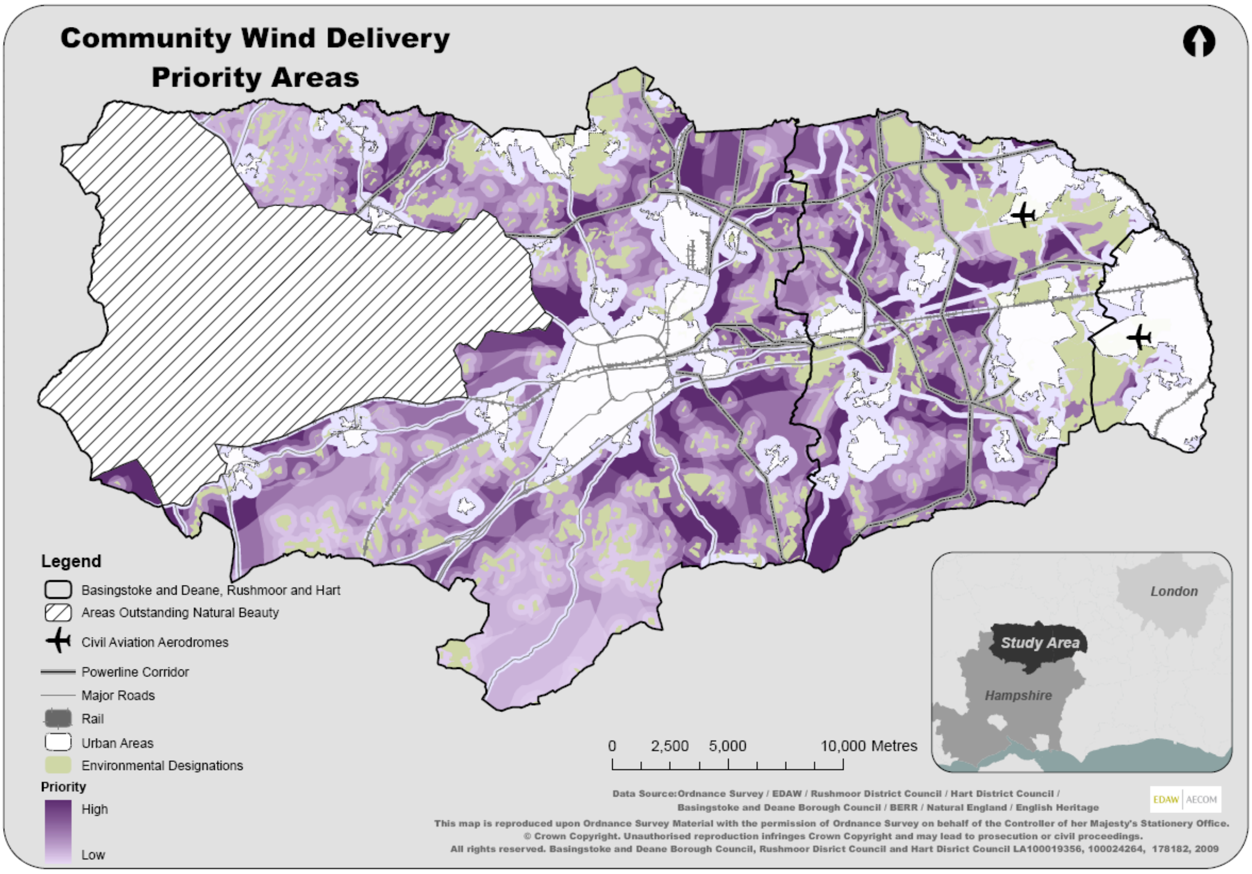


Figure E10: Community wind priority areas

Delivery and Funding Mechanisms

There are a number of potential delivery options explored in this report including:

- Setting up an Energy Company
- Community Infrastructure Levy (CIL)
  - Local Development Orders (LDO):
- Delivery of micro-generation technologies
  - Householder or business purchase
  - Householder or business hire purchase
  - Householder or business rental
- Sources of funding for public bodies
  - UK Green Stimulus Package Pre-Budget Report 2008
  - Salix Finance
  - Low Carbon Buildings Programme – Phase 2
  - Carbon Emission Reduction Target (CERT)
  - The Community Energy Saving Programme
  - Renewables Obligation Certificates (ROCs)
  - Feed-in tariffs
  - EDF Renewable Energy Fund
  - Intelligent Energy Europe

LPA AREA-WIDE POLICY RECOMMENDATIONS

Based on the policy, physical and delivery context in North Hampshire, the following six policy recommendations have been made for application on an LPA area-wide scale.

Recommendation for new Policy 1: Consequential improvements to existing homes

Planning applications for changes to existing domestic dwellings will be required to undertake reasonable improvements to the energy performance of the existing dwelling. This will be in addition to the requirements under Part L of the Building Regulations for the changes for which planning permission is sought. Improvements will include, but not be restricted to loft and cavity wall insulation, draught-proofing, improved heating controls and replacement boilers.

Applicants will be asked to complete a checklist to identify which measures are appropriate to their home. In the case where the building already includes key energy efficiency measures, no improvements need to be made. The total cost should be no more than 10% of the total build cost.

Recommendation for new Policy 2: Community Infrastructure Levy – Energy and CO_2

In order to contribute to the delivery of the Energy Opportunities Plan, all new buildings in North Hampshire will be required to either:

Be subject to a Community Infrastructure Levy, charged at £100 per tonne of CO_2 per building emitted over a 30 year period (or a one-off payment of £3,000 per tonne of CO_2 per building); or

Achieve a 15% reduction in residual CO_2 emissions in all buildings 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 on-site low carbon and renewable technologies and directly connected heat (not necessarily on-site).

Planning approval will be conditional on the provision at the design stage and on completion of design and as-built Building Control Compliance documentation clearly showing the Target Emission Rate (TER) and Dwelling Emission Rate (DER) / Building Emission Rate (BER).

Recommendation for new Policy 3: Sustainable Design and Construction

All new residential developments in North Hampshire are required to meet full Code for Sustainable Homes standards or equivalent. These requirements will not come into effect until successive updates to Part L of the Building Regulations become mandatory:

- **At least Code level 3 will be required for all new homes once updates to Part L come into effect (currently scheduled for April 2010).**
- **At least Code level 4 will be required for all new homes once updates to Part L come into effect (currently scheduled for 2013).**

All new non-residential developments in North Hampshire over 1000 square metres gross floor area are required to achieve the BREEAM "Very Good" standard or equivalent, with immediate effect (relevant versions of BREEAM are available covering offices, retail, industrial, education and healthcare).

Compliance with this policy will require submission of final Code certificates and post-construction BREEAM certificates, as appropriate.

Recommendation for new Policy 4: Renewable Energy

Applications for low carbon and renewable energy installations will generally be supported in the area. The area is seeking new renewable energy generation capacity to deliver an appropriate contribution towards the UK Government's binding renewable energy target. Therefore:

BASINGSTOKE AND DEANE

At least 166GWh of renewable electricity by 2020 (approximately 20% of total electricity demand in Basingstoke and Deane).

At least 195GWh of renewable heat by 2020 (approximately 12% of total heat demand in Basingstoke and Deane).

HART

At least 37GWh of renewable electricity by 2020 (approximately 10% of total electricity demand in Hart).

At least 105GWh of renewable heat by 2020 (approximately 12% of total heat demand in Hart).

RUSHMOOR

At least 46GWh of renewable electricity by 2020 (approximately 10% of total electricity demand in Rushmoor).

At least 105GWh of renewable heat by 2020 (approximately 12% of total heat demand in Rushmoor).

Recommendation for new Policy 5: Delivering the Energy Opportunities Plan

Decentralised, low carbon and renewable energy is a priority for the Council. Planning applications for new development in North Hampshire will need to demonstrate how they contribute to delivery of the current 'Energy Opportunities Plan'.

Recommendation for new Policy 6: Priority areas

The Councils will favourably consider applications for development which will support the following energy priority areas:

1. District heating priority areas

Basing View and Basingstoke Town Centre

North Hampshire Hospital and adjoining industrial estate (on Kingsclere Road)

Industrial estate on Winchester Road

Fleet town centre

Aldershot Town Extension and Aldershot town centre

Invincible Road industrial estate and Farnborough town centre

Chineham incinerator surrounds

These areas will be considered by the delivery ESCo as priority areas for installing district heating systems.

Development within the priority area should install the secondary elements of a district heating network (i.e. from the wider network to properties), unless it can be shown not to be viable or feasible, and work closely with the ESCo to ensure compatibility of systems. Should development come forward prior to a district heating network being in place, developers will be required to provide a containerised energy centre to provide 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.

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

Where applicants demonstrate that connection to a district heating network is not feasible or viable they should contribute financially to the Carbon Buyout Fund/CIL.

2. Community wind priority areas

All areas highlighted in the Community Wind Priority Areas plan

Applications will be encouraged from community groups and individuals in priority areas.

Applications are also encouraged for wind energy developments directly related to new domestic and non-domestic developments, particularly in areas identified in the Energy Delivery Opportunities Plan.

STRATEGIC SITE ANALYSIS

Three strategic sites have been tested in further detail to determine whether advanced carbon reduction targets can be set through policy in accordance with the PPS1 supplement. The following sites were selected, one for each Council in the study area:

- Aldershot Urban Extension (Rushmoor BC)
- Basing View (Basingstoke and Deane BC)
- Queen Elizabeth Barracks (Hart DC).

Aldershot Urban Extension (AUE)

The AUE SPD currently proposes Code for Sustainable Homes and BREEAM requirements. This study has outlined opportunities and constraints concerning delivery of energy-related CO_2 targets on the site, according to the masterplan proposed. As a result, the following recommendations can be made for consideration by the Council in further development of the SPD and site requirements:

- Maintain the proposed policy requirement to achieve Level 4 of the Code for Sustainable Homes and set a requirement for a small proportion of the development to achieve Level 5. The proportion required to achieve Level 5 should be tested for viability once a more detailed masterplan is developed. Three options can be pursued: either developing the proportion to meet Level 5 at such low density that sufficient PV can be installed on the roof to meet the requirement, installing a medium-scale wind turbine, or developing it at high enough density and in proximity of mixed uses in order to make district heating and CHP viable.
- The fields to the north of the development site present an opportunity for the installation of a medium wind turbine. A policy could be introduced to force the detailed investigation of the feasibility of such an option. Alternatively an indirect approach may be to develop a masterplan where the units required to achieve Code Level 5 are in the proximity of the wind opportunity area. With this approach it is likely that developers will investigate the viability of wind as an option to achieve Level 5, as this may be cheaper than on site solutions.
- Maintain the proposed policy requirement for all non-residential buildings to achieve a BREEAM Very Good. Requirements for BREEAM Excellent should be investigated in terms of financial feasibility.
- The requirement to meet Code for Sustainable Homes Level 6 by 2016 should be reviewed. Code Level 6 will be very difficult to achieve under current density proposals. It is expected that Building Regulations will require new development to be ‘zero carbon’ after 2016, but it is important to distinguish that the definition of zero carbon proposed under building regulations differs to that currently included in the Code for Sustainable Homes (which requires CO_2 reductions to all be achieved within the site boundary). Assuming that zero carbon requirements will come through Building Regulations, this requirement could be removed, and achievement of other sustainable construction aspects can be enforced through LPA-wide application of Code for Sustainable Homes Level 4.

Basing View

Based on the analysis undertaken in this study, the following recommendations can be made:

- Maintain the proposed policy requirement for all non-residential buildings to achieve a BREEAM Very Good.
- If a cost assessment specific to the Basing View site shows that achieving a BREEAM Excellent is economically viable, this should be required by policy. If the cost assessment shows that BREEAM Excellent across the site is not viable, it may still be possible to set a policy requirement for a proportion of buildings on the site to meet the higher standard.
- Set a policy requirement for the feasibility of district heating and CHP (biomass and gas) to be thoroughly investigated, including the potential delivery mechanisms that could manage a system at Basing View but also extend the network to the town centre in future.
- An energy strategy, including phasing requirements, should be developed for the entire site and surrounding area. This will guide the development of low carbon infrastructure in a coordinated way, and ensure that individual developments on the site can be taken forward in a carbon and cost-efficient manner.

- There is an opportunity for Basingstoke and Deane Borough Council to lead the integration of a district heating system (powered by CHP or otherwise) to serve the Basing View site and surroundings. The Council could lead the process, functioning as an energy company, or partner or engage an Energy Services Company (ESCo).

Queen Elizabeth Barracks

Based on the analysis undertaken in this study, the following recommendations can be made:

- Maintain the proposed policy requirement to achieve Code Level 3 up to 2013 and Level 4 of the Code for Sustainable Homes after 2013.
- Set a requirement for a small proportion of the development to achieve Level 5. The proportion required to achieve Level 5 should be tested for viability once a detailed masterplan is developed. A proportion of development will have to be of low enough density to allow homes to accommodate sufficient PV and small scale wind capacity to achieve the required 100% reduction in regulated CO_2 emissions.
- An energy strategy should be completed for the site which will determine the type and phasing of technologies for inclusion.
- The feasibility of installation of a large-scale wind turbine off-site to contribute to the site's carbon reductions (either through private wire connection or through 'allowable solutions' if applicable) should be investigated by the developer. If feasible, this should be encouraged through planning.
- Maintain the proposed policy requirement for all non-residential buildings to achieve a BREEAM 'Very Good', though some key buildings could test feasibility against BREEAM 'Excellent'.

WATER USE AND SUPPLY EVIDENCE BASE

This study also considers the issues and opportunities regarding the use and supply of water to the built environment in the three LPA areas. It acts as a standalone evidence base for the development of local policies, but also assists in building a local evidence base for the use of wider sustainable construction targets for new development. Sustainable design tools like the Code for Sustainable Homes and BREEAM, assess water use as one aspect of the accreditation. Energy and Water credits under the scheme tend to be those with which the highest cost and least flexibility is entailed. Other aspects of sustainable design covered by these accreditation schemes depend on site-specific opportunities and constraints, and cannot be assessed at a LPA area-wide scale. Therefore, the development of a water evidence base can act to support the recommendation of the use of the Code or BREEAM on a LPA area-wide scale, and give confidence around the drivers and constraints to inclusion of various targets.

The South East is one of the driest regions in the UK and the most populous. Low average annual rainfall combined with increased demand for water use driven by strong population, employment and housing growth mean that the region has less water available per head than anywhere in the UK. The drought which affected the South East between 2004 and 2006 was one of the most severe in the past 100 years with four drought permits and three drought orders issued in 2006. Climate change means such events are likely to occur with increasing frequency.

It is clear that the area suffers from a high level of water stress, and that improvements need to be made to both existing and new buildings to ensure a sustainable future. This study recommends the following actions are taken through policy development:

- **Overarching Core Strategy Policy**: We suggest the introduction of a water hierarchy within the policy wording to encourage implementation of the most effective water efficiency measures, from those that save the most water at least cost and risk to those that only need to be adopted where targets cannot be achieved otherwise. The Core Strategy should strongly support the reduction of water use and application of SUDS in new development along with the sustainable management of water resources generally. The draft LDFs of Basingstoke and Deane and Hart include policy relating to water use and SUDS. Rushmoor should include requirements in its emerging Core Strategy.

- **Policy for New Development**: The chapters above forward recommendations for the use of the Code for Sustainable Homes and BREEAM targets for new development – Code for Sustainable Homes Level 3 increasing to Level 4 and BREEAM 'Very Good'. These recommendations are supported by this water evidence base, and should be included to ensure new development has a reduced impact on water resources and helps to reduce water consumption of the LPA areas.
- **Policy for Existing Buildings**: Planning cannot directly affect water use in existing buildings, though LPAs should support initiatives to that effect. Planning policy can influence water use in existing buildings where there is significant redevelopment or refurbishment. Requirements to demonstrate improvement of water efficiency in both the extension/redevelopment and within the remaining building should be required alongside planning applications.
- **Review of Policy Going Forward**: It is expected that the level of knowledge surrounding water management will increase significantly in the coming years, and key questions such as the effect of local water recycling on CO_2 emissions will be answered. Currently, there is no evidence base to require water targets above those recommended, primarily due to technical and cost constraints. However, as these are both likely to change in the coming years, we recommend review of the policies in a few years time to determine if further gains can be made.

Contents

1. Introduction

1.1 INTRODUCING THE STUDY

AECOM have been appointed by three Local Planning Authorities (LPAs); Basingstoke and Deane Borough Council, Hart District Council and Rushmoor Borough Council, to develop an evidence base to inform the development of sustainable construction and renewable energy policies to be included in the Core Strategies and supporting documents for the three authorities.

Figure 1 shows the boundaries of the three authorities. The LPAs combine to make up the northern area of Hampshire, encompassing a mix of both rural and urban communities. The North Wessex Area of Natural Beauty (AONB) is located to the northwest of the study area, and includes a large portion of Basingstoke and Deane Borough. The three authorities will be collectively referred to as the 'North Hampshire' LPAs within this report.

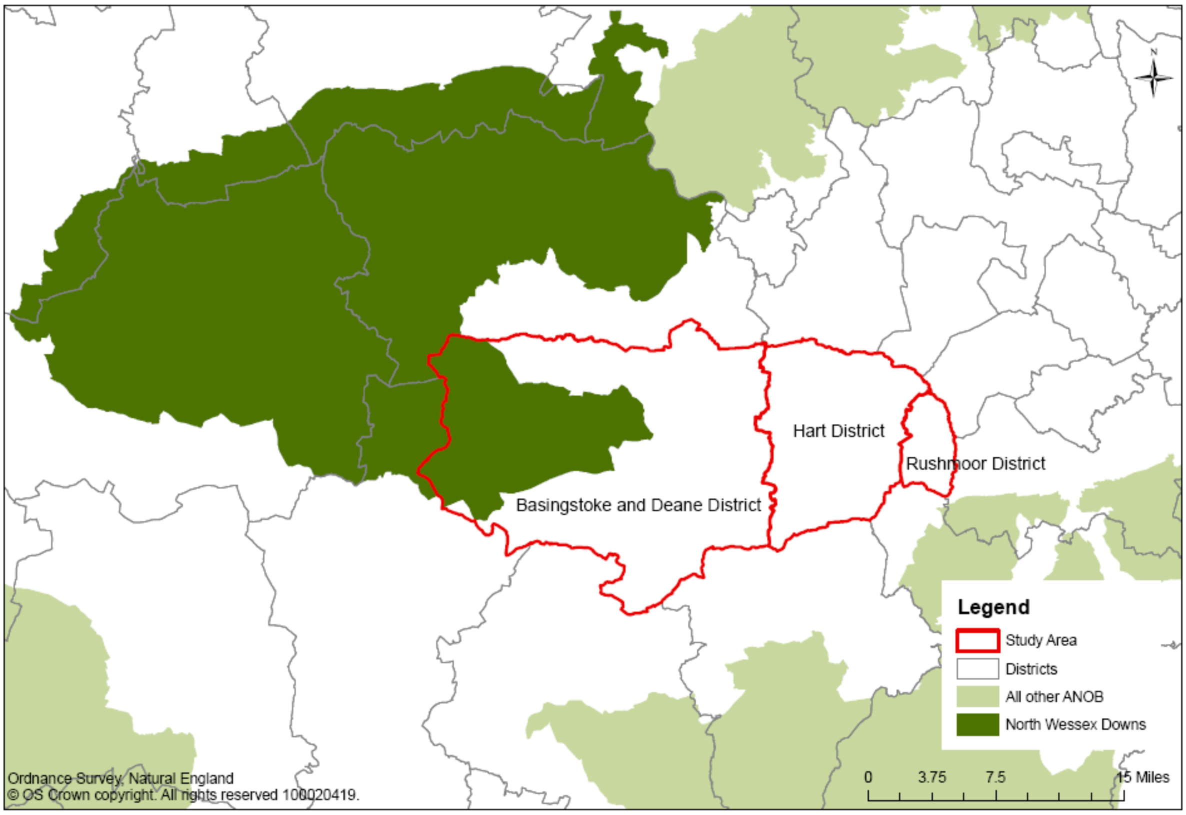


Figure 1: The study area

1.2 SCOPE OF THE STUDY

The evidence base seeks to ensure that the objectives set out in the Core Strategies can be delivered in a more sustainable, carbon efficient way. The development of this evidence base responds directly to requirements set out in Planning Policy Statement 1: Planning and Climate Change (Supplement to Planning Policy Statement 1). The PPS1 Supplement requires local authorities to understand the potential for incorporating renewable and low carbon technologies in their authority area:

"Planning authorities should have an evidence-based understanding of the local feasibility and potential for renewable and low-carbon technologies, including micro-generation, to supply new development in their area." – PPS1 Supplement.

Under the PPS1 Supplement Local Authorities should:

1. Along with criteria based policies, identify suitable sites for decentralised and renewable or low carbon energy;
2. Expect a proportion of energy supply for new development to be secured from decentralised and renewable or low carbon energy:
    - Set targets where necessary;
    - Where opportunities allow, bring forward development area or site-specific targets;
    - Set thresholds and development types to which the target will be applied; and
    - Ensure a clear rationale for the target and it is properly tested.

This study aims to provide a robust evidence base following PPS1 Supplement requirements to enable the delivery of CO_2 reductions associated with energy in North Hampshire. Through an understanding of the current situation in North Hampshire, review of policy direction and analysis of the district's potential, this report sets out the premise and justification for policies. Taking into consideration the availability of baseline information and the duration of growth projections in the district, modelling in this study covers a period from 2006-2026 broken into four 5 year growth phases.

This report also considers particular opportunities for strategic sites (identified due to their large scale and location) to exceed LPA-wide policy requirements, as set out by the PPS1 Supplement. The scope of this study includes focussed study of three strategic sites, one in each LPA area:

1. Aldershot Urban Extension (Rushmoor Borough)
2. Basing View Town Centre Redevelopment (Basingstoke and Deane Borough)
3. Queen Elizabeth Barracks (Hart District).

There will be other strategic sites within the LPA areas that come forward and are capable of exceeding LPA-wide targets and policy requirements. The process for identification of these sites and identification of key delivery opportunities is also discussed in this report, and should be utilised by LPAs to set site specific planning policies as sites come forward.

The primary focus of this report is the development of an evidence base for policy concerning management and reduction of energy-related CO_2 emissions. However, targets concerning energy-related carbon are often closely related to other sustainable construction aspects within target options and assessment methods such as the Code for Sustainable Homes and BREEAM. A key aspect of wider sustainable construction opportunities and a particularly pressing issue for the South East of England is water supply and use. Accordingly, this study also develops an evidence base for water use and recycling in new development as part of its scope.

1.3 POLICY DEVELOPMENT PROCESS

The challenge of reducing CO_2 emissions and mitigating the effects of climate change is global in nature. At a national level, government policy and targets outline the overall approach to CO_2 reduction, but in response to the PPS1 Supplement it is the responsibility of local authorities and local planning to seek to understand and capitalise on local opportunities to deliver CO_2 reduction associated with the built environment. To develop policy and targets on a local level, it is important to understand three areas of context; policy context, physical context and delivery context. While the policy context is consistent on a national level, the local response needs to be tailored according to regional and local policy context, the physical constraints and opportunities of a local area and the market and delivery opportunities available. A tailored local evidence base enables a direct and meaningful application of national aspirations for CO_2 reduction.

Figure 2 below demonstrates the policy development process. This process has been used to structure this evidence base report.

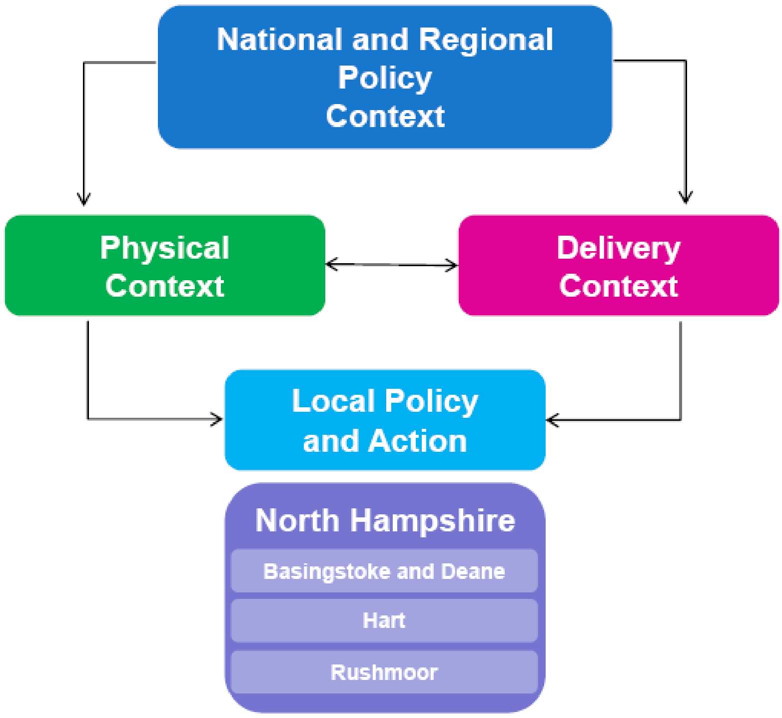


Figure 2: Policy Development Process

1.4 THREE ENERGY OPPORTUNITIES

While it is essential to recognise opportunities and constraints on a local level, it is also important to relate these to the various mechanisms and scales of intervention. The scope and influence of change can be understood as three energy opportunities:

1. Existing Development: The potential to improve performance of existing buildings, through both energy efficiency and inclusion of on-site low carbon and renewable technologies.
2. New Development: The potential to deliver CO_2 efficient buildings on new development sites along with on-site low carbon and renewable technologies.
3. Strategic Community Wide Interventions: Considering the existing and new built environment together in the wider environmental context and the opportunities this brings for development of low carbon energy systems and interventions on a strategic scale.

Figure 3 demonstrates the three energy opportunities that are referred to and utilised in the structure of this report. The influence of planning and of Local Planning Authorities on these three opportunities differs in scope and scale, but policy options can be applied to affect all of these opportunities. Through spatial planning, LPAs play an important role in realising the strategic opportunities at a larger scale, and utilising this wider vision to inform opportunities at a site scale. For example, on a site by site basis, certain low carbon technologies such as district heating may not be viable, but in the wider context, these can become viable when linking to existing areas and neighbouring development sites. LPAs play a key role in identifying and coordinating these opportunities. The wider LPA context also provides a scale of opportunity for utilisation of low carbon and renewable energy resources and infrastructure in landscapes and open spaces as well as the built environment. This wider context informs the level of natural resource available for utilisation either through independent or development-driven delivery of infrastructure, including levels of fuel resource available, such as biomass and waste for energy production, and viability of renewable resource utilisation, such as wind speeds and solar intensity.

Figure 3: Three energy opportunities

1.5 REPORT STRUCTURE

The rest of this report is set out as follows:

- **Chapter 2: Policy Context** – reviews the relevant national, regional and local policy drivers and opportunities.
- **Chapter 3: Physical Context: Energy Demand from the Built Environment** – examines the current and future physical context of the LPA areas, considering the state of existing buildings, expected growth and new development and the overall LPA-wide energy demand profile.
- **Chapter 4**: **Physical Context: Low Carbon and Renewable Energy Potential** – considers the renewable and low carbon resource potential at a site and district scale.
- **Chapter 5: Delivery Context** – considers delivery partners and mechanisms for CO_2 reduction across the LPA areas for every type of energy opportunity.
- **Chapter 6**: **Policy Recommendations** – gathers together evidence from the previous chapters to forward policy recommendations for the LPA areas.
- **Chapter 7: Strategic Site Analysis** - Analyses the potential of three strategic development sites across the LPA areas to achieve higher energy and CO_2 targets in accordance with the PPS1 Supplement.
- **Chapter 8**: **Water Evidence Base** – a water evidence base has also been developed as part of this study as part of the evidence base for wider sustainable construction policy development.

At the end of Chapter 2, 3, 4 and 5, a concluding section is included to summarise the key points emerging from that section of the evidence base that need to feed into the policy recommendations in chapters 6 and 7.

2. Policy Context

2.1 INTRODUCTION TO THIS CHAPTER

Policies regarding renewable energy and CO_2 reduction are rapidly evolving as our understanding of the challenge of climate change becomes clearer and appropriate responses are established at different administrative levels and through varying mechanisms. This, along with the multifaceted nature of energy uses, generation methods and fuel sources, makes for a complicated policy context where approach and importantly targets are not necessarily consistent or compatible. Below is an outline of the key national policy, which with recent publications is at the forefront of renewable energy and CO_2 reduction policy, followed by discussion of how regional policy and local policies currently relate. At the end of this section, we explore the assessment mechanisms of Code for Sustainable Homes and BREEAM, which are available to planners for use within policy targets and requirements to assist in the assessment of sustainable construction integration in new development.

2.2 NATIONAL POLICY

The challenge of climate change, and the need to reduce greenhouse gases and stabilise carbon dioxide in the atmosphere to 450ppm (parts per million) has intensified in recent years. At the international level, the **Kyoto Agreement** is currently being updated (using the “Bali Roadmap”) and will be agreed in Copenhagen in December 2009. This will commit the UK to an updated carbon dioxide reduction path, as well as technology development and transfer and financial investment, which will need to be reflected in planning policy. In addition, the UK Government is committed to reducing greenhouse gas emissions by 80% from 1990 levels by 2050, and at least 34% by 2020, through the **Climate Change Act**. The Act is supported by the **UK Low Carbon Transition Plan**, a National strategy for climate and energy, which sets out the Government’s approach to meeting their CO_2 reduction commitments. As building related CO_2 emissions currently account for approximately 25% of all CO_2 emissions, improving efficiency and supplying buildings with low and zero carbon is a priority. Furthermore, it is predicted that around two thirds of the current housing stock will remain in 2050, highlighting the importance of improving the existing housing stock as well ensuring new building are highly efficient. The Transition Plan includes commitments to reducing greenhouse gas emissions from existing housing stock by 29% on 2008 levels by 2020 and by 13% for places of work.

A crucial part of our strategy to reduce CO_2 emissions is a step-change in the resources used to generate electricity and heat, through a switch away from gas and coal, to a much higher reliance on renewable energy. Installations of renewable and low carbon energy infrastructure will need to be both significant and widespread, with every local authority area looking to utilise opportunities. The UK is currently committed to meeting carbon reduction targets set out by the European Commission in the **EU Renewable Energy Target** which requires a 20% reduction in CO_2 associated with electricity, heating and transport through conversion to renewable energy sources. As the UK’s portion of this target, it is expected to supply 15% of its energy from renewable sources. The translation of this target across to the various energy generation areas is not equal in portion, and is instead related to the opportunities and delivery constraints associated with each. Accordingly, the following proportions of renewable energy supply are expected for the three sectors:

- 30% of electricity
- 12% of heat
- 10% of transport.

This study is concerned with the use of electricity and heat in the built environment, and excludes the use of renewable energy for transport.

Traditionally, drivers and targets for renewable energy have focussed on electricity supply. We are now seeing an expansion in focus to consider heat supply as well. **The Draft Heat and Energy Saving Strategy** (2009) aims to ensure that emissions from all existing buildings are approaching zero by 2050. Proposed mechanisms for achieving this include a new focus on district heating in suitable communities, and removing barriers to the development of heat networks, encouragement of combined heat and power and better use of surplus heat through carbon pricing mechanisms. Alongside the drivers for CO_2 reduction and the inclusion of renewables, there are also targets and strategies in place to encourage the inclusion of Combined Heat and Power (CHP) schemes in new and existing neighbourhoods. In 2000 the Government set a new target to achieve at least 10,000 MWe of installed Good Quality CHP capacity by 2010. In support of this target, the Government has set a target to source at least 15% of electricity for use on the Government Estate from Good Quality CHP by 2010. The Government released a 'combined heat and power strategy to 2010' in April 2004 which encourages a rapid increase in the implementation of CHP. Local authorities play a key supporting role in the implementation of CHP.

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

Planning Policy Statement 22: Renewable Energy (PPS22) (2004) is becoming outdated and superseded by more current guidance however it is still important to refer to this guidance and targets on renewable energy. It sets out policies that cover technologies such as onshore wind generation, hydro, photovoltaics, passive solar, biomass and energy crops, energy from waste (but not energy from mass incineration of domestic waste), and landfill and sewage gas.

PPS22 sets out the Government's energy policy, including its policy on renewable energy, which is set out in the Energy White Paper. The Energy White Paper aims to put the UK on a path to cut its carbon dioxide emissions by some 60% by 2050, with real progress by 2020, and to maintain reliable and competitive energy supplies. The development of renewable energy, alongside improvements in energy efficiency and the development of combined heat and power, will make a vital contribution to these aims.

The Government has already set a target to generate 10% of UK electricity from renewable energy sources by 2010. The White Paper set out the Government's aspiration to double that figure to 20% by 2020, and suggests that still more renewable energy will be needed beyond that date.

Paragraph 6 of PPS22 refers to policies in Regional Spatial Strategies and Local Development Documents. The paragraph states that Local planning authorities should only allocate specific sites for renewable energy in plans where a developer has already indicated an interest in the site, has confirmed that the site is viable, and that it will be brought forward during the plan period. Planning applications for renewable energy projects should be assessed against specific criteria set out in regional spatial strategies and local development documents. Regional planning bodies and local planning authorities should ensure that such criteria-based policies are consistent with, or reinforced by, policies in plans on other issues against which renewable energy applications could be assessed.

Paragraph 8 of PPS22 states that Local planning authorities may include policies in local development documents that require a percentage of the energy to be used in new residential, commercial or industrial developments to come from on-site renewable energy developments. These policies are required to ensure that requirement to generate on-site renewable energy is only applied to developments where the installation of renewable energy generation equipment is viable, should not put an unnecessary burden on developers by, for example, specifying that all energy to be used in a development should come from
on-site renewable generation. Guidance on the formulation of these policies and best practice can be found in the companion guide to PPS22.

These targets and LPA requirements within policy are still pertinent and important for this study.

The Government has also announced its intention for **Building Regulations** to require that the dwelling emission rate (DER) of new residential development to be 25% better than Target Emissions Rate (TER) in 2010, 44% better in 2013 and meeting a zero carbon target by 2016, with non-residential development expected to meet the zero carbon target by 2019. The enforcement of CO2 reductions through building regulations, removes the emphasis somewhat from planning. Previously stand-alone policies for CO2 reduction, such as 'merton-style rules' for inclusion of certain percentages of renewable energy supply, have been used for new development, but such policies are likely to be superseded by proposals for changes to Building Regulations to some extent. However, LPAs can still require sites to go beyond Building Regulations where suitable.

The proposed residential Building Regulations correspond to the DER targets set out in the energy section of the Code for Sustainable Homes for levels 3 (25% reduction) and level 4 (44% reduction), however the definition of zero carbon is likely to differ from the level 6 of the Code (the Code is discussed in greater detail in the section at the end of this chapter). It is a common misconception, that full Code levels will be required under the government proposals, but in fact it is just the equivalent of the energy section of the Code that will be applied through Building Regulations. Expected changes to Building Regulations are discussed in more detail in section 2.5 below.

The Government has recently undertaken consultation on the **Definition of Zero Carbon Homes and Non-Residential Buildings**. The consultation proposes meeting part of the zero carbon requirements through offsite measures. The document suggests that between 44 and 100% of the CO_2 emissions reduction must be met onsite, and that for the remaining emissions a range of onsite and offsite solutions are possible. Currently, it is expected that developers will be required to meet a 70% reduction in TER on-site. The consultation also proposes a maximum cost per tonne of CO_2 for offsite measures, which will be published in 2009 and updated in 2012, to give developers some certainty over the costs they face.

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

The **Energy Act** (2008) gives power to the Secretary of State to establish or make arrangements for the administration of a scheme of financial incentives to encourage small scale low-carbon electricity generation. The holders of distribution licenses may also be required under this act to make arrangements for the distribution of electricity generated by small-scale low-carbon generation and to make a payment to small-scale low-carbon generators (or to the Gas & Electricity Markets Authority). This act also allows the Secretary of State to make regulations to establish a new scheme to facilitate and encourage renewable heat generation and to establish methods to administer and finance the scheme.

The **Planning Act (2008)** paves the way for a new planning system for approving nationally significant infrastructure projects, and introduces the concept of National Planning Statement (NPS). Twelve NPSs are envisaged including one covering renewable energy. The act also adds a duty on councils to take action on climate change within their development plans.

In addition, the Planning and Energy Act (2008) enables local planning authorities to set requirements for energy use and energy efficiency in local plans, including:

- a proportion of energy used in development in their area to be energy from renewable sources in the locality of the development;
- a proportion of energy used in development in their area to be low carbon energy from sources in the locality of the development; and
- development in their area to comply with energy efficiency standards that exceed the energy requirements of building regulations.

2.3 REGIONAL POLICY

The **South East Plan (May 2009)** contains a suite of policies relating to climate change and renewable energy. Policy CC2: Climate Change stresses 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 to incorporate actions 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 LPAs to promote best practice in sustainable construction and help to achieve the national timetable for reducing CO_2 emissions from residential and non-residential buildings. As such, the design and construction of all new development, and the redevelopment and refurbishment of existing building stock is expected to adopt and incorporate sustainable construction standards and techniques.

Policy NRM13 also sets out regional renewable energy targets for electricity as set out in Table 1. Policy NRM14 Sub-regional targets for land-based renewable energy provides further detail as to how renewable generation is expected to be delivered across the region. The proportion allocated for the Hampshire and Isle of White sub-region is highlighted in Table 2. The Figure below shows an indication as to the mix of resources proposed to meet the sub-regional target. It shows a high proportion of wind energy expected in Hampshire, along with biomass fuelled heating, and smaller proportions of solar power, landfill gas utilisation and anaerobic digestion of biomass. These targets, based on a resource assessment undertaken in 2001 are however considerably lower than the targets set out by the UK Renewable Energy Strategy, which is calling for approximately 30% of electricity being sourced from renewables.

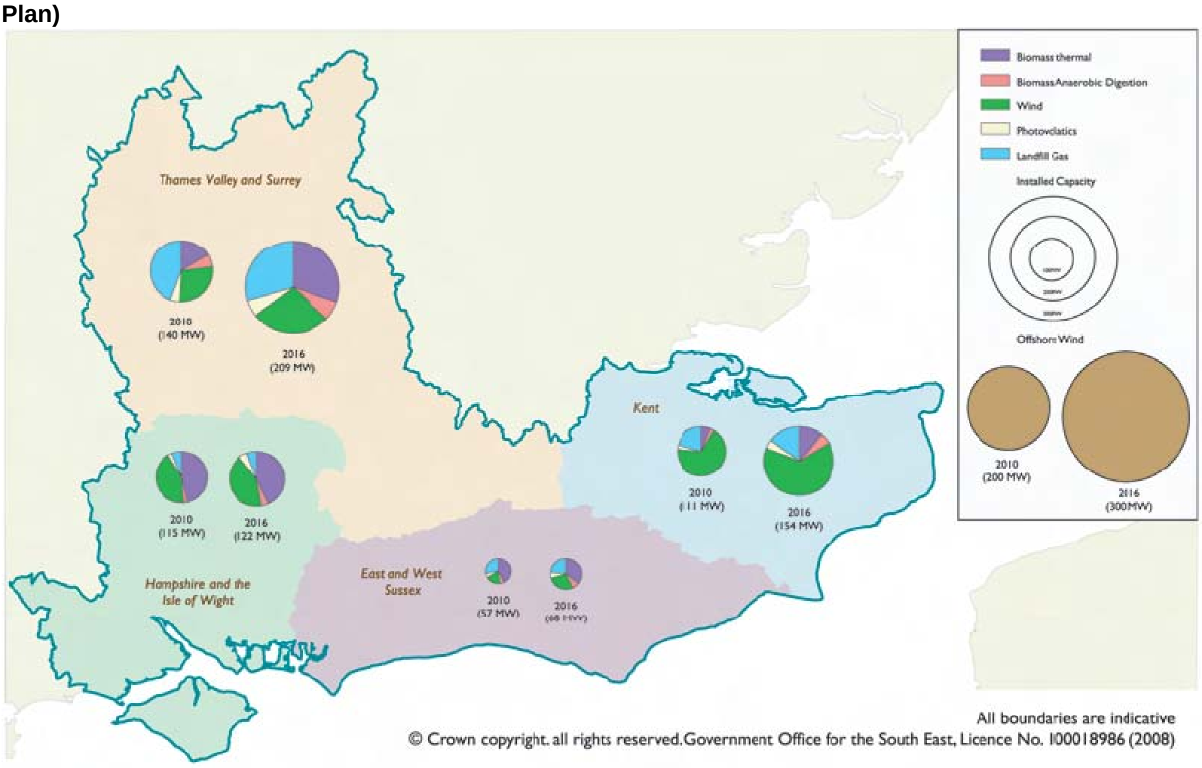
Table 1: South East Plan Policy NRM13 Renewable Energy Targets

Year	Installed capacity (MW)	% Electricity Generation Capacity
2010	620	5.5
2016	895	8.0
2020	1130	10.0
2026	1750	16.0

Table 2: South East Plan Policy NRM14 Hampshire and Isle of White Target for Land-based Renewable Energy

Sub region	Installed Capacity (MW)	% of regional target
2010 Renewable energy target	115	18.5%
2016 Renewable energy target	122	13.6%

Figure 4: Indicative sub-regional renewable energy potential 2010-2016 (diagram NRM 4 from the South East Plan)



Although no targets for the proportion of renewables used for heat generation are set out in the South East Plan, it does acknowledge that 'heat generation and use is also often the most efficient and cost-effective means of using renewable energy'.

The South East Plan also provides guidance on the location of renewable energy development through Policy NRM15, which 'should be located and designed to minimise adverse impacts on landscape, wildlife, heritage assets and amenity. Outside of urban areas, priority should be given to development in less sensitive parts of countryside and coast, including on previously developed land and in major transport areas... informed by landscape character assessment where available…and in… protected and sensitive landscapes including Areas of Outstanding Natural Beauty or the national parks, development should generally be of a small scale or community-based'. In general, however, renewable energy developments should be supported by local authorities, as set out in Policy NRM16. Local development documents should 'include criteria-based policies' that consider:

i. the contribution the development will make towards achieving national, regional and sub-regional renewable energy targets and carbon dioxide savings
ii. the potential to integrate the proposal with existing or new development
iii. the potential benefits to host communities and opportunities for environmental enhancement
iv. the proximity of biomass combustion plant to fuel source and the adequacy of local transport networks
v. availability of a suitable connection to the electricity distribution network.

Policy NRM12 also encourages the use of CHP 'in all developments and district heating infrastructure in large scale developments in mixed use'. The Policy also refers to the fact that the 'use of biomass fuel should be investigated and promoted where possible'. This is supported by Policy NRM7 which focuses on woodland and promotes the use of wood resources, 'including wood fuel as a renewable energy source'.

The South East Plan also sets out requirements to improve the energy performance of new development in Policy NRM11: Development Design for Energy Efficiency and Renewable Energy. It encourages the 'use of decentralised and renewable or low-carbon energy in new development' and in advance of local targets being set in development plan documents, new developments of more than **10 dwellings or 1000m2 of non-residential floorspace should secure at least 10% of their energy from decentralised and renewable or low-carbon sources** unless, having regard to the type of development involved and its design, this is not feasible or viable'. In addition local authorities should use design briefs and supplementary planning documents to 'promote development design for energy efficiency, low carbon and renewable energy'.

2.4 LOCAL POLICY

The three councils' LDFs have a vital role in ensuring future development is delivered in a sustainable manner and reflects the growth requirements set out in the South East Plan. The councils' respective Core Strategies are the most important documents within their LDFs. Core Strategies set out long-term visions for an area over a period of at least 15 years, as well as spatial objectives and strategic planning policies to guide development in accordance with the strategic vision and objectives.

2.4.1 BASINGSTOKE AND DEANE BOROUGH

Basingstoke and Deane Borough Council published their **Core Strategy Issues and Options** for public consultation in January 2008. Comments and feedback received through the public consultation and stakeholder engagement process are assisting the Council in the preparation of its 'key themes' which will be published in Spring 2010.

The Issues and Options Core Strategy provides draft Objectives which will shape development of the borough's communities up to 2026. Objectives 5 and 6 highlight the strategic importance of reducing CO_2 emissions, increasing resource efficiency and harnessing renewable sources of energy going forward. Objective 5 is "*to improve the efficiency of resource use and ensure that all new development makes optimum use of the principles and techniques of sustainable design and construction"*. Objective 6 is *"to reduce significantly emissions of greenhouse gases and mitigate the impacts of climate change".*

The document explicitly states that the Core Strategy has a role in helping the borough to meet national targets for renewable energy generation and CO_2 reduction. Issue 15 sets out the following possible policy approaches to reducing the borough's carbon footprint and adapting to climate change:

1. *Continue our current approach which focuses upon improving the environmental performance of new development, for example by requiring a 'Construction Statement' from developers. Other mechanisms such as Building Regulations will be used to achieve energy and resource efficiency.*
2. *Introduce a higher local target than that set by Government to increase the proportion of energy generated from renewable sources in the Borough. This will include building in mechanisms to encourage and motivate state of the art building, methods and environmental outcomes. For example, we could require a viability assessment of Combined Heat and Power installations for developments greater than a given number of dwellings or level of employment.*

Until such time as the Core Strategy is adopted, the **Basingstoke and Deane Local Plan 1996 - 2011** (adopted July 2006) remains the statutory development plan for the borough. The Local Plan provides a planning policy framework against which the LPA determines planning applications until 2011. Overarching Objective 5 of the Local Plan seeks to protect and enhance the Borough's natural and built environment. The Objective's supporting text in paragraph 0.16 states that *"opportunities will also be taken to promote efficient use of energy and other resources".*

Policy E1: Development Control sets out the parameters which development proposals coming forward in the Borough should reflect. Under the policy, all development should *"incorporate features to minimise the energy consumed in the construction and future use of the building, conserve water and minimise water use".*

Until such time as the Core Strategy is adopted, 'saved' policies within the Local Plan, together with the South East of England Plan provide the basis for the determination of planning applications in the borough. Policy E1: Development Control states that all new development proposals should incorporate features which minimise the energy consumed in the construction and future use of the building.

Policy A6 is specifically concerned with renewable energy generation and states that proposals to generate renewable energy will be granted planning permission providing that:

- structures, transmission lines, and access roads have no significant adverse impact on the historic and natural landscape, landscape character, townscape or nature conservation interests;
- there are no adverse impacts on the amenity of the area in respect of noise, dust, odour, and traffic generation; and
- provision is made for the removal of the facilities and reinstatement of the site should it cease to be operational.

Basingstoke and Deane Council have also adopted a **Design and Sustainability Supplementary Planning Document (SPD)** to provide guidance on how new development in the Borough will be designed and constructed. The SPD requires that:

- all residential development over 10 dwellings to meet Code for Sustainable Homes Level 3; and
- all new commercial buildings over 1,000m2 meet BREEAM 'very good'.

The SPD also supports the renewable energy policy, outlining that proposals should consider cost, technological risk, visual impact/promotional value, site location and characteristics, maintenance, and management. The SPD outlines the planning and design considerations for each type of renewable and low carbon technology.

2.4.2 HART DISTRICT

The emerging **Hart District Core Strategy** sets the long-term strategic planning objectives for the district and identifies the broad locations for delivering the housing growth requirements established in the South East Plan. The council published Core Strategy Preferred Options in 2006 for public consultation. Although subsequent changes in national guidance have necessitated revisions to the Core Strategy, the Preferred Options provide a useful indication of the direction of planning policy in Hart.

The Preferred Options Core Strategy's Vision highlighted the strategic prominence of sustainability and environmental considerations in the district, stating that:

"Hart will apply policies and will develop and use relationships with others to champion and improve the quality of life for its communities through allowing sustainable development, conserving the local environment, enabling access to services and amenities and promoting the best use of resources"

The Preferred Options contained a series of Strategic Objectives which underpinned the delivery of the overarching Vision. A number of these Strategic Objectives reflect the importance of promoting energy efficiency and harnessing renewable energy going forward. Meeting Objective D required that all new developments reduce use of non-renewable resources, increase reuse and recycling of materials and promote renewable energy and water efficiency measures. Objective L sought to promote measures to enable mitigation and adaption to the impacts of climate change while Objective L was to promote the conservation and efficient use of natural and non-renewable resources.

Preferred Policy 17: Design Quality / Sustainable Design and Construction sought to ensure a high standard of design in developments by setting out criteria which proposals are expected to demonstrate compliance with. In particular, design statements would be required to show *'measures to assist in adapting to the impact of climate change and reducing the carbon footprint of the development'*. Furthermore, Preferred Policy 17 stated that:

"For applications made up to the end of March 2010, the Council will require all relevant new building development to provide evidence that it will meet the appropriate current BREEAM 'Very Good' standard. For applications made after March 2010, the Council will require all relevant new building development to provide evidence that it will meet the appropriate current BREEAM 'Excellent' standard".

Preferred Policy 18: Natural Resources sought to encourage new development to contribute to renewable energy targets, to reduce greenhouse gas emissions to take account of the effects of climate change and make prudent and efficient use of natural resources, whilst taking into account other environmental, policy and material considerations, by:

- *Requiring submission of an assessment of a proposed development's energy demand and evidence that a proportion of this demand will be from renewable sources for housing schemes of over 10 dwellings and commercial schemes of over 1,000m²;*
- *Supporting the use of renewable energy generation and micro-renewable projects, subject to these not having an adverse effect on areas, sites, buildings or other features that are nationally designated as having special significance for their biodiversity, heritage or amenity value and subject to any significant adverse effects in all other cases being fully mitigated; and*
- *Requiring all development applications to include proposals to incorporate measures delivering energy efficiency and promoting recycling or re-use of waste products.*

Until the adoption of the Core Strategy, the **Hart District Local Plan 1996 - 2006** remains the statutory development plan for the district. Delivering sustainable development is the overall aim of the Plan and safeguarding the districts resources and assets is identified as a key objective within this overarching goal.

Policy GEN10: Renewable Energy states that proposals for renewable energy schemes will be permitted provided that:

- The impact of the development on the immediate and wider landscape is not significantly detrimental;
- The proposal does not adversely affect features and areas of ecological, historic or cultural interest;
- The impact of development on local land use and residential amenity is minimised, both during and after construction, to the satisfaction of the local planning authority;
- The proposal is justified in terms of local and wider benefits; and
- The location is necessary as the particular resource can only be harnessed where it occurs.

Hart District requires **Design and Access Statements** to be submitted with development proposals. The Design and Access Statement Guidance has a section on 'Addressing sustainability and climate change' based on the requirements in supplement to PPS1 and the South East Plan. Requirements for non-householder applications include:

- Explaining how the proposed site layout and design maximise energy efficiency and how at least 10% of the development energy demand will be met by decentralised renewable or low carbon energy sources;
- Demonstrate how existing land and buildings will be re-used in the development;
- Demonstrate how the use of appropriate SUDs has been incorporated;
- Demonstrate how water efficiency including grey-water recycling has been implemented;
- Explain how adequate storage has been provided for recycling;
- Demonstrate what measures have been included to encourage alternative transport choices to the car, including secure cycle parking; and
- Explain how landform and landscape has been used to provide accessible shelter during summer in open spaces.

2.4.3 RUSHMOOR BOROUGH

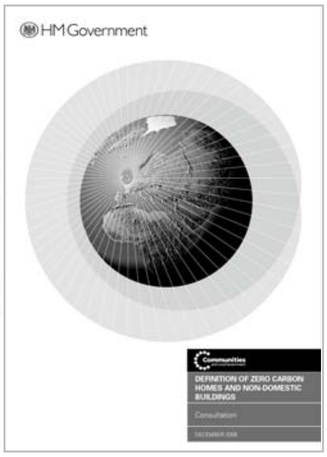
Rushmoor is currently preparing its Core Strategy. Until the Core Strategy is adopted by the Council, the **Rushmoor Local Plan (Review) 1996-2011** (adopted 2000) remains the statutory development plan for Borough. One of the Plan's overarching objectives is to promote and encourage sustainable development and maintain the borough's environmental quality. Policy ENV16, which sets out the overarching development control criteria for major developments suggests applicants should have regard *"to the need to conserve energy, by considering orientation and exposure to prevailing wind and incorporating design and construction features which will reduce energy demand".*

Rushmoor have adopted a **Sustainable Design and Construction Supplementary Planning Document (SPD) (2006)** to encourage sustainable development in the Borough. The SPD outlines the potential for renewable energy as a key consideration in the selection of good locations for development. It also outlines that planning and mix of uses can increase the viability of CHP systems. It outlines good design principles for energy efficiency, showing the benefits of housing with adjoining walls to prevent heat loss, correctly orientated roof space for use of solar technologies and passive design to naturally capture heat and light.

2.5 BUILDING REGULATIONS AND THE TRAJECTORY TO ZERO CARBON

The **Building Regulations** first started to turn its focus towards reducing CO_2 emissions in the 2002 revision to Part L (Conservation of Fuel and Power). Further revisions to Part L in 2006 brought the UK Building Regulations in line with the EU's Energy Performance of Buildings Directive (EPBD), introducing amongst other things the requirement for Energy Performance Certificates (EPCs).

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



Following consultation, the Government's **Building A Greener Future: Policy Statement** announced in July 2007 that all new homes will be zero carbon from 2016. In the Budget 2008, the Government also announced its ambition that all new non-residential buildings should be zero carbon from 2019 (with earlier targets for schools and other public buildings). The Government has also indicated that non-residential buildings will be required to be zero carbon by 2019, again implemented through the Building Regulations.

The **Definition of Zero Carbon Homes and Non-Residential Buildings** consultation in 2009 sought to clarify the definition of zero carbon that will be applied to new homes and buildings through proposed changes to the Building Regulations. A statement by John Healey, Minister for Housing and Planning, in July 2009 confirmed the policy to require all new homes to be zero carbon by 2016 and set out the proposals which will be taken forward to implement this policy. This addressed the concern that the original definition, which followed the definition of Code for Sustainable Homes Level 6, would not be feasible or viable on many sites.

Prior to the introduction of the zero carbon requirement, the following intermediary step changes are proposed to the requirements of Part L of the Building Regulations for dwellings:

- 2010: 25% improvement in regulated emissions (relative to 2006 levels). This is expected to broadly correspond to the energy and CO2 element of Level 3 of the Code for Sustainable Homes. The changes are being discussed as part of a current government consultation.
- 2013: 44% improvement in regulated emissions (relative to 2006 levels), corresponding to Code Level 4
- 2016: Zero carbon in terms of both regulated and unregulated emissions

The figure below illustrates the planned changes in the Building Regulations requirements for dwelling emission rates. One of the key points is that the requirements in 2010 and 2013 will only apply to the emissions that are currently regulated, which are associated with energy use for fixed building services (heating, ventilation, cooling and lighting) inside the dwelling. From 2016, the requirements will apply to all emissions associated with energy use in the dwelling, including cooking and other appliances.

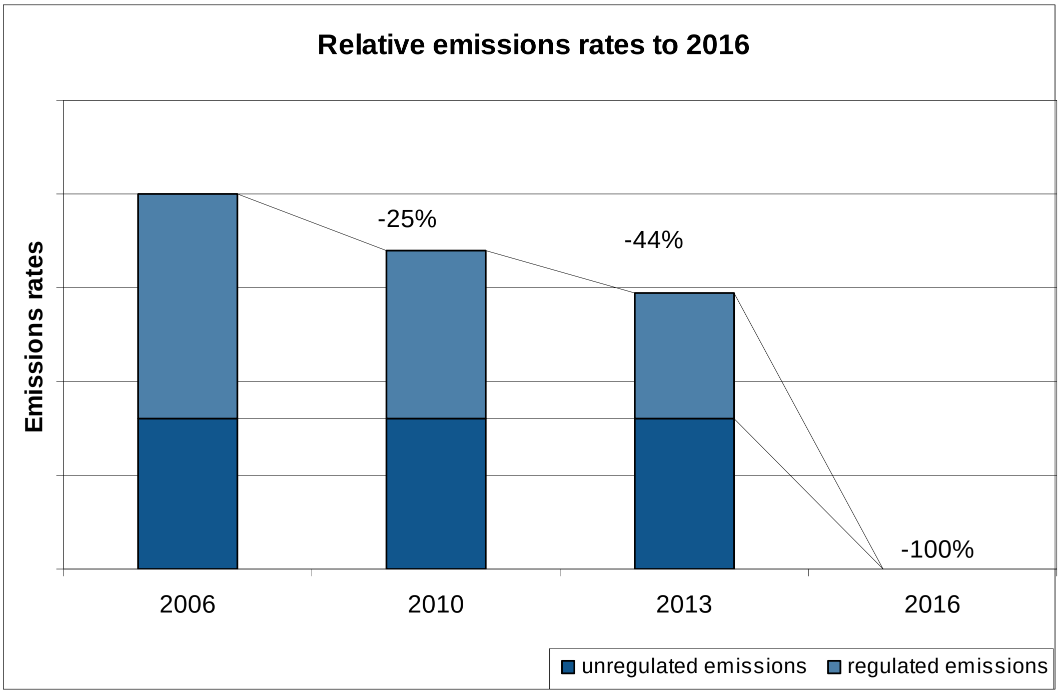


Figure 5: Incremental changes to Building Regulations Part L requirements for dwelling emission rates

The Government has published a hierarchy for how CO2 emissions should be reduced to achieve the zero carbon emissions standard, as in the figure below.

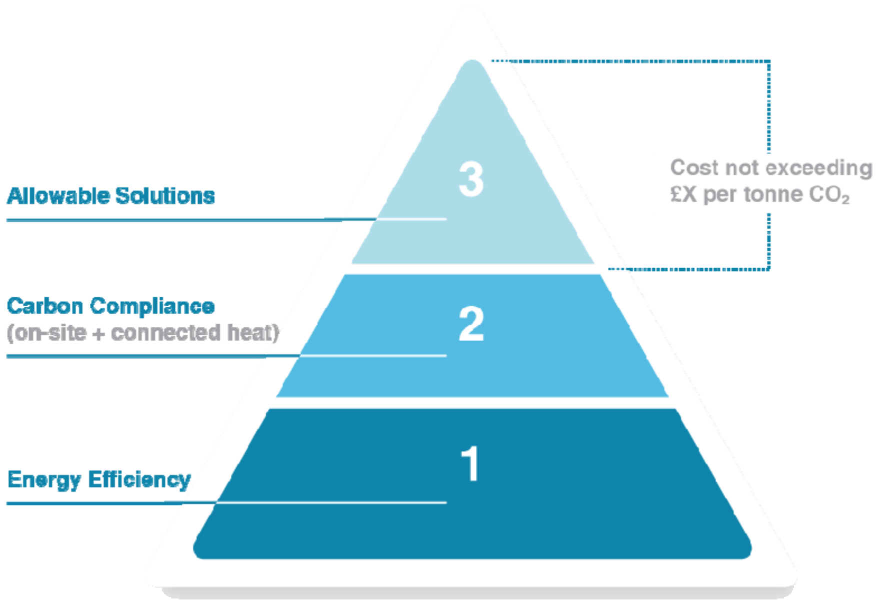


Figure 6: The Government's hierarchy for reducing CO_2 emissions

Developments will not be required to achieve zero carbon emissions entirely within the site boundary. There will be a minimum requirement for emissions savings through energy efficient design of the building services and building fabric; the amount is to be determined by the Government by the end of 2009. Further measures will be required to achieve "carbon compliance" on-site, bringing the regulated emissions savings on-site up to a 70% on TER. These can include building integrated renewable energy, additional energy efficiency features and connection to a heat network.

The residual CO2 emissions beyond carbon compliance are to be dealt with through "allowable solutions". Likely allowable solutions include:

- Further CO_2 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; or
- 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.

Currently, it is undecided who will coordinate and deliver allowable solutions, though LPAs are expected to play a role and should account for the effect of allowable solutions in planning.

2.6 CODE FOR SUSTAINABLE HOMES

The Code for Sustainable Homes (CfSH, The Code), developed by BRE and supported by the Department of Communities and Local Government (DCLG), sets out a national rating system to assess the sustainability of new residential development, replacing the previous system 'Ecohomes'. The CfSH consists of a number of mandatory elements which can be combined with a range of voluntary credits to achieve a credit level rating of between 1 and 6 covering nine sustainability criteria including CO_2 reduction, water, ecology, waste, materials, management and pollution. If the mandatory elements for a particular level are not reached, irrespective of the number of voluntary credits, then that code level cannot be achieved. This means that to achieve a full code rating, a range of sustainability issues will have to be incorporated into the building and site design.

Table 3: Performance required to meet Code levels.

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

The PPS1 Supplement states that planning authorities should specify requirements for sustainable buildings "in terms of achievement of nationally described sustainable buildings standards, for example in the case of housing by expecting identified housing proposals to be delivered at a specific level of the Code for Sustainable Homes". Where such local requirements go beyond national requirements including the Building Regulations, the evidence base must justify this based on local circumstances.

Since May 2008 it has been compulsory for new homes to have a CfSH rating. There is currently no national minimum requirement for the rating that they achieve, however proposed changes to the Building Regulations are expected to reflect the requirements of the Code for energy. However, 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.

Cost Implications of the Code for Sustainable Homes

The graphs below show the predicted % increase over the base build cost to deliver Code targets 4, 5 and 6, broken down by the assessment category areas for a flat and a house. The graphs exclude the costs associated with credits ENE 1, 2 and 7 which are assumed to be covered in the costs discussed in the following Chapters to deliver the mandatory energy requirements.

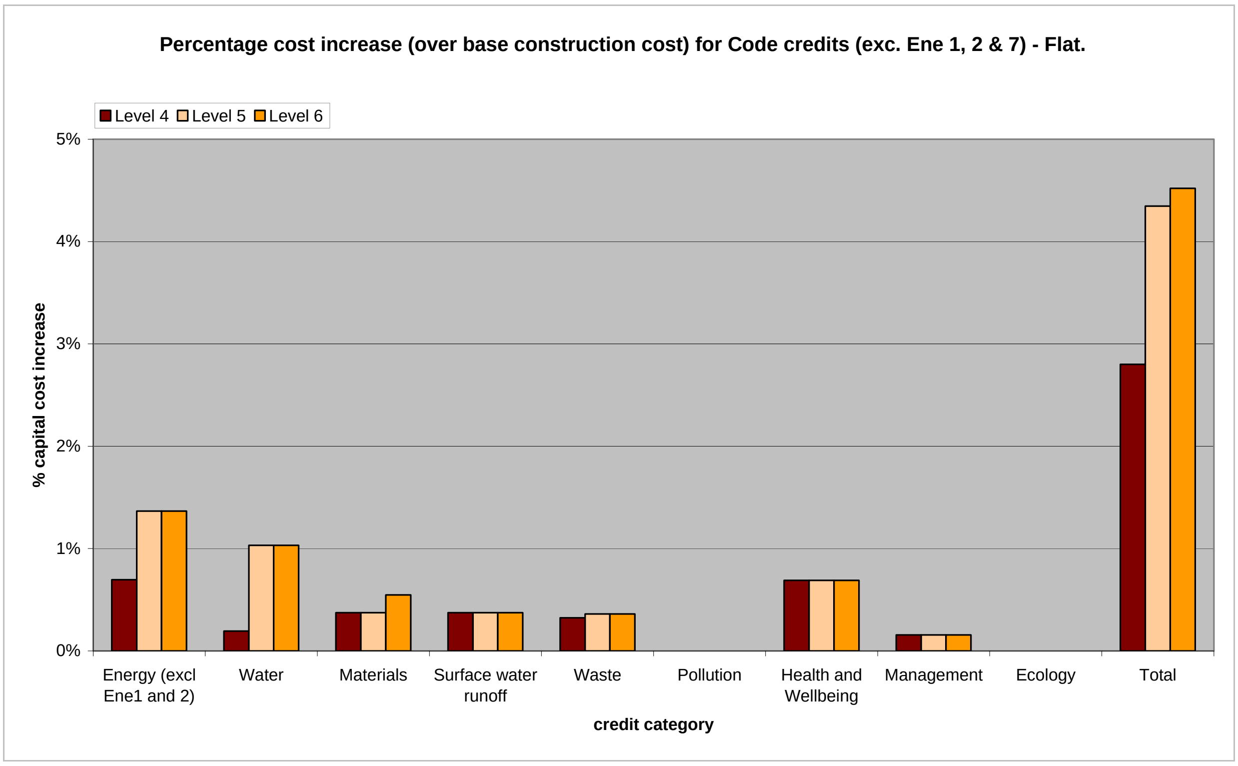


Figure 7: Costs (over base construction cost) for delivering Code credits as required to levels 4, 5 & 6 for a flat

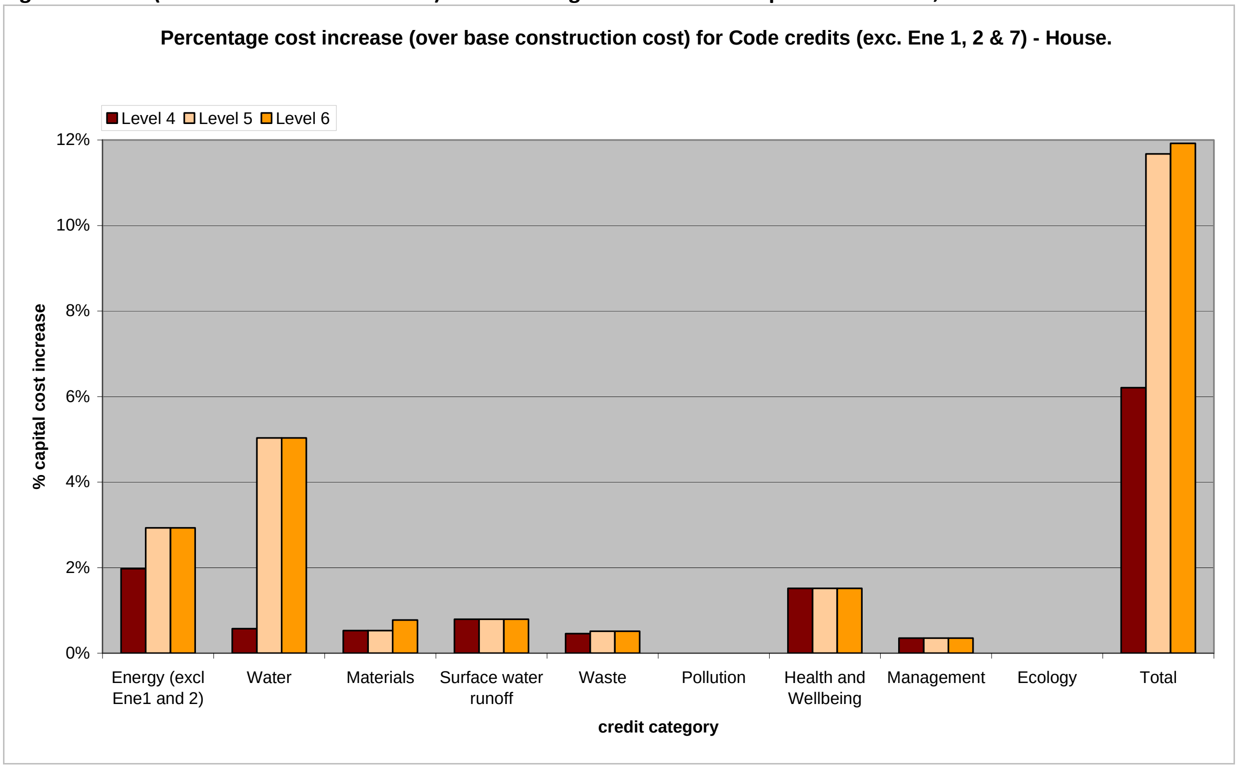


Figure 8: Costs (over base construction cost) for delivering Code credits as required to levels 4, 5 & 6 for a house

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

Predicted costs show that costs associated with meeting advanced Code for Sustainable Homes levels are relatively modest for most elements. However a 'jump' in cost is evident upon an increase from Code Level 4 to Code Level 5/6 due to the requirements to meet higher levels of water efficiency through water recycling measures.

2.7 BREEAM

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

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

- Management
- Health and Well Being
- Energy
- Transport
- Water
- Materials and Waste
- Land Use and Ecology
- Pollution

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

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

Cost Implications of BREEAM Standards

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

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

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

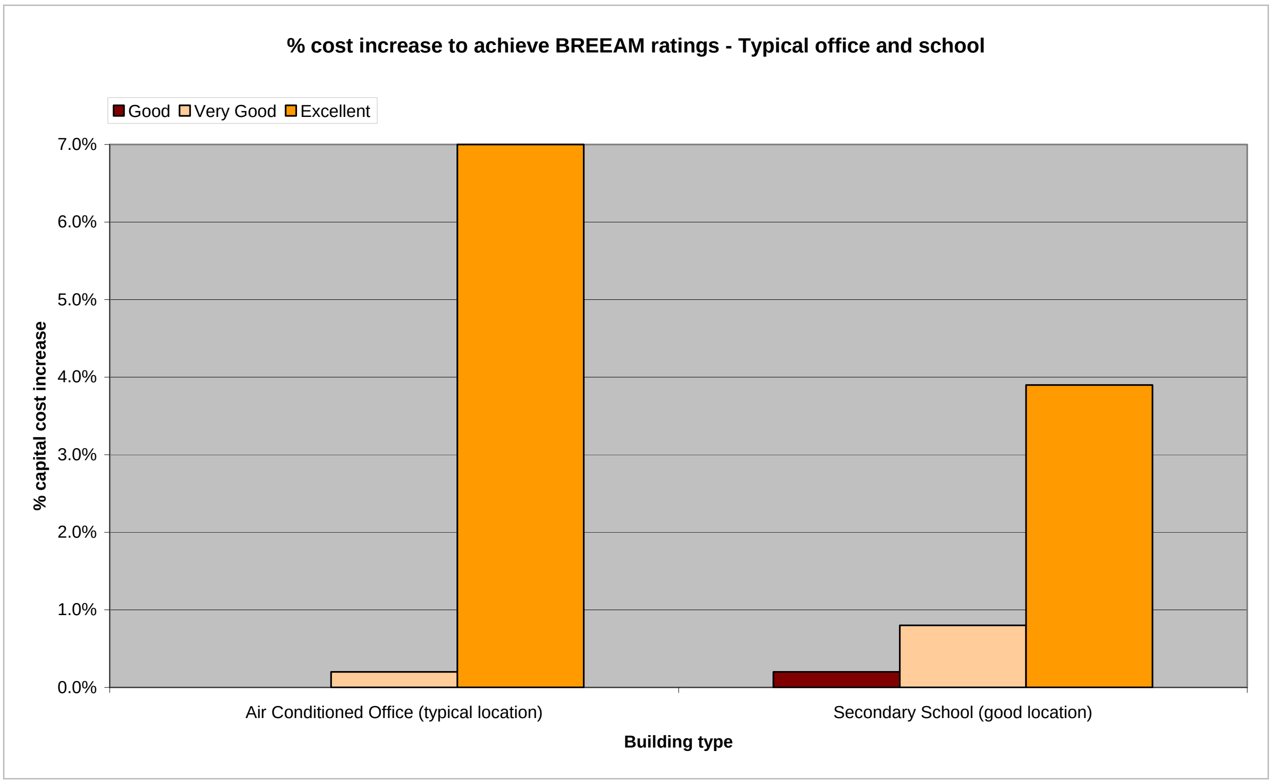


Figure 9: Costs (over base construction cost) for delivering BREEAM Offices (2004) and BREEAM schools ratings.

The cost analysis above 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 substantial.

2.8 KEY CONSIDERATIONS EMERGING FROM THIS CHAPTER

The sections above have considered the wider policy context, and some key findings have emerged that should be considered in the development of local policies for the LPA areas:

- There are very strong and challenging policy drivers for both the reduction of CO_2 emissions and the inclusion of renewable and low carbon technologies from a national level;
- These drivers are reinforced by targets and policy at a regional level, though to some extent regional targets are out-of-date due to recent advances in National policy;
- The local planning documents and emerging Core Strategies of the LPAs provide a useful framework for the implementation of policy relating to building related CO_2 emissions. This study is being conducted at a stage where it can directly recommend policy for inclusion in Core Strategies.
- PPS1 Supplement requires LPAs to investigate the potential for the inclusion of renewable and low carbon technologies in their LPA area, and to identify opportunities to exceed LPA area-wide targets on strategic sites where there is good potential for additional CO_2 reductions. Therefore LPAs need to both consider policies on an area-wide scale and policies for specific sites where additional opportunities exist for additional CO_2 reductions.
- Expected changes in Building Regulations will significantly decrease CO_2 emissions from new development, therefore removing some emphasis in this role from planning authorities.

- The changes to Building Regulations are likely to create demand for 'Allowable Solutions' which involve the development of solutions outside of the site boundary that can further reduce CO_2 emissions associated with new development. LPAs are likely to need to play a role in coordinating and delivering Allowable Solutions.
- 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. The energy sections of these tools can be utilised as a policy tool.
- The Code and BREEAM also require other sustainability aspects to be addressed. The costs associated with other aspects are considered reasonable in relation to the overall build cost for levels up to and including Code for Sustainable Homes Level 4 and BREEAM 'Very Good'.

3. Physical Context: Energy Demand from the Built Environment

3.1 INTRODUCTION TO THIS CHAPTER

This chapter considers the existing and future performance of buildings in North Hampshire in terms of demand for energy (both electricity and heat). Firstly, it considers the current performance of buildings in each LPA area, and then considers how this energy demand from existing buildings is likely to change over time. Secondly, it considers the level of growth expected in the LPA areas over the Core Strategy periods (until 2026). The energy modelling described in this Chapter was undertaken using AECOM energy use models and building typologies developed through professional research projects.

3.2 ENERGY PERFORMANCE OF EXISTING BUILDINGS

The following sections consider the current performance of existing homes and other buildings.

3.2.1 RESIDENTIAL BUILDINGS

There are several sources of information available which help us to analyse the state of existing stock in the LPA areas. BERR provides a national data set of energy use of residential buildings within each LPA area. Information is also available from Housing Condition Surveys (where available) and through reporting under the Home Energy Conservation Act 1995. This study has reviewed the following reports:

- Basingstoke & Deane Borough Council, Housing Condition Survey (2006)
- Hart District Council, Housing Condition Survey (March 2005)
- Rushmoor Borough Council, Stock Condition Survey (2001)
- Basingstoke & Deane Borough Council, Home Energy Strategy (2007)
- Basingstoke & Deane Borough Council, Annual Housing land Supply Position Report (October 2008)
- Hart District Council, Home Energy Conservation Act 1995 Report (2008)

Home Energy Conservation Act

All local authorities have been given the status of Energy Conservation Authority (ECA) by the Home Energy Conservation Act and are mandated to carry out voluntary cost effective and practical measures that will reduce home energy consumption by 30% over 10 to 15 years, that is, by 2006 or 2011[1]. The measures as defined by HECA include a combination of any or all of the following:

a. Improve levels of insulation, that is:
    - Add or increase loft insulation to a thickness of 200mm
    - Add cavity wall insulation, where applicable
    - Add or increase insulation of hot water cylinders, tanks and pipes
b. Install or upgrade heating systems to gas powered programmable central heating
c. Upgrade all windows to double glazing
d. Install low energy lighting and energy efficient electrical appliances
e. Provide good quality advice to householders.

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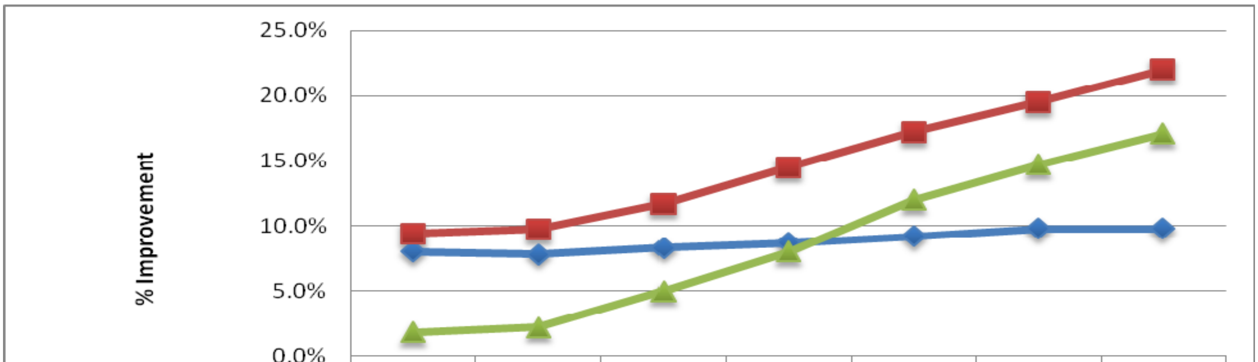
[1] Consultation on the Review of the Home Energy Conservation Act 1995 (HECA), DEFRA (October 2007)

ECAs are also obliged to report annually on the uptake of energy conservation measures. The report must include costs, CO_2 savings and annual improvements achieved in the energy efficiency of the housing stock.

In response to the requirements of HECA, local authorities have devised several innovative schemes and kick-started initiatives which include; the establishment of community businesses, provision of loans and use of negotiated bulk discounts, as well as innovative approaches to giving advice and raising awareness. These schemes vary from one authority to another. These schemes have been developed to encourage the uptake and implementation of energy efficiency measures for the private housing sector with the goal of achieving a 30% improvement in energy efficiency of the stock. That is, increasing the average SAP[2] (Standard Assessment Procedure) ratings of the housing stock from its current level by 30%; for instance, an increase from 50 to 65.

The graph below gives a summary of the improvement in energy efficiency as reported by the Councils between 2001 and 2007 according to the HECA reports. However, data from individual authorities are inconsistent and cannot be compared as there are variations in the methodologies used by the authorities. It would have been easier to draw a comparison of the performance of the various councils based on their annual HECA report; however, this has not been possible due to the inconsistency in the method of reporting energy efficiency across the councils. The HECAMON software (Version 3, issued by DEFRA in April 1999 and updated in April 2001) was specifically developed and recommended for collecting and collating energy efficiency data by the ECAs, but this has not been made mandatory and therefore is not often used.



	2001	2002	2003	2004	2005	2006	2007
Basingstoke & Deane	8.0%	7.8%	8.3%	8.7%	9.2%	9.8%	9.8%
Hart	9.4%	9.7%	11.7%	14.5%	17.2%	19.5%	22.0%
Rushmoor	1.8%	2.2%	5.0%	8.0%	12.0%	14.7%	17.1%

Figure 10: Improved Energy Efficiency (2001 - 2007) as Reported in the Councils' Annual HECA Reports

Local Energy Efficiency Initiatives

According to the English Housing Condition Survey (EHCS) 2007, the energy efficiency of homes in England has improved from an average SAP rating of 42 (1996) to 50 (2007) due to energy efficiency measures. On an LPA area basis in North Hampshire there are differences in performance in response to varying degrees of penetration of local energy efficiency initiatives.

[2] The energy efficiency level of a dwelling is often measured by its SAP Rating, also known as Energy Ratings. Houses are rated from 0 – 100; 0 (Least efficient) and 100 (Most efficient). SAP ratings are the Government's standard methodology for home energy rating and uses SEDBUK figures to calculate the energy needed for space heating and hot water supply systems. The Building Regulations require a SAP assessment to be carried out on all new dwellings (Source: DEFRA, April 2006).

Basingstoke & Deane Borough Council

It appears that there has been a relatively high uptake of energy efficiency measures in Basingstoke with 2006 statistics showing that over 80% of the dwellings have loft insulations above 100mm as well as double glazing[3]. Almost all the dwellings (95%) in this council have full central heating; hence the average SAP rating of 62 and this is well above the national average of 50.

Hart District Council

Due to the modern stock of the Hart district, most of which currently provide an adequate level of thermal efficiency, energy efficiency levels are much higher than national averages. This has been attributed to the high provision of central heating and building insulation. Fuel poverty is very low at 2%, compared to 11% for England[4]. Average SAP rating for the dwellings in the district is 58.

Rushmoor Borough Council

The average SAP rating for Rushmoor is 50, the least of the three councils. Only about 1.3% of the dwellings have the current recommended standard of insulation (200mm), while the majority (65.7%) of dwellings had no more than 100mm of loft insulation[5]. The majority of the housing stock is old and therefore improving energy efficiency in Rushmoor is likely to have significant cost implications.

Factors Affecting Performance of Existing Buildings

The estimated number of dwellings is comparable in Rushmoor and Hart, with around double the amount of existing stock in Basingstoke and Deane. The table below provides a summary and comparison of the profile of the existing housing stock of the three councils.

[3] Basingstoke & Deane Borough Council, Home Energy Strategy (2007)
[4] Hart District Council, House Condition Survey (March 2005)
[5] Rushmoor Borough Council, Housing Condition Survey (2001)

Table 4: Existing Housing Stock across 'The Councils'

			Basingstoke	Hart	Rushmoor	South-East	England
	General Summary	**Estimated total dwellings**	61754	32464	35267		
		Occupied dwellings	96.9%	98.2%	98.4%		
		Vacant dwellings	3.1%	1.8%	1.6%		
		Decent	84%	75%	**n/a**	**n/a**	67%
		Not Decent	16%	26%	**n/a**	**n/a**	33%
		Fuel poverty	2%	2%	**n/a**	**n/a**	11%
		Modern buildings (post 1964)	74%	72%	47%	**n/a**	**n/a**
		Average SAP	62	58	50	**n/a**	50
		Houses with SAP < 35	1.3%	8.0%	4.0%	**n/a**	10.0%
		Houses with SAP > 65	61.3%	30.0%	25.2%	**n/a**	14.0%
		Cost of improvements (£million)	31.8	19.5	67.8		
Existing Housing Stock Profile	**tenure**	Owner-occupier	82.2%	79.4%	75.2%	77.0%	69.0%
		Private rented & other	17.6%	7.2%	7.9%	8.0%	13.0%
		HA/ Council/ RSL	0.2%	13.4%	16.9%	15.0%	18.0%
		total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
	house type	Terrace	27%	23%	30%	30%	28%
		Semi-detached	29%	28%	32%	29%	32%
		Detached	37%	40%	19%	24%	22%
		Purpose built flat	6%	8%	17%	12%	13%
		Converted flat	1%	1%	2%	5%	5%
		total	**100%**	**100%**	**100%**	**100%**	**100%**
	age	Pre 1919	6%	8%	15%	21%	23%
		1919 - 1944	3%	4%	17%	16%	19%
		1945 - 1964	16%	16%	22%	20%	21%
		Post 1964	74%	72%	47%	43%	37%
		total	**100%**	**100%**	**100%**	**100%**	**100%**

The performance of existing buildings depends on a number of factors including:

1. *Building type*: The mix of housing types varies largely across the Councils. Like Basingstoke & Deane, Hart district has a large percentage of detached houses (40%) and fewer flats (9%) as opposed to Rushmoor council with 19% of house types being flats, while the majority are either semi-detached or terraced. The energy demand of a home varies greatly based on building type. Buildings with a high amount of adjoin exterior walls (like flats or terraced housing) are more efficient due to reduced heat loss. Differences in energy efficiency due to housetype are demonstrated in the figure below.
2. *Age of Buildings*: Generally, the Councils have a younger dwelling stock when compared with equivalent regional or national data. Basingstoke & Deane Council boasts the most modern stock; about three-quarters of the dwellings were built post 1964 and this probably explains why over 80% of dwellings in this council have been classified as decent. The situation is similar in Hart district, whereas less than half of the dwellings in Rushmoor are modern (post 1964) and about a third of the housing stock was built before 1945.

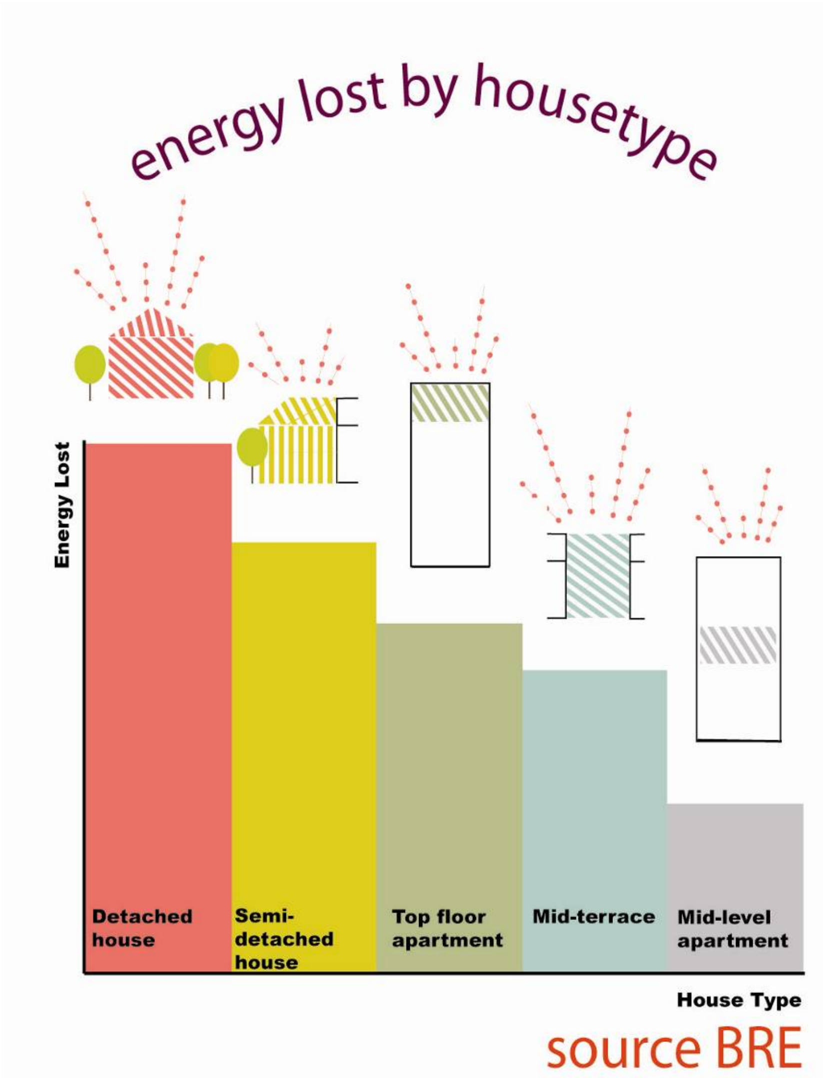


Figure 11: Energy efficiency of different housing types

3. *Tenure*: The type of tenure and the utility billing arrangements have effect on the energy use of a property. The English House Condition Survey (DCLG, 2007) 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. Between 1996 and 2007, Registered Social Landlord (RSL) dwellings have consistently had a higher average SAP rating compared to the other three tenures. This is demonstrated by the figure below.
4. *Local Initiatives*: Also the penetration of local energy efficiency measures will differ across LPA areas as described in the section above.

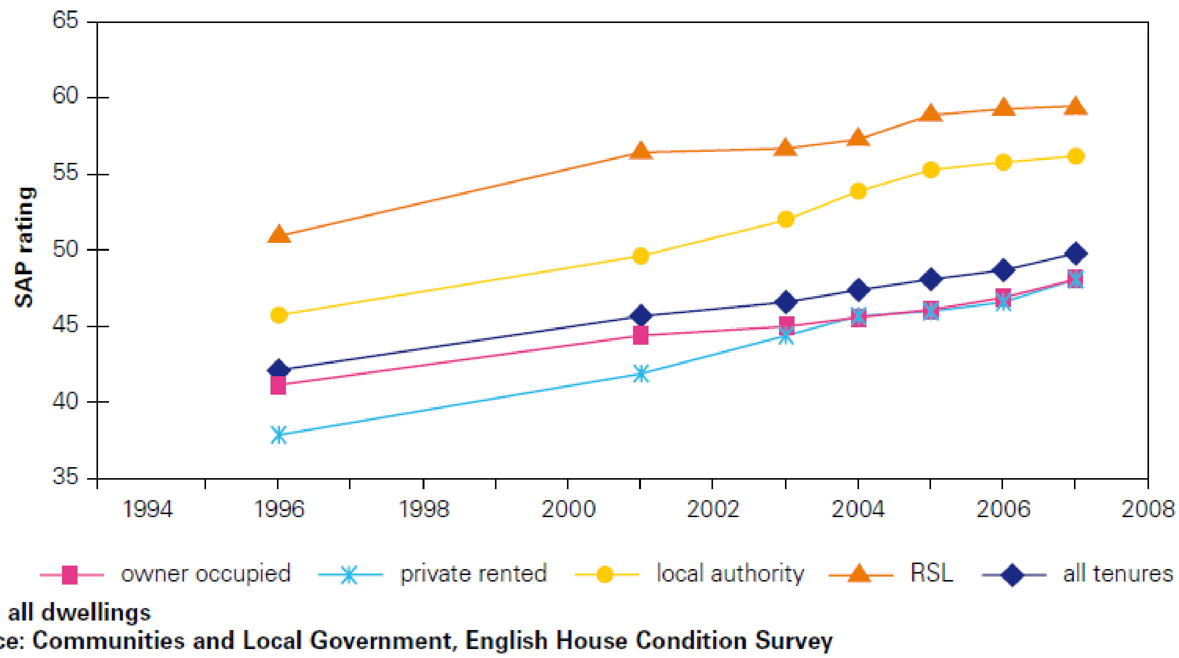


Figure 12: Energy Efficiency, Average SAP rating by Tenure (England), 1996 – 2007

Energy Demand of Existing Homes

The factors described above affect the energy demand of buildings. BERR data helps us to understand the actual use of energy by buildings in the LPA areas. BERR energy use data in 2006 has been used as a baseline in this study due to data availability and to see cohesion with the Core Strategy periods. BERR provides spatial data (based on 'Middle Super Output Areas') for both electricity and gas use, and also provides oil and coal demand on an LPA area level.

The tables below compares the performance of residential buildings in the three LPA areas to the southeast and British average. The figures demonstrate that Hart District has the highest electricity and gas demand per home, both of which are significantly higher than the averages for the South East. Homes in Rushmoor are the most efficient of the three councils.

Table 5: Energy consumption per consumer (BERR, 2006)

	Average electricity sale per consumer	Average gas sale per consumer
	Residential kWh	Residential kWh
Basingstoke and Deane	4,890	17,389
Hart	5,146	21,204
Rushmoor	4,329	17,965
South East Average	4,780	18,322
Britain Average	4,457	18,241

Table 6: Energy demand from residential buildings for each LPA area

District	Residential Electricity Demand (GWh)	Residential Gas Demand (GWh)
Basingstoke and Deane	332	942
Hart	187	689
Rushmoor	158	595
	Residential CO_2 Emissions from Electricity Demand (ktonnes)	**Residential CO_2 Emissions from Gas Demand (ktonnes)**
Basingstoke and Deane	143	194
Hart	80	142
Rushmoor	68	122

The spatial variation of electricity and gas use gives us an insight into the areas of existing stock which are least efficient and should be a priority for improvement. The figures below show relative performance spatially. The western area of Basingstoke and Deane shows a high electricity and low gas use as most areas are not currently served by gas supply, and therefore there is a dominance of electric heating.

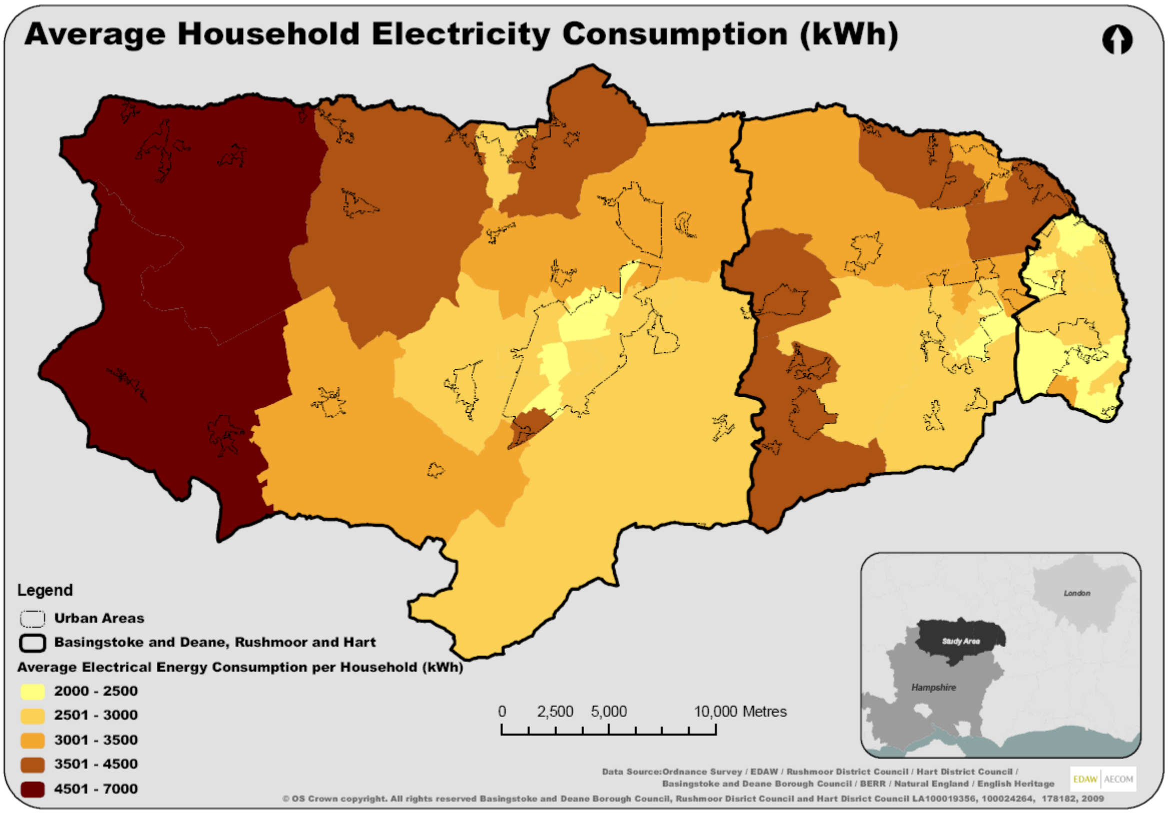


Figure 13: Electricity Consumption per Household in North Hampshire

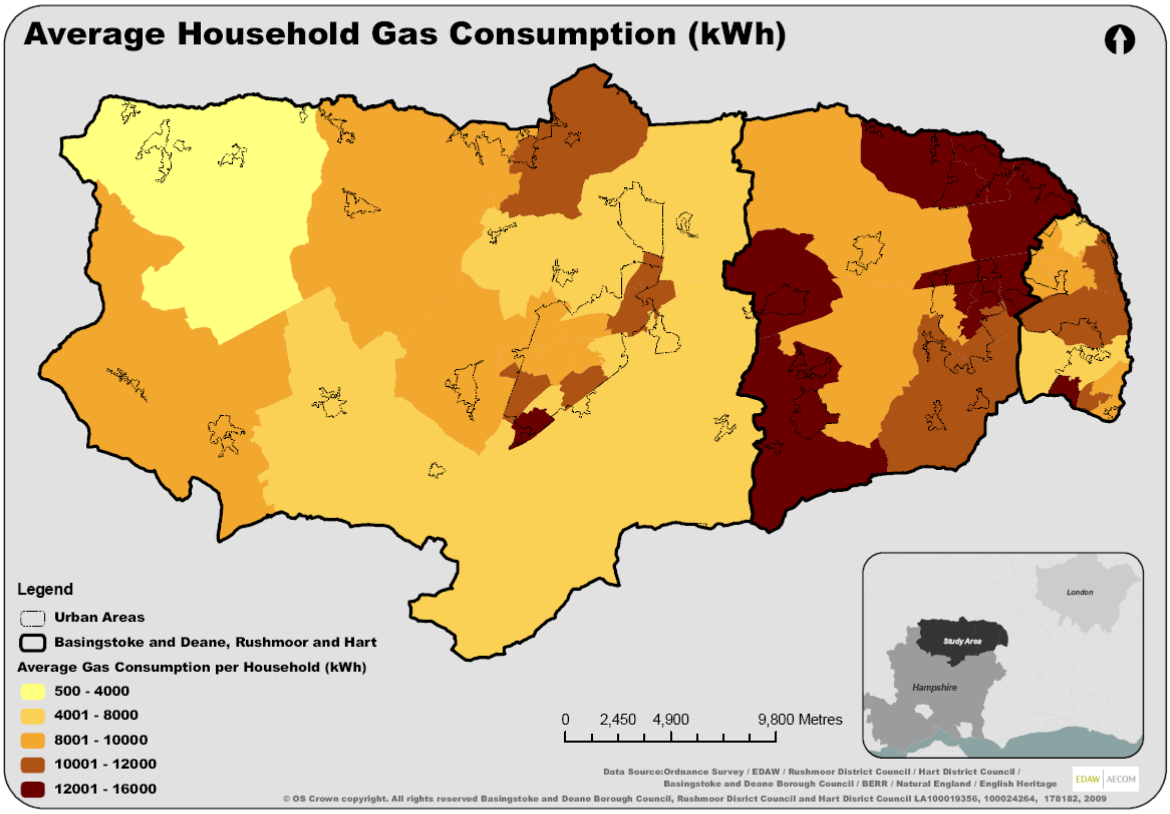


Figure 14: Gas consumption per household in North Hampshire

Use of other fuels

While gas is the primary source of heating fuel across the LPA areas, buildings also use oil and coal for heating purposes. The use of oil and coal varies, with Basingstoke and Deane having the highest use of other fuels per home, followed by Hart and Rushmoor. This is due to a high portion of rural homes in Basingstoke and Deane Borough and Hart District.

Table 7: Use of other fuels in each LPA area in 2006

District	Domestic Oil (MWh)	Commercial Oil (MWh)	Domestic Coal (MWh)	Commercial Coal (MWh)
Basingstoke and Deane	201	12	6	18
Hart	54	4	4	5
Rushmoor	26	5	13	2

Commentary on Carbon Performance of Existing Homes

Basingstoke and Deane Borough

Basingstoke and Deane Borough has a high proportion of modern stock, and as such there is a relatively modest amount of work required to improve the energy efficiency of the dwellings. Homes in the Borough have a relatively high SAP rating of 62. The high proportion of detached homes means that despite efficient build, the energy use is close to the average in the South East. The gas demand is particularly low, but this is likely to be due to the high use of electricity, oil and coal as heating fuels in rural properties – these are all high carbon fuels for heating, and initiatives should focus on fuel conversion in rural properties.

Hart District

Hart also has a high proportion of modern stock, meaning that the SAP rating is relatively high at 58. The generally low density of development in the District and high proportion of semi-detached and detached housing is likely to mean that heat loss is high in homes. This is supported by BERR data, which indicated both gas and electricity use in Hart is the highest of the LPA areas and exceeds the South East and National averages. Hart also uses a high proportion of oil and coal, which are high carbon fuels. Consequently, Hart has the highest relative carbon profile of the three LPA areas for residential buildings. Hart District Council has recorded a significant improvement in existing buildings since 1996. The District Council is taking a proactive approach to increasing energy efficiency in the private housing sector. This is also shown in the recent "*HeatSeekers project"* carried out in March 2009 to identify buildings with insulation deficiencies. The project involved a thermographic survey of residential buildings using the new *Heatseekers* vehicle; developed and mobilised by the Energy Saving Partnership. This project will be concluded next year, but so far, 4200 houses have been surveyed and 1500 of these have failed and will be recommended for additional insulation packages.

Rushmoor Borough

Rushmoor has the oldest housing stock, and a lower SAP rating of 50. Consequently, there are an extensive range of retrofit improvements possible to reduce CO_2 emissions from existing stock. However, Rushmoor is not the worst performing LPA area on an energy use basis, probably due to the fact that the housing stock is mostly higher density, with a high proportion of flats and terraced housing which is naturally more energy efficient. Due to the urban nature of the Rushmoor Borough, there is low use of high carbon heating fuels like oil and coal.

3.2.2 NON-RESIDENTIAL BUILDINGS

BERR publish commercial and industrial energy consumption collectively. In 2006, the total electricity consumption from non-residential users in North Hampshire was as shown in the table below. BERR do not provide a geographical breakdown that includes the location of high energy users as it is potentially possible to identify individual businesses, contravening privacy policies. The non-residential energy demand shows a high quantity of commercial and industrial activity in Basingstoke and Deane Borough compared to the other two LPA areas. The figure below demonstrates the energy use of non-residential buildings compared with residential buildings in each area. Comparatively, Basingstoke and Deane has a high proportion of non-residential energy demand, followed by Rushmoor then Hart. Non-residential energy demand makes up almost half of the total energy demand in all LPA areas. This emphasizes that improvement programs should be focussed on both residential and non-residential buildings.

The table below also emphasizes the carbon context of electricity in comparison to gas. Electricity from the grid is more carbon intensive than gas supply, meaning that while electricity and gas demand are roughly equivalent in all LPA areas in terms of giga-watt-hours (GWh) energy use, the CO_2 emissions associated with electricity are approximately double.

Table 8: Energy demand from non-residential buildings

District	**Non-residential Electricity Demand (GWh)**	**Non-residential Gas Demand (GWh)**
Basingstoke and Deane	567	588
Hart	185	184
Rushmoor	344	283
	Non-residential CO_2 Emissions from Electricity Demand (ktonnes)	**Non-residential CO_2 Emissions from Gas Demand (ktonnes)**
Basingstoke and Deane	244	121
Hart	80	38
Rushmoor	148	58

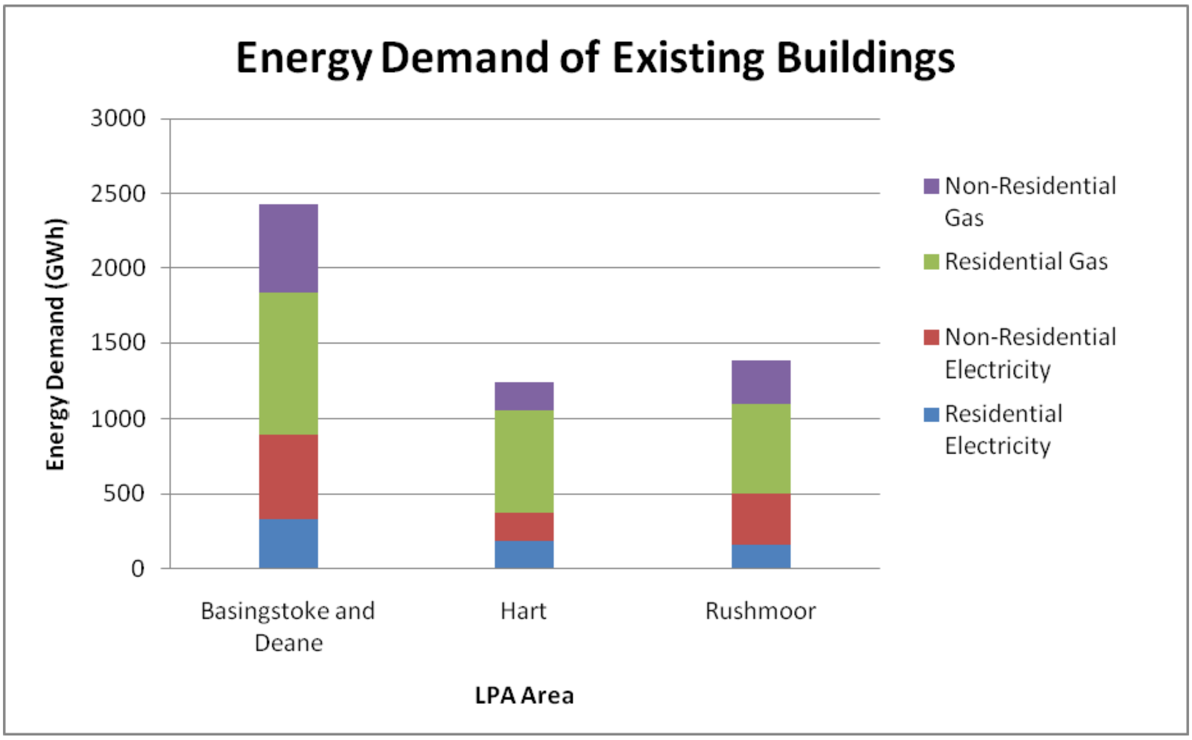


Figure 15: The electricity and gas demand of the three LPA areas, showing residential and non-residential breakdown.

3.3 FUTURE PERFORMANCE OF EXISTING BUILDINGS

The carbon profile of existing buildings will not remain static over time. Instead we can expect changes in energy demand due to energy efficiency measures, through uptake of micro-generation technologies to supply homes with renewable energy, change in behaviour and switches in fuel type. This section considers the likely change in the energy demand profile of existing buildings until 2026.

3.3.1 RESIDENTIAL BUILDINGS

The uptake of energy efficiency measures in the housing stock is relatively low, with most measures taking a number of decades to reach saturation. Schemes such as the Energy Efficiency Commitment (EEC) and its successor the Carbon Emissions Reduction Target (CERT) aim to promote the uptake of measures by requiring utility companies to promote and facilitate energy efficiency improvements. CERT (2008 – 2011) is significantly more ambitious than previous phases of the obligation, doubling the level of activity seen under EEC 2005 - 2008. It also sees a shift in emphasis, with the target set in terms of carbon savings rather than terawatt hours. Under CERT, energy suppliers nationwide must, by 2011, deliver measures that will provide overall lifetime CO2 savings of 154 MtCO2 – equivalent to the emissions from 700,000 homes each year. It is expected to lead to energy supplier investment of some £2.8bn.

Suppliers must focus 40% of their activity on a 'Priority Group' of vulnerable and low-income households, including those in receipt of certain income/disability benefits and pensioners over 70 years old. By increasing the energy efficiency of UK households, CERT will not only help households from falling into fuel poverty but is also expected to help alleviate fuel poverty.

Estimates for energy efficiency in North Hampshire have been made based on a study of the likely penetration of measures by 2020 based on historic, current, and new uptake schemes[6]. These predictions have been done on a nation-wide scale and utilise expected uptake of a range of energy efficiency measures. Extrapolating these expected rates of energy efficiency increase from the 2006 energy demand baseline, as show in the figures below, it can be seen that electricity demand is likely to increase slightly, as demand for more energy intensive appliances outweighs

[6] Delivering Cost Effective Carbon Saving Measures to Existing Homes. BRE for DEFRA. 2007.

energy efficiency measures. Gas demand on the other hand is likely to decrease as energy efficiency measures are applied.

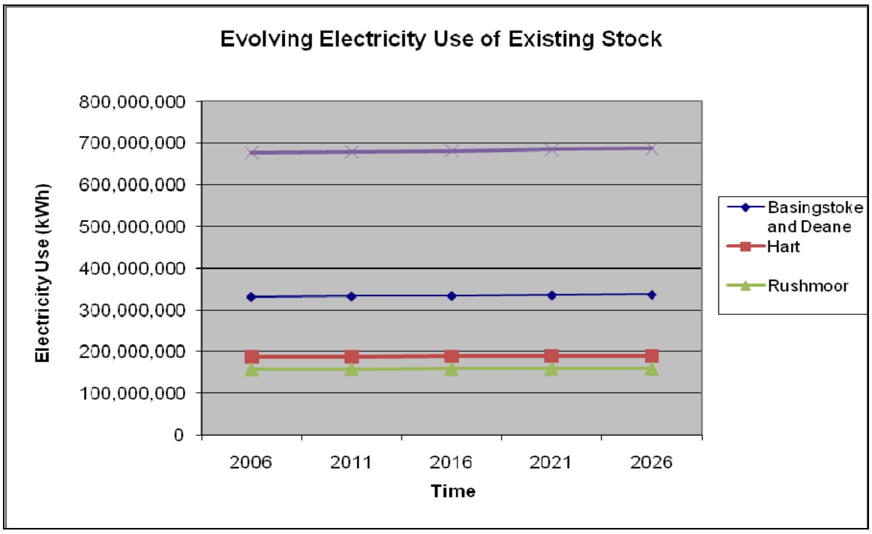
Fuel sources also play a key role. Basingstoke and Deane and Hart show a high proportion of oil and coal users. Due to market and environmental drivers, these fuel sources are likely to switch to other fuels over time.

Two scenarios are tested in the graphs below demonstrating the expected reduction in electricity and gas consumption over time in line with 'business as usual' rates of improvement of existing buildings, as predicted by BRE:

- Scenario 1: No change of fuel sources: This assumes that all buildings retain the same fuel sources as the current situation – i.e. those supplied by electricity and gas remain the same, as do those rural properties supplied by oil and coal.
- Scenario 2: Switch of oil and coal users: Over time it is likely that rural properties will change their fuel source. It has been assumed that conversion from coal will be immediate and constant due to ease of retrofit, but due to technical viability, it is assumed oil conversion will not begin until 2021.

Figure 16: Comparison of Electricity Use under Scenarios 1 and 2

Scenario 1



Scenario 2

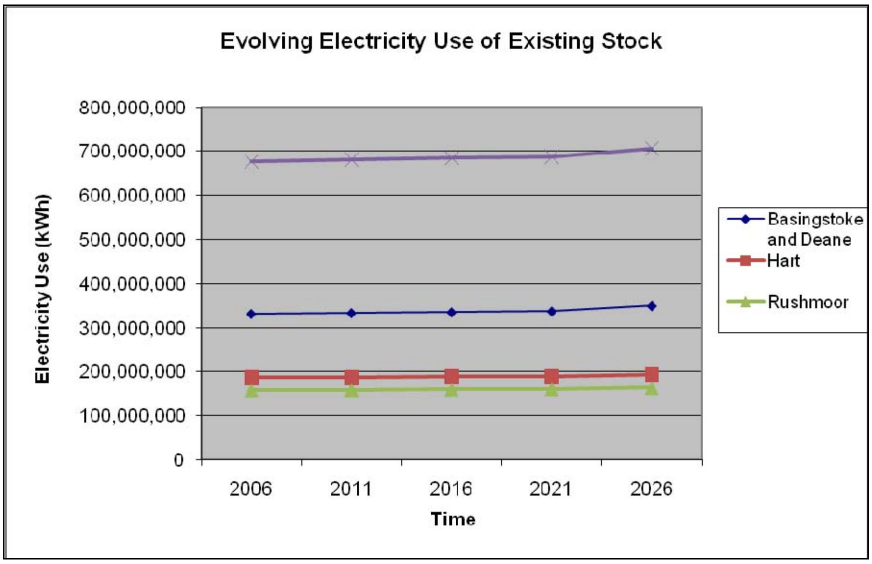
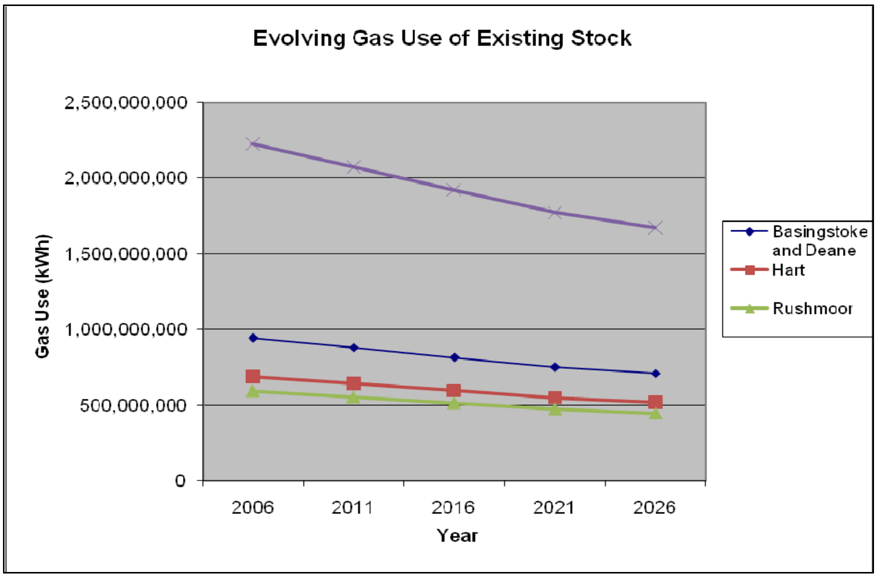
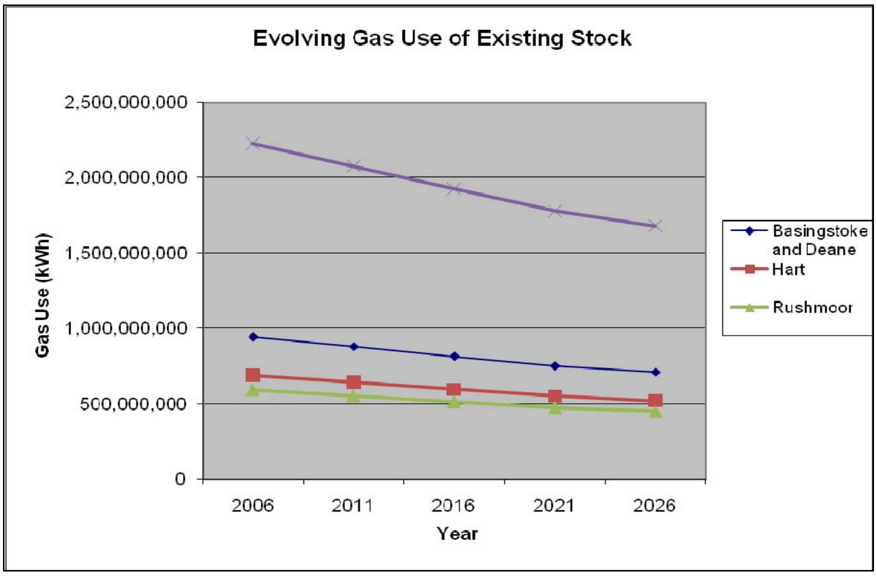


Figure 17: Comparison of Gas Use under Scenarios 1 and 2

Scenario 1



Scenario 2



The switch of oil and coal users is likely to have a significant effect on the electricity demand of the LPA areas, particularly Basingstoke and Deane, as seen by the sudden upturn in electricity consumption after 2021, when a conversion of 5% of oil fuel to electricity is modelled. Conversion to gas is unlikely to be an option for many rural properties as there is no gas infrastructure in place. As grid electricity is currently a high carbon source of energy for heating, the use of other renewable or low carbon fuels should be a priority in rural areas. Options are discussed further in Chapter 5.

3.3.2 NON-RESIDENTIAL BUILDINGS

The assessment of energy efficiency in the non-residential sector is difficult due to the range of building forms, construction, and usage types. A large amount of advice is available from bodies such as the Carbon Trust on reducing building and process energy, but it is not simple to quantify the UK potential, or uptake rates due to lack of data at a national scale. Based on Carbon Trust targets for non-residential buildings, this study has developed estimates for energy efficiency improvement expected through behavioural change, and through capital cost measures. The trend for commercial and industrial development is one of increased efficiency in both electricity and gas use as set out in the graphs below.

While the Carbon Trust has developed targets for energy reduction in non-residential buildings, the initiatives are less visible and less coordinated than those for residential buildings. LPAs play a key role in encouraging energy efficiency in existing non-residential buildings to help to meet these targets.

Figure 18: Predicted Change in Electricity Demand of Non-Residential Buildings

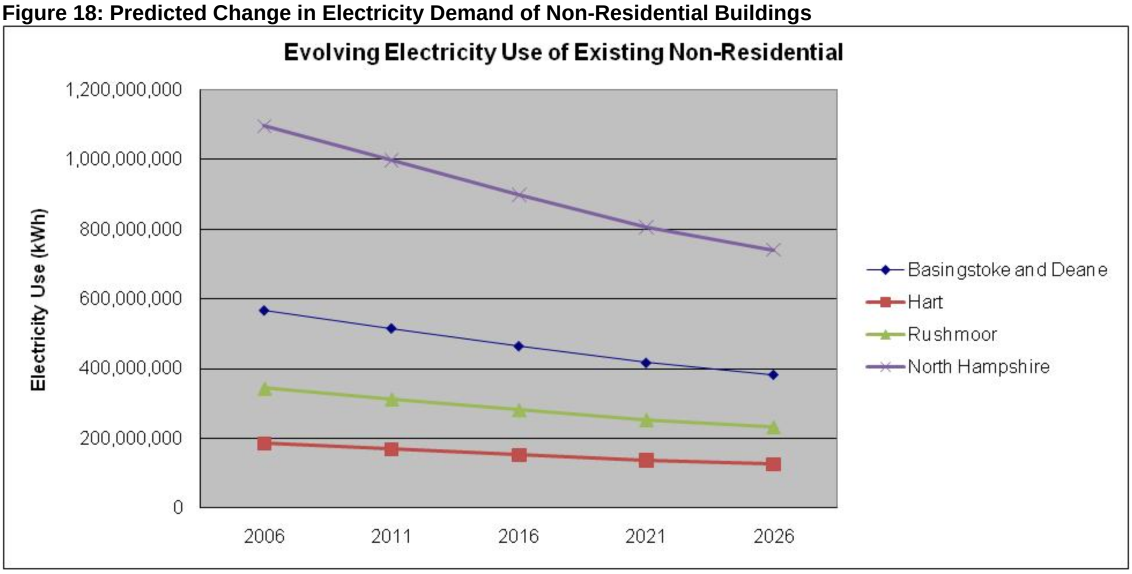
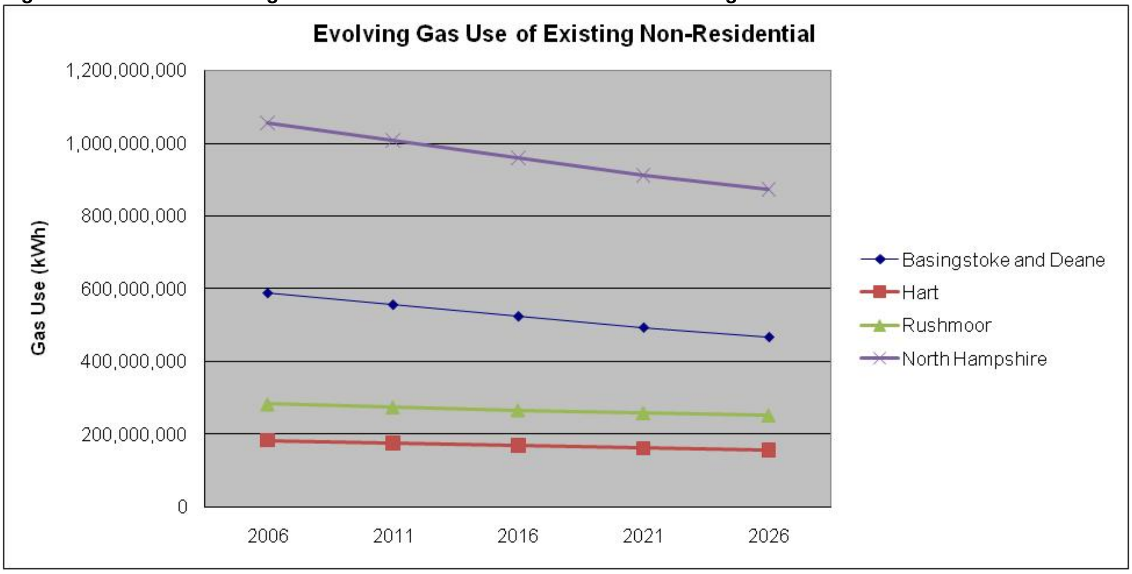


Figure 19: Predicted Change in Gas Demand of Non-Residential Buildings



3.3.3 ALL BUILDINGS SUMMARY

The graph below demonstrates the expected change in energy demand of existing buildings over the study period (2006-2026), due to nationally driven energy efficiency measures in both residential and non-residential buildings.

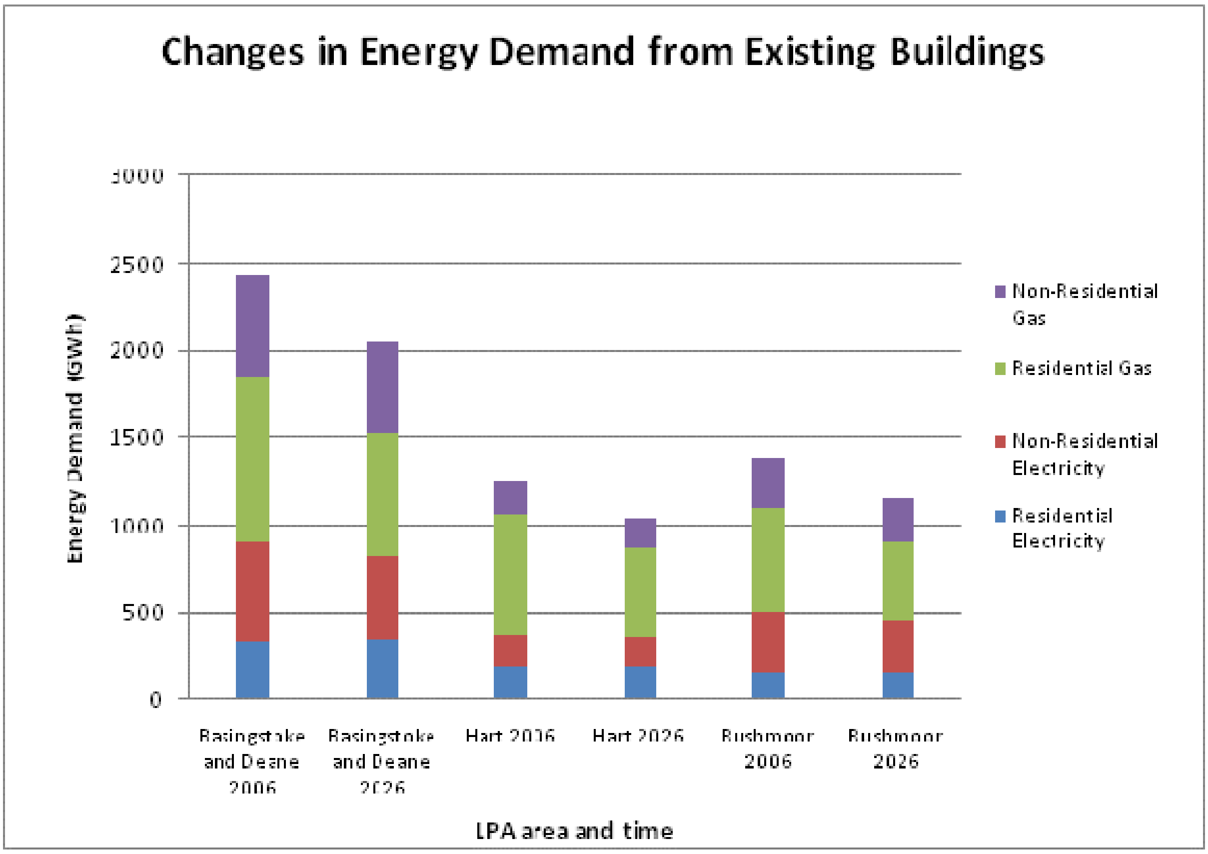


Figure 20: Expected change in electricity and gas demand over Core Strategy period under 'business as usual' energy efficiency measures

3.3.4 INCREASING IMPROVEMENT OF EXISTING BUILDINGS

The estimations in the change in performance of existing buildings above show a 'business as usual' estimation, where energy efficiency measures continue to be encouraged on a national scale with existing measures and initiatives undertaken by the LPAs and partners. This estimation reflects an expected uptake in energy efficiency measures based on which measures are most cost-effective and most easily retrofitted. A higher up-take of energy efficiency measures may be possible with targeted funding and initiatives. The table below compares the expected CO_2 saving of a 'high rate' of energy efficiency improvement (as predicted in the study by BRE[7]), compared to the baseline situation outlined above. The CO_2 savings that can be achieved through improvement of existing buildings are very substantial and this should be a priority for change in the LPA areas.

[7] Delivering Cost Effective Carbon Saving Measures to Existing Homes. BRE for DEFRA. 2007.

Table 9: Comparison of carbon dioxide reduction due to higher energy efficiency levels being applied in existing stock in North Hampshire

Demand (GWh)	2006	2011	2016	2021	2026
Baseline Scenario					
Residential Electricity Demand	677	679	682	685	687
Residential Gas Demand	2,225	2,074	1,923	1,772	1,673
Non-Residential Electricity Demand	830	797	763	731	702
Non-Residential Gas Demand	1,055	1,027	999	972	949
High Reduction Scenario					
Residential Electricity Demand	677	672	666	661	656
Residential Gas Demand	2,225	2,028	1,831	1,635	1,507
Non-Residential Electricity Demand	830	755	680	611	561
Non-Residential Gas Demand	1,055	1,007	959	913	874
Potential CO_2 Saving through increased energy efficiency (tonnes)	0	34,678	69,355	102,100	123,646

3.4 FUTURE GROWTH IN NORTH HAMPSHIRE

This section outlines expected growth in the North Hampshire area. Understanding the scale of expected development is crucial to understanding the probable changes in the energy profile of the three LPA areas.

3.4.1 RESIDENTIAL GROWTH

The South East Regional Spatial Strategy (RSS) sets out housing targets for North Hampshire, as set out in the table below. The LPAs, in developing their Core Strategies, will set out options for where that growth could take place and how much growth each area could accommodate. A key document in this process is the Strategic Housing Land Availability Assessment (SHLAA) which identifies possible development sites which are currently foreseeable. Draft SHLAAs have been developed for each LPA. It should be noted that identified SHLAA sites do not guarantee development, but simply scope options. The amount of housing identified within SHLAA sites is also shown below.

Table 10: RSS housing targets

RSS Growth Targets	2006-2011	2011-2016	2016-2021	2021-2026	Total
Basingstoke and Deane	4,725	4,725	4,725	4,725	18,900
Hart	1,100	1,100	1,100	1,100	4,400
Rushmoor	1,550	1,550	1,550	1,550	6,200

Table 11: SHLAA housing site availability

Draft SHLAA Possible Housing Numbers	2006-2011	2011-2016	2016-2021	2021-2026	Total
Basingstoke and Deane	5,776	4,148	1,389	308	11,621
Hart	1,330	1,159	252	197	2,938
Rushmoor	1,875	1,559	2,294	1,060	6,788

For the purpose of this study, it is assumed that the RSS targets are met, and hence the RSS housing delivery projections have been used to model housing growth in the three LPA areas. Indicative development sites, identified in the draft SHLAAs have been used to spatially model possible development locations in the maps in this study.

The density of housing and the mix of house types expected in new development, has a considerable effect on energy demand. Modelling within this study reflects two scenarios – where development follows a house type mix mirroring that of the existing house type mix, or where density of new development is increased to over 50 dwellings/hectare. The tables below show the existing house type mix, and the modelled higher density house type mix.

Table 12: Existing House type Mix

Housetype	Detached	Semi-Detached	Terraced	Apartment
Basingstoke and Deane	37.00%	29.00%	27.00%	7.00%
Hart	40.00%	28.00%	23.00%	9.00%
Rushmoor	19.00%	32.00%	30.00%	19.00%

Table 13: Modelled higher density house type mix

Housetype	Detached	Semi-Detached	Terraced	Apartment
Basingstoke and Deane	25.00%	21.00%	27.00%	27.00%
Hart	25.00%	21.00%	27.00%	27.00%
Rushmoor	25.00%	21.00%	27.00%	27.00%

3.4.1 NON-RESIDENTIAL GROWTH

The amount of non-residential growth that will accompany housing growth is less certain, so broad assumptions have been made in this study. Projections for commercial and industrial growth have been taken from the 'Industrial Land Supply Survey' (2006) for North Hampshire, which sets out the amount of land available in the table below. Commercial and industrial growth is assumed to fulfil these availability projects over the study period.

Table 14: Non-Residential land projections

Industrial land supply survey 2006	Area (ha)
Basingstoke and Deane	72.97
Hart	76.2
Rushmoor	69.89

Given the projected growth in North Hampshire, there is likely to be a requirement for supporting infrastructure, such as schools, community and health care facilities which are relatively large energy users. For the purposes of this study, we have made assumptions as to area of these facilities required based on population yields generated from number of dwellings expected. These area assumptions are taken from AECOM social infrastructure models and assuming a new population of 2.3 persons per new home. The area assumptions made are set out in the table below.

Table 15: Yield assumptions

Facility type	Area assumption
Primary School	2230m^2 per 840 pupil population
Secondary School	10,000m^2 per 900 pupil population
Health Care	0.85m^2 per person
Community	0.84m^2 per person

Table 16: Non-Residential land projections over plan period (hectares)

	Commercial/ Industrial	Schools	Healthcare	Community
Basingstoke and Deane	72.97	3.7	1.6	1.6
Hart	76.2	1.2	0.4	0.4
Rushmoor	69.89	1.2	0.5	0.5

3.5 EXPECTED ENERGY DEMAND FROM NEW DEVELOPMENT

New development will increase energy demands with the LPA areas. Part L of the Building Regulations is expected to require that buildings meet increasing minimum energy efficiency standards. These standards have been applied to the quantum and assumed mix set out in section 3.4 and modelled using AECOM residential profiles prepared for DCLG, and CIBSE industry benchmarks for non-residential development. In addition, increased energy performance in line with the proposed changes to Building Regulations Part L requirements which will take effect in 2010, 2013 and 2016 have been taken into consideration, along with the expected changes to regulations affecting non-residential buildings leading up to zero carbon in 2019. The expected additional energy demand is set out in the tables below.

3.5.1 RESIDENTIAL DEVELOPMENT

For residential development, two scenarios have been tested, one where new development follows the existing mix of house types in each LPA area, and one where new development follows the higher density scenario outlined in 3.4 above.

Table 17: Cumulative electricity demand from new residential development (GWh)

	2011	2016	2021	2026
Maintaining current mix of house types				
Basingstoke and Deane	18	36	56	76
Hart	4	8	13	18
Rushmoor	5	11	17	24
Total	27	55	86	117
Using the higher density mix of house types				
Basingstoke and Deane	17	34	53	71
Hart	4	8	12	17
Rushmoor	5	11	17	23
Total	26	53	82	112

Table 18: Cumulative gas demand from new residential development (GWh)

	2011	2016	2021	2026
Maintaining current mix of house types				
Basingstoke and Deane	31	59	78	98
Hart	7	14	18	23
Rushmoor	9	18	24	30
Total	48	90	120	151
Using the higher density mix of house types				
Basingstoke and Deane	29	54	73	91
Hart	7	13	17	21
Rushmoor	9	18	24	30
Total	45	85	114	143

The change in density across the LPA areas demonstrates how more efficient house types can automatically reduce energy demand and consequently reduce CO_2 emissions. The tables above demonstrate that the change in density will reduce electricity demand by 5GWh and gas demand by 8GWh by 2026. The difference in CO_2 emissions due to the change in density described above equates to 3871 tonnes of carbon dioxide emissions (equivalent to the emissions offset through the installation of two large-scale wind turbines (2MW rating, over 100m tall)). Land use planning and development density can significantly affect CO_2 emissions, and hence higher densities should be encouraged where suitable.

3.5.2 NON-RESIDENTIAL DEVELOPMENT

CIBSE TM46 benchmarks were used to model energy demand of future non-residential buildings, increased energy efficiency measures mirroring expected changes to building regulations for non-residential buildings. This is illustrated in the tables below.

Table 19: Cumulative electricity demand from new non-residential development (GWh)

	2011	2016	2021	2026
Basingstoke and Deane	12	25	37	49
Hart	12	24	36	48
Rushmoor	11	22	33	44
Total	35	71	106	141

Table 20: Cumulative gas demand from new non-residential development (GWh)

	2011	2016	2021	2026
Basingstoke and Deane	58	107	121	135
Hart	58	107	120	134
Rushmoor	53	99	111	123
Total	169	312	352	392

The scale of energy demand, particularly gas (or heat) demand, predicted for future non-residential development in North Hampshire is higher for than that for residential growth. Non-residential buildings can have a very high energy demand, though this will vary greatly depending on the type of building. Consequently, non-residential development is often ideal for use as an ‘anchor load’ or fixed energy user to regulate supply through a district heating scheme.

3.6 TOTAL ENERGY DEMAND PROFILE

The following table summarises the combined energy demand profile of the three LPAs in North Hampshire. This summary assumes new development follows existing house type patterns and switch of fuels from coal and oil does not occur before 2026.

Table 21: Expected Cumulative Energy Demand in Basingstoke and Deane Borough over time (GWh)

	2006	2011	2016	2021	2026
Existing Residential Electricity Demand	332	329	327	324	322
Existing Residential Building Gas Demand	942	858	775	692	638
New Residential Electricity Demand	0	18	36	56	76
New Residential Building Gas Demand	0	31	59	78	98
Residential Oil Demand	201	201	201	201	201
Residential Coal Demand	18	18	18	18	18
Existing Non-Residential Electricity Demand	567	516	465	417	383
Existing Non-Residential Gas Demand	588	556	524	493	466
New Non-Residential Electricity Demand	0	12	25	37	49
New Non-Residential Gas Demand	0	58	107	121	135
Non-Residential Oil Demand	12	12	12	12	12
Non-Residential Coal Demand	6	6	6	6	6
Total Electricity Demand	899	875	853	834	830
Total Heat Demand	1767	1740	1702	1621	1574

Table 22: Expected Cumulative Energy Demand in Hart District over time (GWh)

	2006	2011	2016	2021	2026
Existing Residential Electricity Demand	187	185	184	183	181
Existing Residential Building Gas Demand	689	628	567	506	467
New Residential Electricity Demand	0	4	8	13	18
New Residential Building Gas Demand	0	7	14	18	23
Residential Oil Demand	54	54	54	54	54
Residential Coal Demand	5	5	5	5	5
Existing Non-Residential Electricity Demand	185	169	152	136	125
Existing Non-Residential Gas Demand	184	176	169	162	156
New Non-Residential Electricity Demand	0	12	24	36	48
New Non-Residential Gas Demand	0	58	107	120	134
Non-Residential Oil Demand	4	4	4	4	4
Non-Residential Coal Demand	4	4	4	4	4
Total Electricity Demand	372	370	368	368	372
Total Heat Demand	940	936	924	873	847

Table 23: Expected Cumulative Energy Demand in Rushmoor Borough over time (GWh)

	2006	2011	2016	2021	2026
Existing Residential Electricity Demand	158	157	156	154	153
Existing Residential Building Gas Demand	595	542	489	437	403
New Residential Electricity Demand	0	5	11	17	24
New Residential Building Gas Demand	0	9	18	24	30
Residential Oil Demand	26	26	26	26	26
Residential Coal Demand	2	2	2	2	2
Existing Non-Residential Electricity Demand	344	313	282	253	233
Existing Non-Residential Gas Demand	283	275	267	259	252
New Non-Residential Electricity Demand	0	11	22	33	44
New Non-Residential Gas Demand	0	53	99	111	123
Non-Residential Oil Demand	5	5	5	5	5
Non-Residential Coal Demand	13	13	13	13	13
Total Electricity Demand	502	486	471	457	454
Total Heat Demand	924	925	919	877	854

The following graph demonstrates the effect of new development on the expected energy profile. It demonstrates that while new development will make up a significant proportion of the energy demand profile, it is still far outweighed by energy demand from existing development in each of the LPA areas.

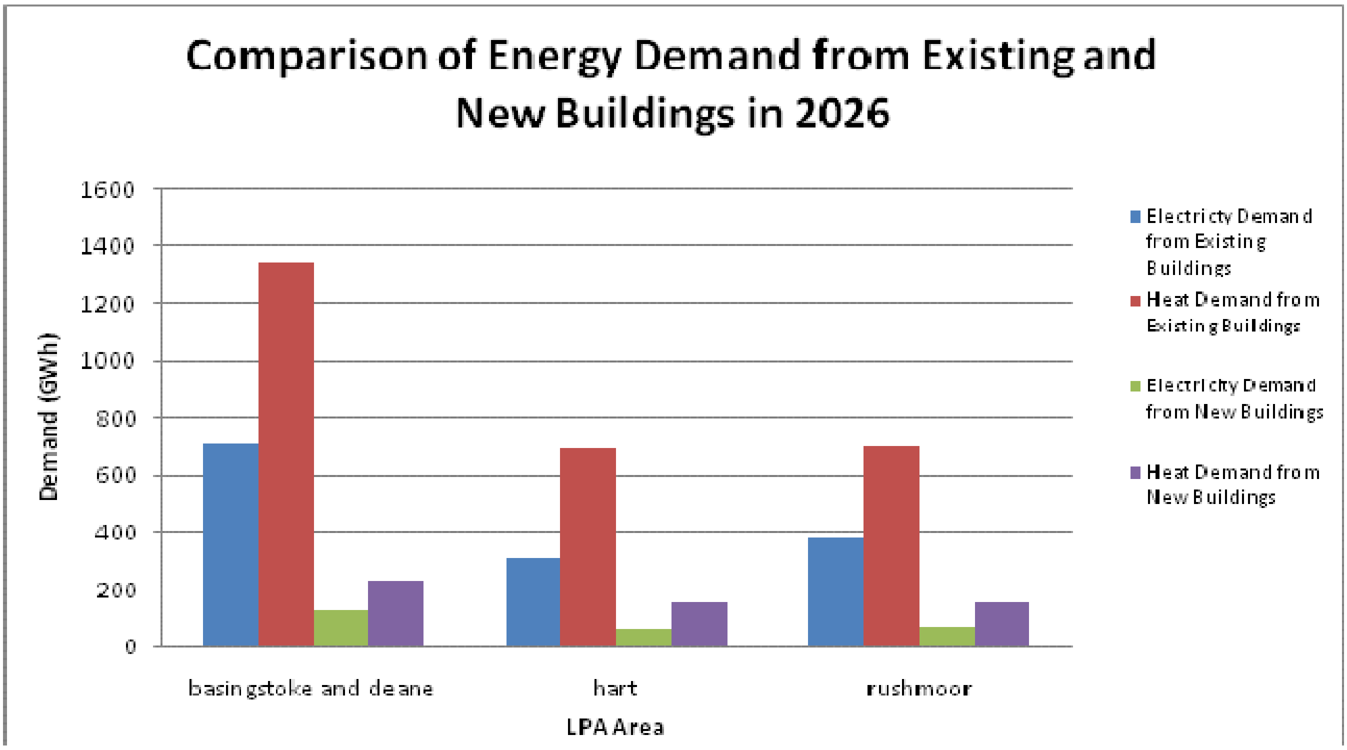


Figure 21: Comparison of energy demand from existing and new buildings

3.7 KEY CONSIDERATIONS EMERGING FROM THIS CHAPTER

The sections above have considered the energy profile of the three LPA areas, both now and in the future. Key considerations emerging from this chapter are:

- It is important to realise the scale of energy demand in order to both set planning targets and measure planning targets for renewable energy delivery based on a percentage of demand. Current and future energy demands have been calculated in this chapter for use in policy and delivery;
- LPAs play a key role in increasing energy efficiency of existing buildings. Existing buildings make up the bulk of the future energy demand, and hence efforts must be made to reduce energy demand of existing stock.
- Existing non-residential buildings often receive less focus than existing homes. LPAs should support initiatives to increase energy efficiency in non-residential buildings in their area, particularly large energy users.
- Planning can affect CO_2 emissions by affecting the density of development and mix of house types. Higher densities should be encouraged where suitable.
- There is significant use of oil and coal fuels, especially in Basingstoke and Deane and Hart. Efforts should be made to switch these fuel users to lower carbon fuels, ideally biomass (see Chapter 5).

4. Physical Context: Renewable and Low Carbon Potential

4.1 INTRODUCTION TO THIS CHAPTER

This chapter considers the scale of potential for introduction of renewable and low carbon technologies in North Hampshire. Opportunities and constraints vary on a local level according to the features of the natural environment and the built environment.

There are two recent background studies that include an assessment of renewable resource potential that cover the three Authorities included in this study. The **South East Regional Renewables Review** (June 2009) evaluates the applicability of the assumptions made in the **Development of a Renewable Energy Assessment and Targets for the South East** (2000) (which provided the basis for establishing the renewable energy targets set out in the South East Plan) against the latest thinking and provides an update to the resource assessment. **Towards a Hampshire Energy Strategy** (Draft, July 2009) analyses potential CO_2 savings from 'greening the grid' through large scale infrastructure, and also considers opportunities for delivering Code for Sustainable Homes and retrofitting existing development in Hampshire. There have also been some studies undertaken for particular technologies, including an On-Shore Wind Resource Assessment for Hampshire (2004) and the Biomass Resources and Concentrators (2009) report which looks at biomass potential in the South East. These studies have been used in conjunction with additional resource potential analysis developed for this study and key findings are presented below.

4.2 EXISTING SITUATION

The amount of renewable and low carbon energy currently being produced in North Hampshire is limited. Regional drivers have ensured that Landfill Gas is being used for energy generation, and there is an Energy from Waste scheme associated with the Chineham Incinerator in Basingstoke and Deane. Otherwise there are a few micro-generation installations on buildings in the study area. As micro-generation is permitted without planning permission, it is difficult to monitor uptake, but 'SEE-Stats.org' keeps a live data base of installations in the Hampshire area, which has records for three installations of photovoltaics in Rushmoor. It is likely that there are other small installations across the three LPA areas, but as these are permitted development, their number is unknown. Details of the current known renewable and low carbon installations in North Hampshire are shown in the table below.

Table 24: Known existing renewable and low carbon technology installations in North Hampshire

Source	Contractor	Location	Energy Generated (MWh/year)	District	Status
Landfill Gas		Apsley Landfill Site	6,242	Basingstoke and Deane	Awaiting Construction
Municipal and Industrial Waste	Associated Energy Projects plc	Chineham Incinerator	97,367	Basingstoke and Deane	Operational
Landfill Gas	ONYX HAMPSHIRE LTD	Bramshill Generation Station	7,823	Hart	Operational
Solar Array	Rushmoor BC	Rushmoor Community Centre	4	Rushmoor	Operational
Solar Array	Rushmoor BC	Cover Community Hall	1	Rushmoor	Operational
Solar Array	Homeowner	Farnborough	2	Rushmoor	Operational

4.3 THE RENEWABLE ENERGY CHALLENGE

The EU Renewable Energy Target requires a 20% reduction on 1990 levels by 2020 of CO_2 from electricity, heating and transport. The UK is expected to meet 15% of this target, which equates approximately to around 30% reduction in carbon dioxide from electricity production and approximately 12% from heating requirements as set out in the UK's Renewable Energy Strategy 2009. The contribution of different areas to this target should depend on the scale of potential and delivery opportunities. However, the scale of the challenge is vast, and all LPA areas should seek to maximise opportunities. Simultaneously, renewable energy targets have been set for Hampshire as a whole through the South East RSS, as described in Chapter 2. The breakdown of contribution across the South East, shows Hampshire contributing an 'average' amount compared to other areas in the South East. As a whole, the South East Region has committed to 10% of electricity demand through renewables by 2020 (with no heat targets). Assuming, North Hampshire would meet this portion of its own need, this target is considered a minimum in this study. To some extent, these targets have been superseded by current National aspirations, but they are still based on an assessment of potential of the South East. LPA areas in North Hampshire should seek to at least meet their share of the South East targets, and exceed these where possible to assist with meeting the National targets.

This chapter seeks to review and test the ability of the three LPA areas to deliver against renewable energy targets. Chapter 4 has established an energy profile for North Hampshire, which allows us set energy generation targets for renewable energy based on a percentage of energy use in the LPA areas. The table below sets out the amount of renewable energy which would need to be produced to meet the South East RSS requirements and to meet an equal share of the National Renewable Energy targets.

Table 25: North Hampshire's renewable energy requirements (GWh)

LPA area	South East 2020 renewable electricity target (10%)	South East 2026 renewable electricity target (16%)	National 2020 renewable electricity target (30%)	National 2020 renewable heat target (12%)
Basingstoke and Deane	83.4	132.8	250.2	194.5
Hart	36.8	59.5	110.4	104.8
Rushmoor	45.7	72.6	137.1	105.2

* Note: 2020 targets have been approximated from the 2021 modelled scenario

4.4 ESTIMATING DISTRICT WIDE LOW CARBON AND RENEWABLE ENERGY POTENTIAL

Before estimating the potential for the delivery of low carbon and renewable energy associated with future development, it is important to understand the opportunities and constraints around the use of different generation technologies across the Local Authority Areas. Opportunities are likely to vary across the three Authorities, and their individual abilities to meet the challenge set out above may be constrained. However, it is important to first identify opportunities to maximise potential within each of the Authorities, then where there are limitations, assessing the potential for the Authorities as a collective to meet the shortfall.

As identified in the regional study, the greatest opportunities for renewable energy in the Region are large (i.e. at least 80m hub, 3MW turbines) onshore wind power, landfill gas and biomass (from energy crops, imported biomass, agricultural wastes and managed woodland). Anaerobic digestion of waste and sewage by-products also contribute along with solar power. Crucially, the South East study doesn't consider or set targets for renewable heat, but there is also considerable potential for biomass fuelled heating, district heating and combined heat and power (CHP) in the southeast. This chapter also considers the likely scale of renewable energy that will be brought forward by new development and the amount likely to be retrofitted to existing development.

This study focuses on the potential for renewables and low carbon technologies associated with wind, biomass, anaerobic digestion, District heating and combined heat and power and (with the planned introduction of feed-in tariffs) large scale Photovoltaics. Other low carbon and renewable technologies that are applied at a smaller site scale associated with existing and new development are discussed in Chapter 5. The following renewable technologies are excluded from the District-wide analysis for reasoning as follows:

- **Energy from sewage**: Energy from sewage needs to be taken forward at a wider-scale and is very dependent on existing infrastructure. Opportunities for this could be explored in partnership with the Hampshire County Council.
- **Energy from waste**: Waste is managed at a county level and the waste management facility in North Hampshire (at Chineham) is already utilised for energy from waste. Further potential for energy from waste should be considered at a regional or county level, but is considered outside the influence of North Hampshire Councils alone.
- **Hydropower**: Hydropower has been excluded from this study as there are no significant sources of hydropower in North Hampshire according to the South East Region Study.
- **Geothermal energy**: There is no known geothermal resource for large scale installations in North Hampshire. Ground source heat pumps are viable on a site scale and are considered in the micro-generation and new development sections of this report.

4.5 LARGE-SCALE WIND ENERGY POTENTIAL

The South East Regional Renewables Review found that assumptions used to inform the targets in the South East Plan underestimated the potential of on shore wind developments, primarily due to technological advances increasing viability from slower wind speeds and small wind farms. The rate of deployment of turbines was, however, less than had been envisaged in Development of a Renewable Energy Assessment and Targets for the South East due to non-technical barriers such as planning. Drawing on the 'On Shore Wind Resource Assessment for Hampshire' (2004), 'Towards a Hampshire Energy Strategy' concluded that 'a maximum of 49MW' of on shore wind capacity 'could be installed given the right economic circumstances'. Both these background studies highlight that the study area sits within an area with potentially significant opportunities for on shore wind development, however, to date it is largely non-technological challenges, such as economic viability and planning barriers that have restricted development.

Potential and constraints to onshore wind development in North Hampshire

The assessment of on shore wind energy potential undertaken for this study draws similar conclusions to the background reports. Wind speeds over 5.5m/s are generally considered to be favourable to make energy generation technically and commercially viable. The figure below shows wind speed at 45m above ground level across the three Authorities, demonstrating wind energy generation from large scale wind turbines is viable (in terms of wind speed) across the entire study area. This study considers the wind energy potential of the three Authorities from a desk-top study based on GIS modelling using data available. Higher wind speeds, above 7m/s at 45m, will be more desirable as available power from the wind is a cube function of wind speed velocity power output, and the potential of these sites should be investigated first. The figure below shows wind speed distribution across North Hampshire.

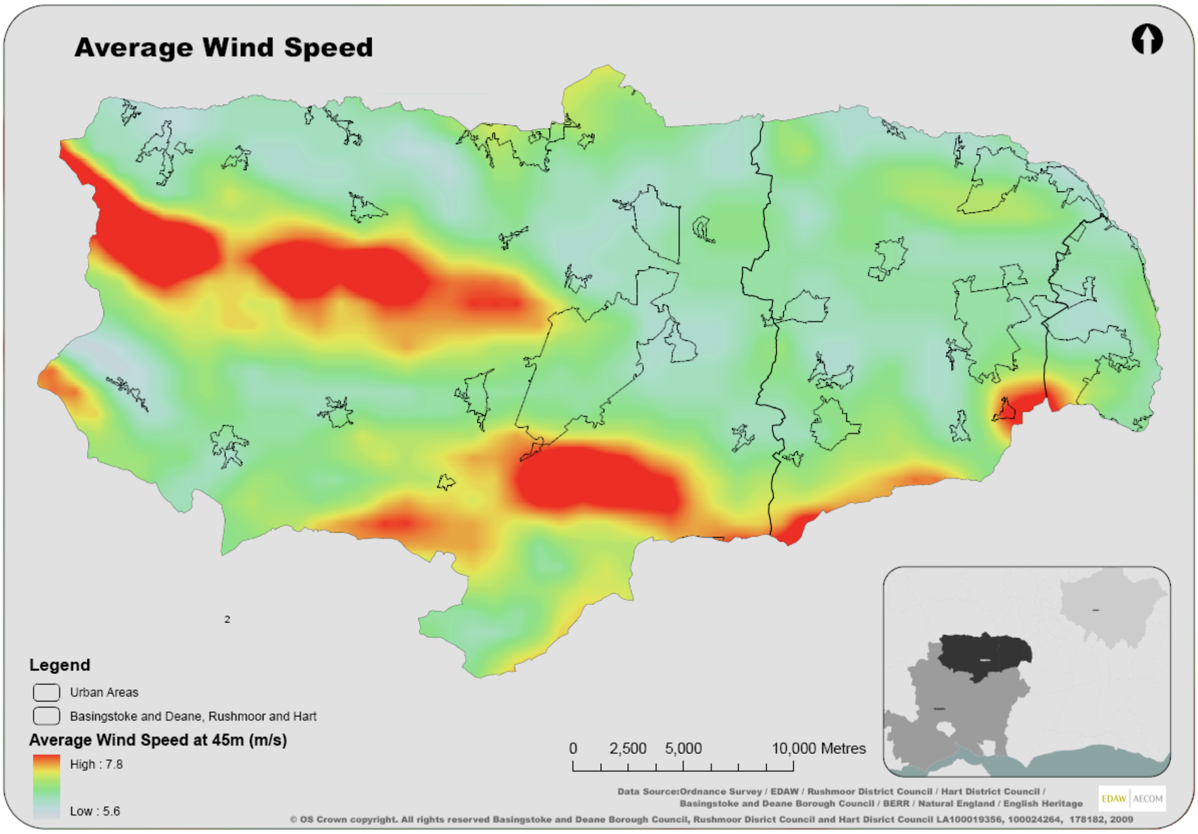


Figure 22: Wind Speed Distribution

A process of physical constraint mapping has been used to identify which sites are likely to have the greatest potential for large wind turbine location. These areas indicate an 'area of search' rather than specific locations and still need to be subject to further local investigation. Through GIS analysis, the following constraints have been included:

- Safety Buffer of 100m from roads, rail and major overhead transmission lines (approximate for a large turbine);
- 400m noise buffer from urban settlements;
- Exclusion of designated sites of ecological or landscape significance; and
- Exclusion of un-designated woodland and forest.
- Locations of existing turbines
- Airfields (licensed for public use).
- Flood zones
- Airport radar 'safeguard zones' (note: these are zones where consultation should occur with aviation authorities, but development is not necessarily restricted)

Constraints are mapped over the three Authorities and discussed further below.

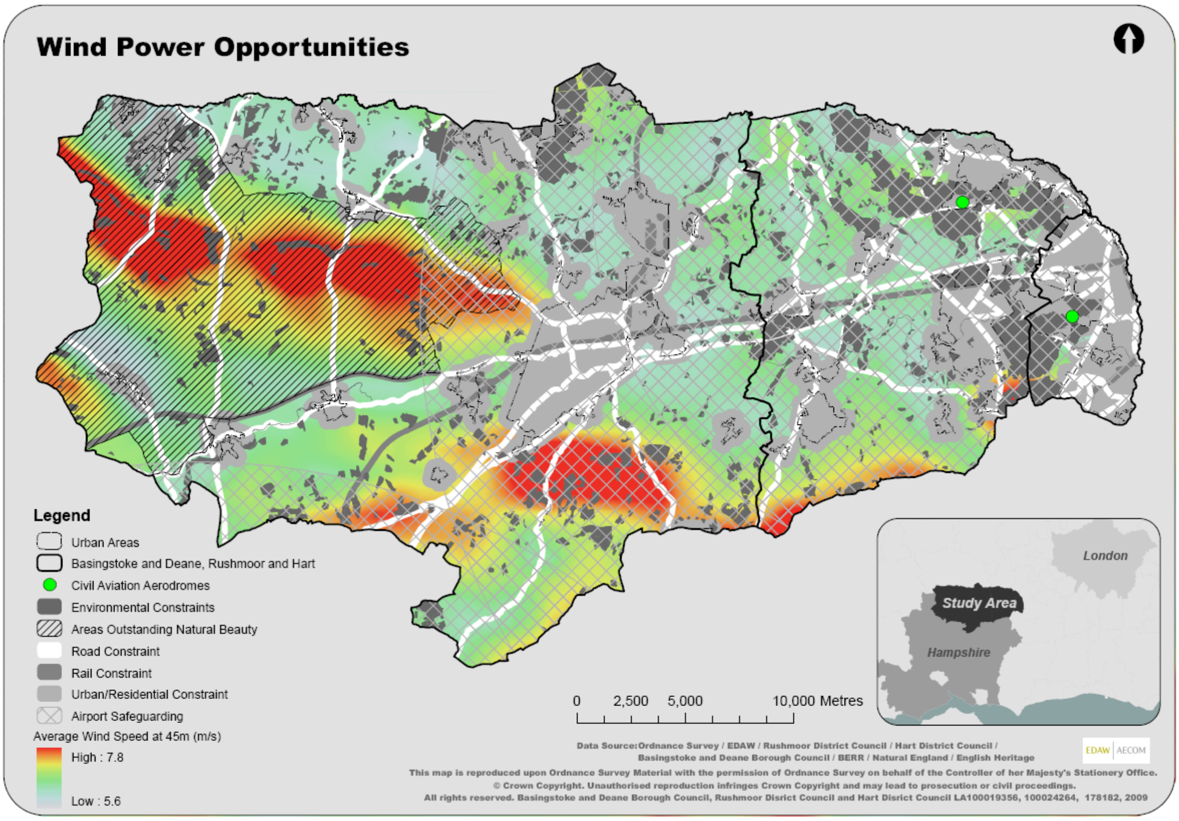


Figure 23: Wind Energy Opportunity Areas

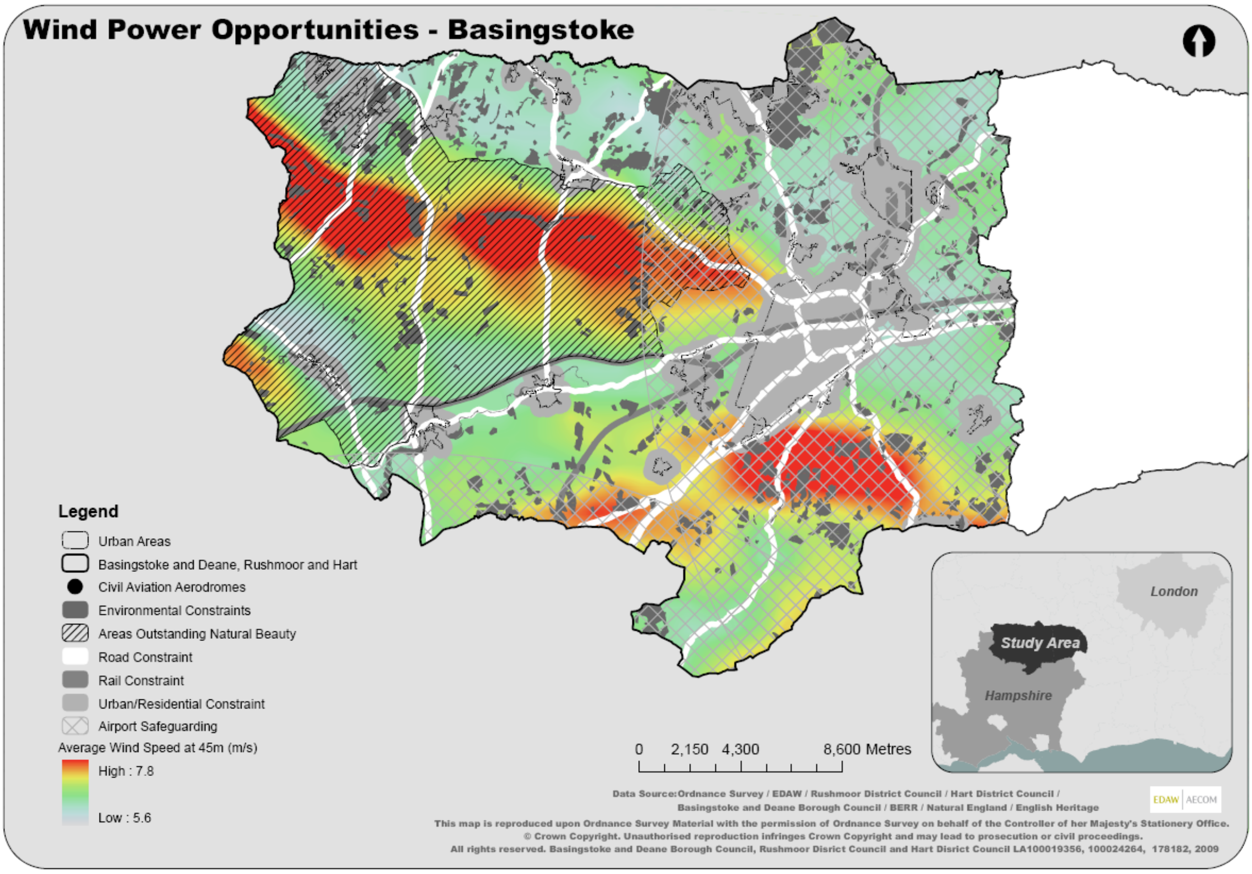


Figure 24: Wind Energy Opportunity Areas - Basingstoke

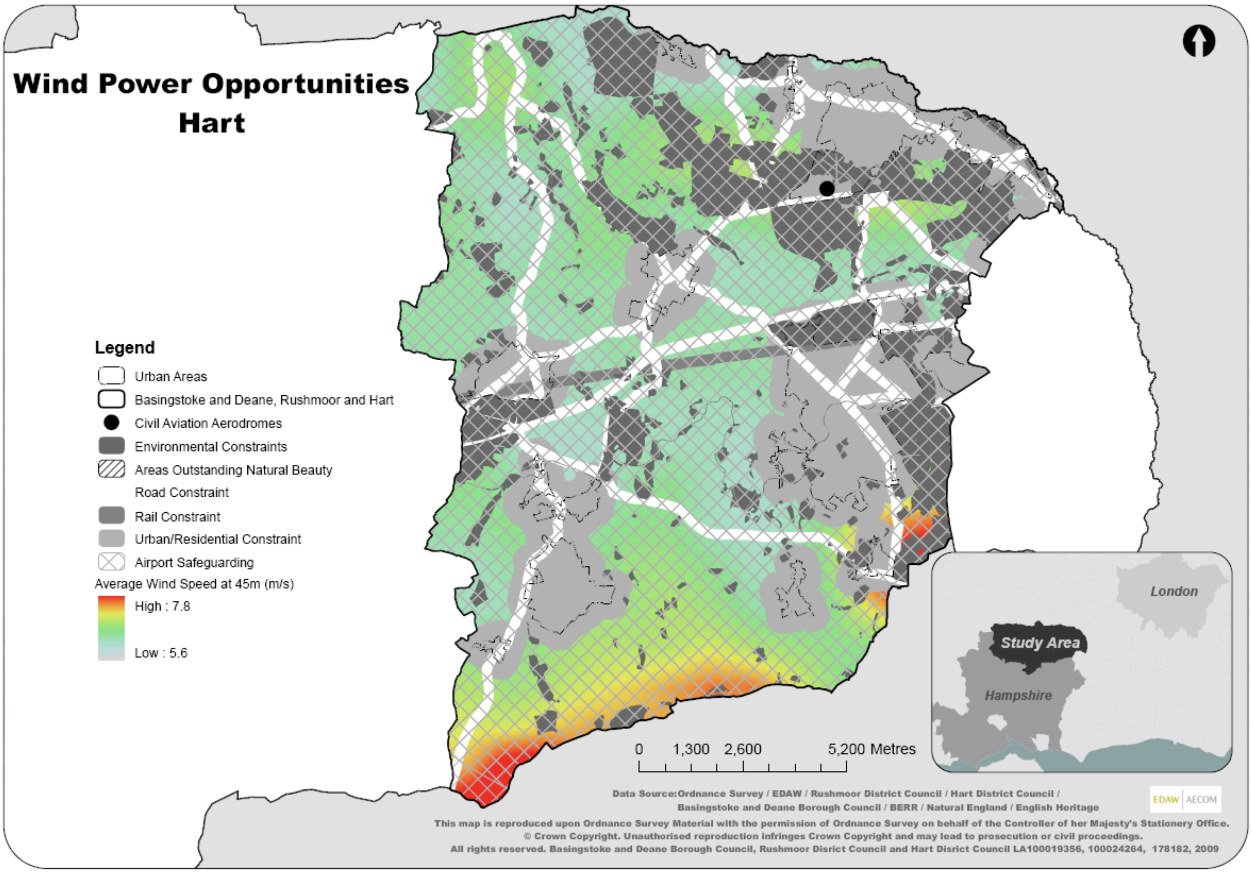


Figure 25: Wind Energy Opportunity Areas - Hart

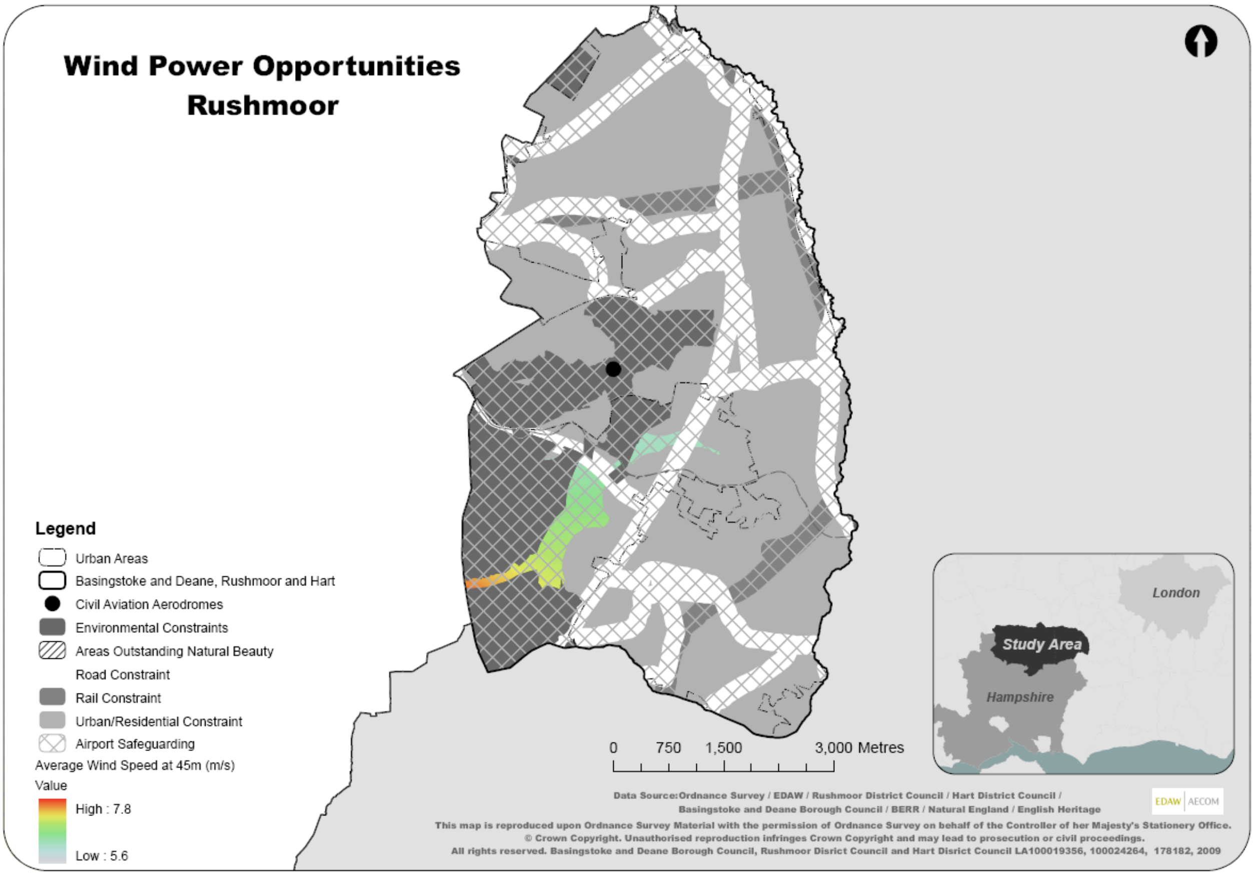


Figure 26: Wind Energy Opportunity Areas - Rushmoor

The areas which have potential for further investigation are coloured in the figure above, showing priority relating to wind speed. Where areas are hatched, planning constraints such as aviation stakeholder consultation and Area of Natural Beauty designations will need to be considered, but do not necessarily preclude installation. Constraints are shown in shades of grey, where dark grey indicates a more finite constraint, while lighter greys indicate less restrictive constraints where site specific investigation is needed to determine feasibility.

Further detailed feasibility studies would have to consider a number of additional siting constraints in addition to these before any site could be confirmed, including:

- **Local Wind Resource Survey** - Wind speeds of 5.5m/s or above at turbine hub level are needed to operate a large scale wind turbine efficiently. The national dataset for wind speeds at a height of 45m above ground level was used to examine wind speeds across the three Authorities, however, this study is not a sufficient evidence base for the actual siting and delivery of wind turbines, but it gives a high level assessment of promising areas to look into further.
- **Noise implications** - Concerns over noise are usually related to perception rather than actual experience. The noise impact of large scale wind turbines will depend on local sources of noise such as from major roads, rail lines, industrial areas etc. There are no required distances between wind turbines and residences, but 400m is a rough guideline that is often used and has been adopted within this assessment. Distances between turbines and industrial buildings are not subject to the same restriction. More detailed studies will be require to map noise and identify areas of least impact for turbine development.
- **Aeronautical and Defence Impacts** – Wind turbines may interfere directly with the operation of aeronautical and defence equipment, for example, when located near aerodrome protected surfaces, runway takeoff points or within military low-flying zones. Radar systems associated with airports and military sites are also a significant issue; for example, radar technology that is unable to differentiate between rotating turbine blades and an approaching aircraft have contributed to the rejection of a number of wind applications in the UK. Consultation will have to be undertaken with MOD and nearby airport authorities to determine particular constraints in the area and possible mitigation strategies, such as software upgrades to the radar technology. It is emphasised that the presence of local airports or military sites is not necessarily a critical constraint when considering the exploitable wind resource, but consultation is advised on a case by case basis.
- **Grid connection and Sub Station Requirements** –It will be necessary to carry out a detailed assessment of the opportunities and constraints presented by existing infrastructure in relation to each turbine site. And this information should feed into any development programme for turbines. Planning applications for sites close to a suitable grid connection should be prioritised
- **Flood risk -** Development of wind turbines on areas of high flood risk is currently restricted by PPS 25. This could potentially impact upon the construction of Turbines in the flood risk areas. Proposed revisions to PPS 25 suggest wind turbines be reclassified as essential infrastructure[8.] This would largely permit turbine development in flood zones and as such flood zones have not been considered a constraint in the above analysis.
- **Shadow Flicker Modelling** - This can be an issue at certain times of day when the wind is blowing, but effects can usually be mitigated against and has not been specifically considered at this stage. This would need to include driver distraction issues, in partnership with the Highways Agency and local highways services.
- **Telecommunication Impacts** - Wind turbines can interfere with radio signals, television reception and telecommunications systems. This has not been specifically assessed at this stage, but with consultation measures can be put in place to mitigate these effects.

[8] Planning Policy Consultation – Consultation on proposed amendments to Planning Policy Statement 25: Development and flood risk, paragraphs 3.31-3.38
- http://www.communities.gov.uk/documents/planningandbuilding/pdf/consultationfloodrisk.pdf

- **Landscape and Visual Impact** - A detailed visual and landscape impact assessment has not been conducted at this stage. The specific sites of the turbines would have to be carefully considered to ensure that they do not detrimentally impact key view corridors and that they are well integrated into the surrounding landscape.
- **Bird Migration** - An important element that will need consideration is the annual migration of birds, particularly due to the presence of important environmental sites in the area. A detailed migration survey must be conducted over a year period.
- **Transport Access Assessment per turbine** - Blade section is the longest/largest full section to be delivered on site. Some site are restrictive.
- **Additional losses to turbine energy output** - A more detailed analysis would be required into the effect of local topography, clustering effects, hysteresis and local climatic conditions on the energy yield of the turbines.
- **Impact upon land use and land management** - The amount of land consumed by wind turbines is relatively small. Nevertheless, further study should be carried out to ensure that the turbines do not have a negative effect upon land use potential.
- **Ground Condition Survey** – The feasibility of the construction of a large turbine would have to be supported by geotechnical investigations
- **Gas pipelines and other sub terrain analysis** - The current assessment has not assessed the presence of utility pipelines beneath the sites which would have considerable impact on the ability to site turbines.
- **Archaeological Constraints** - Any impacts on archaeology in the area will have to be assessed in more detailed studies.
- **Listed Building and Conservation Area impact** – a detailed impact assessment has not been conducted at this stage and would be required for any further study.

The most favourable sites for further investigations in terms of wind speed are to the south of Basingstoke where there is a significant area with higher wind speeds. Although this area is covered by an 'airport safeguarding zone' where consultation is needed with aviation authorities, this should not be considered restrictive, particularly as the area with the most potential is quite some distance from the aerodrome sites. There is also considerable resource availability inland in agricultural areas across the remainder of the three Authorities. Community involvement in the decision making process and in the financial gain from electricity generation, such as through community investment models, will be important if the resource is to be utilised for the benefit of the District and with community support. Site-specific studies, Environmental Impact Assessments and stakeholder consultation would have to be undertaken to identify which areas are the most favoured based on wind availability and other constraints.

Delivery Considerations for Wind Power in North Hampshire District

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

- **Thorough engagement and investigations** – While there is a great impetus to deliver renewable energy, and wind power has strong potential, engagement with stakeholders and thorough investigation of all effects of wind power development needs to be undertaken to locate feasible sites.
- **Connection to the grid** – The most efficient way of providing electricity is most likely connection to the grid rather than individual developments. A clear funding scheme would have to be put in place to establish which developments can claim allowable offsets' from such an investment in electricity generation and how they contribute to that investment.
- **Partnerships with electricity providers** – To finance the capital investment and collect revenue, wind projects would have to partner with an electricity provider.
- **Community involvement** – there are many models for community installation and investment in large-scale wind turbines, which helps return investment gains to local communities. This is discussed further, with prioritised community wind projects sites in North Hampshire, in Chapter 5.

4.6 MEDIUM-SCALE WIND ENERGY POTENTIAL

Smaller wind turbines have a significantly reduced visual impact and, whilst their output is significantly less, medium-scale wind can contribute to the three Authorities renewable energy generation capacity. Recent reports have shown that medium-scale wind is not suitable for urban or sub urban locations due to the effects of turbulence at low levels on power output. Agricultural land is characterised by large field with a relatively uninterrupted yaw which will minimise the impact of turbulence on power output.

The yearly average wind rose for Heathrow, South East England, the closest annual wind rose available from the Met Office to North Hampshire, indicates that as with the rest of the UK the predominant direction of wind is from the southwest, see Figure below. Medium-scale turbines that cannot afford to carry out a year-long monitoring exercise examining wind speed and direction should therefore be sited to take maximum advantage of winds originating from this direction.

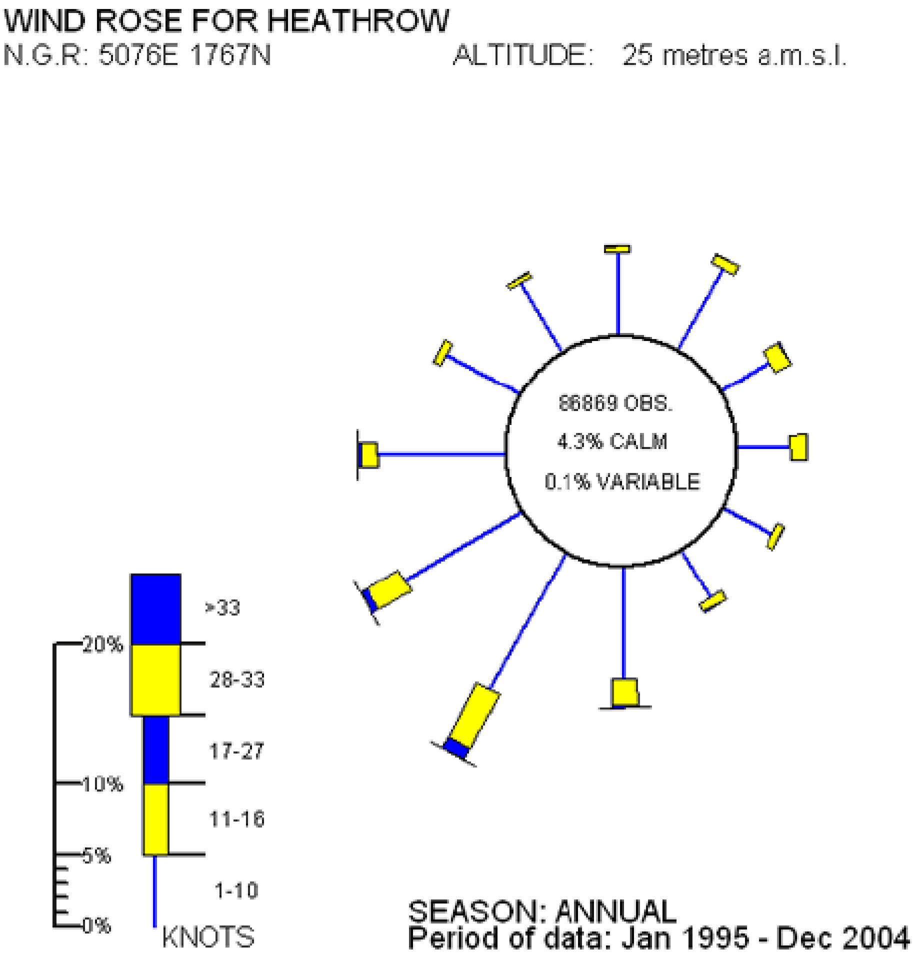


Figure 27: Met office wind rose for the Heathrow, Southern England [9]

Scale of Potential

There is a large amount of farmland in North Hampshire, particularly in Basingstoke and Deane. Farm properties in particular are ideal for the installation of medium-scale wind turbines. Hart is also likely to have potential to supply medium-scale wind in open spaces, while potential for medium-scale wind in Rushmoor is restricted due to the urban build-up of the area. Installation of 200 6kW turbines would add 1.2MW capacity to North Hampshire's contribution to the South East target and generate approximately 1.6GWh per annum. This contribution is less than a third of the

[9] http://www.metoffice.gov.uk/climate/uk/location/southwestengland/wind.html

electricity generated by 1 large-scale Turbine. This demonstrates the efficiencies of scale achieved by large scale wind, as demonstrated in the figure below.

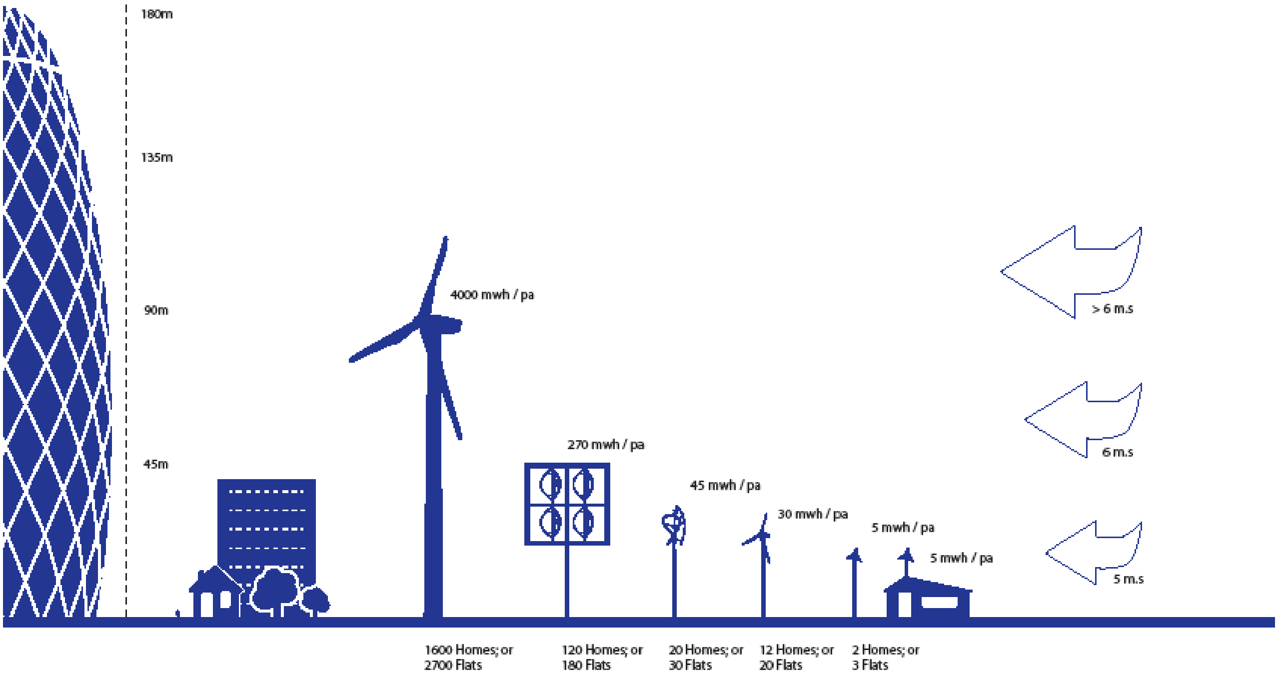


Figure 28: Difference in output relating to scale of wind turbine

Delivery Considerations for Medium-Scale Wind Power

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

- Finance - Farming is generally in decline in the UK due to increasingly limited margins and a potential income source from renewable electricity would be welcome. However it is expected that a significant barrier to investment in small scale renewables will be the upfront investment. As such some form of fiscal support such as an 'energy loan' is likely to be required to provide funding. Such a loan could be set up through the use of a revolving door energy fund such as SALIX10 if it was applicable to renewables. In addition to funding such a service would need to provide information and advice and expect a return in investment from energy saving and Renewable Obligation Certificates (ROCs) receipts.
- Partnerships with turbine providers and installers to leverage efficiencies of scale.

[10] http://www.salixfinance.co.uk/home.html

4.7 BIOMASS ENERGY POTENTIAL

Introduction to Biomass Energy

Biomass is an organically based fuel which can be utilised to produce low carbon energy. As organic material can be grown, it is regarded as a rapidly renewable resource. Utilisation of biomass for energy production does produce CO_2 emissions, but during the growth and production of organic matter, CO_2 is also absorbed from the atmosphere, so over its whole lifecycle it is regarded as a low carbon fuel source.

Biomass can contribute to generation of heat through either individual biomass boilers in homes or district heating systems, and it can contribute to the generation of both heat and power through the use of a combined heat and power system (CHP). The use of CHP requires a higher tonnage of biomass fuel to produce the same amount of usable heat, though it also produces electricity. Some types of biomass can also be used to produce biogas through an anaerobic digestion process.

Some biomass products are waste products from other activities including agriculture and forestry, while biomass can also be specifically produced through growth of bio-crops. There is concern in the industry that excessive specification of biomass technologies on a site-by-site basis will lead to either long-distance import of biomass material or the sacrifice of food-producing arable land to grow dedicated biomass crops. There is a need to take a region-wide approach to biomass sourcing and supply to ensure that biomass is both available for energy use, but that its use is managed and sustainable and that waste biomass sources are utilised first.

The South East Regional Renewables Review concluded that there is potentially more biomass potential than what was originally estimated as a base for the South East targets, by approximately 50%, and is being delivered at a faster rate than expected in the assessment that underpinned the South East Plan targets.

The following sections consider various types of biomass available:

- Biomass suitable for direct combustion in biomass boilers or biomass CHP
  - Waste wood from industrial uses
  - Forestry residues
  - Fuel crops including miscanthus and short rotation coppice such as willow
  - Straw
- Organic waste suitable for utilisation in anaerobic digestion processes
  - Pig and poultry farming sectors
  - Meat and Poultry Processors
  - Brewing
  - Water industry

4.7.1 BIOMASS SUITABLE FOR DIRECT COMBUSTION

Three sources of biomass have been explored:

1. Predicted arisings of low grade wood from improved management of forestry in North Hampshire. Currently much of forestry in the district is unmanaged and could be brought back into productive use as a biomass fuel resource;
2. Potential contribution of dedicated biomass crops such as miscanthus or willow, grown in short rotation on agricultural land in the area. It is unknown how much biomass is currently grown for fuel in the three LPA areas, though it is assumed to be negligible. The use of Grade 3 agricultural land for cultivation of biomass crops is considered optimal as it does not impact on the most productive areas yet is of sufficient quality for crops to grow;
3. Use of straw arising from agricultural activity in the area; and
4. Waste wood recovery.

Biomass available from woodland management

The South East is one of the most forested areas in England. There are approximately 15,962ha of woodland in the study area, which through effective management could generate 55,869odt (oven dried tonnes) of biomass fuel from trimmings. This equates to approximately 13% of the 423,500odt of biomass generated through woodland management that the Biomass Resources and Concentrators study estimates could be generated across the South East. Assuming that all the woodland is managed and waste wood was made available for biomass energy through an appropriate supply chain, this could potentially generate 302,620MWh of energy. If all the biomass was used in a biomass CHP unit this could generated enough electricity for over 25,000 homes and heat for around 33,000 homes each year. If used for a district heating system this would be enough to supply over 71,000 homes with heat each year.

The figure below shows the location of woodland resource in North Hampshire. High proportions of forest are present in Basingstoke and Deane and Hart, while Rushmoor has limited resource within the Borough. However, biomass resource should be managed on a County or Region scale, as management phasing will mean that different areas of forest have waste arisings at different times. Biomass supply chain coordination is a good opportunity for the three LPAs to work together to establish a local supply scheme. At the time of writing, Hampshire County Council had begun a study entitled 'Investigating Biomass/Biofuels as a source of clean, alternative energy' to assess the economic possibilities for biomass as an energy source in Hampshire.

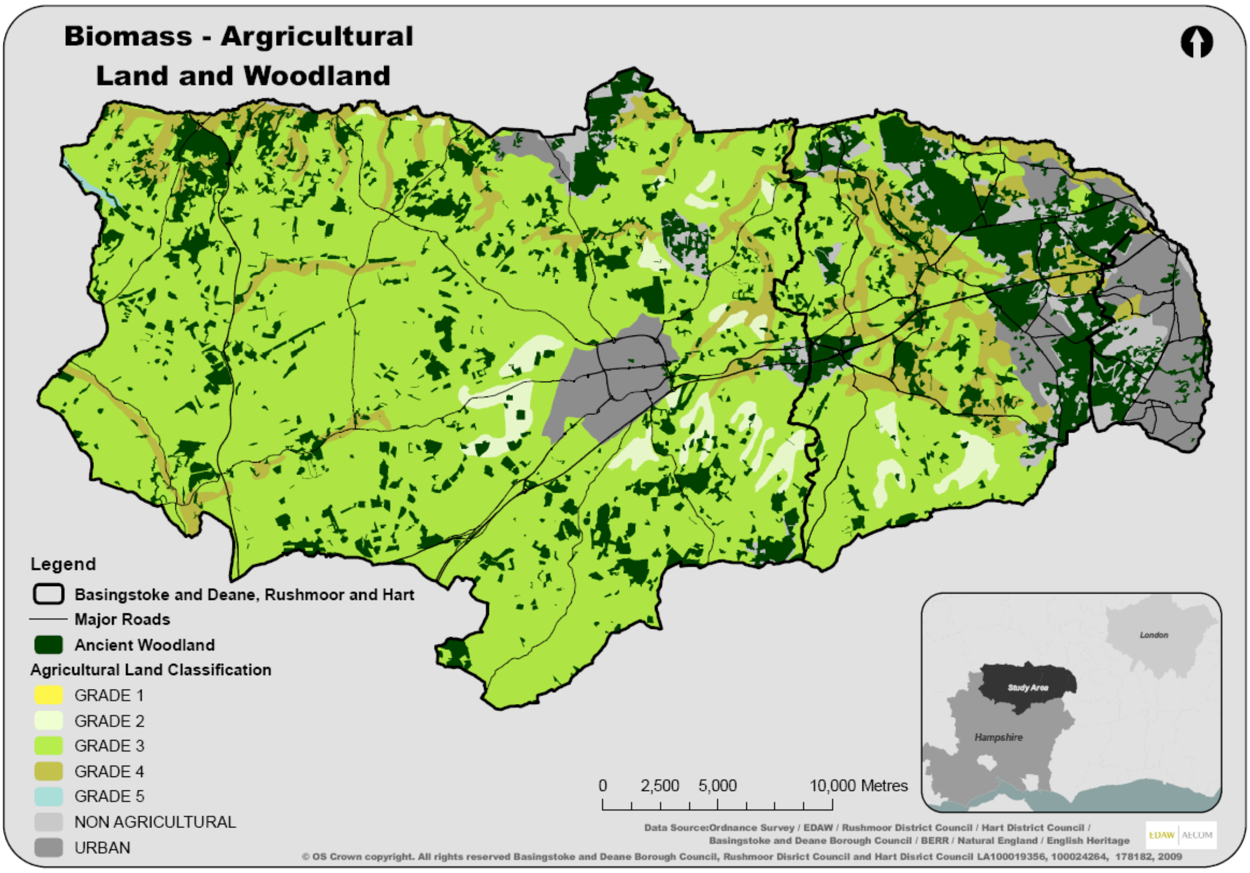


Figure 29: Wood-based Biomass potential

Biomass Potential from Fuel-crops – short rotation coppice and Miscanthus

Both the South East Regional Renewables Review and Towards a Hampshire Energy Strategy recognise that there is significant potential for renewable energy from dedicated fuel crops. The South East Regional Renewables Review outlined that using 5% of the total agricultural area would generate more primary energy than the existing woodland resource. In its assessment of fuel crop resources, grown only on land designated as set aside, Towards a Hampshire Energy Strategy concluded that fuel crops would still be the most significant biomass resource, providing an electricity generation capacity of approximately 45MW.

The figure above shows the grades of agricultural land across North Hampshire. The ideal land for cultivation of bio-crops is grade 3 and 4 (though lower yields are expected on grade 4). Grade 1 and 2 land is unsuitable due to competition with food crops. The vast majority of agricultural land in the study area, approximately 54,212ha is grade 3, which is considered ideal for fuel crops as it preserves the most productive land, grade 1 and grade 2, for sole use for agricultural crops but still of sufficient quality to grow well. Given that large areas are required to grow and/or collect biomass resources viably, and that Rushmoor is more constrained opportunities for biomass have been considered across the three Authorities collectively.

The yield of biomass resource from fuel crops is more efficient than forestry arisings, generating between 10 and 12 oven dried tonnes (odt) per hectare rather than around 2-4 odt. If 5% of the Grade 3 agricultural land was dedicated to growing fuel crops this would generate approximately 27,000odt with the potential to generate 65,204MWh. This would provide electricity for approximately 12,500 homes and heat for 16,500 homes if used in a biomass CHP or heat to 34,500 homes in a district heating system directly through using biomass boilers.

Diverting significant areas of good quality arable land from food cultivation to industrial growth for fuels could prove counter-productive to wider aims of sustainability and local self sufficiency. Nonetheless, as part of a wider strategy for regional and District energy self sufficiency, sourcing a proportion of fuel from woody bio-fuels offers the potential to reduce the CO_2 emissions in North Hampshire. Key opportunities are offered by urban centres that offer sufficient demand to make a Biomass CHP system viable, and development of strong local sources of biomass will be essential.

It is expected that energy crops would be developed later than the utilisation of woodland trimmings and waste wood. This will be driven by the market price of energy crops. Currently the market price of miscanthus is comparable to that of straw so it is not yet considered economically viable in the South East of England. It is expected that increased competition for limited fossil fuel resources and a rising cost of carbon will drive an increase in the demand for biofuels. In order to achieve a target of 12% renewable heat, North Hampshire should firstly seek to harness waste wood and forestry arisings, along with straw before supplementing supply with local bio-crops. Where local supply-chains are not in place, fuel can be imported from elsewhere, but this is not desirable from a carbon perspective.

Biomass Potential from Cereal Crop Residue / Straw

DEFRA's Survey of Agriculture and Horticulture of Local Authorities (2007) sets out that there were 21,012ha of cereal crop grown between Basingstoke and Deane and Hart, with no arisings in Rushmoor. Using assumptions developed in the East of England Biomass Foundation Study (Enviros, 2006), it is predicted that 101,362 tradable tonnes of straw is likely to be produced in the area. Assuming all of this straw was available as biomass for use in a CHP it would be possible to generate 127,000MWh of electricity and 319,000MWh of heat.

The South East Renewables Review concluded, however, that 'existing available straw potential is much reduced' compared with estimates of straw as a biomass source used in the 'Development of a Renewable Energy Assessment and Targets for the South East' report (2000) as it was based on areas of cereal planted, not taking straw use on farm into consideration. Livestock rearing is a significant consumer of locally generated straw and it is not expected that 100% of straw would be available for combustion. Towards a Hampshire Energy Strategy also played down the potential of straw, estimating that it could provide only around 0.2MW electricity generation capacity.

Although there may be some straw available to utilise as a biomass resource it is unlikely to be significant. In addition, the use of straw for combustion for the generation of electricity with or without the use of heat will be dependent on the cost and availability of straw. The price of straw has been steadily rising over recent years and currently ranges from £38 to £50 per tonne depending on time of year (range was £27-£38 per tonne in 2005). A high price of straw will limit the viability as a combustion fuel. As such, the scale of straw combustion to be economic is likely to be greater than the production capacity. A small CHP plant might require around 100,000 tonnes of straw.

Biomass available from waste wood streams

Municipal waste streams offer potential for source separated fuels (wood fuels) that can be burnt, and this can be economically attractive as waste handlers can avoid disposal costs by using waste wood as a heat source. Translating resource potential to North Hampshire's waste stream is difficult with limited LPA scale information but based on population, approximately 38,000 t/yr might be secured and supplied from waste streams within North Hampshire into bio-energy schemes. However, some of the wood waste resource may already be collected and utilised at the Chineham Energy from Waste Plant.

Assuming that by 2020 all of the available resource is secured and supplied to a biomass plant, 38,000 tonnes of waste wood would be expected to generate around 120GWh/yr of heat that could be used to heat homes or to provide pre-heating for high grade industrial uses.

Delivery Considerations for Biomass Energy for Direct Combustion

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

- **Establishment of a supply chain** – While there is already biomass resource available, there is no supply chain set up to collect, process and distribute that fuel. The LPAs should work together and with partners to enable the set up of a local supply chain.
- **Management of local forests** – Ownership and status of local forest varies. A management plan and coordinated programme will need to be in place in partnership with the Forestry Commission and key stakeholders to ensure forests are appropriately managed and the biomass yield is captured for local use. This initially might be best undertaken on a county scale.
- **Management of environmental effects** - 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'.

4.7.2 BIOMASS SUITABLE FOR ANAEROBIC DIGESTION / ORGANIC WASTE

Potential and constraints for anaerobic digestion

There are a variety of waste streams available which could be utilised for energy production using Anaerobic Digestion (AD). AD refers to the decomposition of putrescible waste such as food waste, animal slurries and potentially a proportion of garden waste in anaerobic (oxygenless) conditions. AD produces a biogas made up of around 60 per cent methane and 40 per cent carbon dioxide (CO_2). This can be burnt to generate heat or electricity. The biogas produced by the AD process can be used to generate electricity in a gas engine. Note that the AD process itself has an electricity requirement of between 10 - 20% of the power generated.

Anaerobic digesters also produce valuable fertilizer as a by-product which can be recycled back onto the land aiding agricultural productivity. In addition to all of that, biogas is in many ways a good alternative transport fuel – particularly for buses and heavy vehicles - that could provide a measure of resilience against peak oil.

As a transport fuel, the potential of biogas has already been demonstrated in Europe. In the city of Lille[11] in northern France, 120 of the city's 400 buses run on biogas made from locally sourced food waste, with one new gas-power bus commissioned every week. By 2012 all buses will run on a mix of one-third natural gas, two-thirds biogas. The biogas is produced by an anaerobic digester at the bus terminus, which fuels not only the buses but also the lorries that collect the waste. This means there is a high degree of insulation to short term interruptions in the oil supply. In Switzerland there are 3500 vehicles running on biogas, and there are also major programmes in Sweden and Germany.

[11] The Oil Depletion Analysis Centre and the Post Carbon Institute (2009) "Preparing for Peak Oil – Local Authorities and the Energy Crisis" ODAC

Some British local authorities (Norfolk, South Staffordshire) have commissioned anaerobic digesters as part of their waste strategy, but none has yet exploited the full transport potential of biogas – which is considerable. According to a report by Environmental Protection (formerly the National Society for Clean Air), Britain produces some 30 million dry tonnes of food waste and agricultural manure per year, and this could produce over 6 million tonnes of oil equivalent in biomethane. That equates to about 16% of total transport fuel demand, while public transport consumes less than 5%. In other words, Britain could fuel a public transport network three times bigger than today's on food and agricultural waste alone.

Potential for utilisation of household putrescible waste

The South East Renewables Review suggests that as the 'biomass portion of Municipal Solid Waste' is deemed by the Renewable Obligation Order 2009 to be 50%', 2,260,000t of the 4,520,000 tonnes of MSW produced in the South East would count as biomass resource.

Using an understanding of the average household waste per person produced in each of the Authorities, as recorded in the Best Value Performance Indicator, along with the population data for 2007, it is possible to estimate the suitable waste arising in the study area.

Table 26: Waste Arisings from Waste Best Value Performance Indicators

	Annual household waste per person (kg)	Total household waste (t)	Biomass available (t)
Basingstoke and Deane	392.3	62,823	31,411.5
Hart	362.7	32,615	16,307.5
Rushmoor	362.0	32,347	16,173.5
North Hampshire		127,785	63,892.5

Although there is potentially considerable biomass resource generated from household waste, and composting rates are currently low (Basingstoke and Deane 0.95%, Hart 5.55%, Rushmoor 3%) a large proportion of the waste generated across the whole of Hampshire, 47.73% (figures are not broken down by Local Authority) goes to feed Hampshire's three energy from waste facilities at Chineham, Marchwood and Portsmouth. The energy from waste facility at Chineham, which is in Basingstoke and Deane Borough processes around 90,000 tonnes of waste per year to generate approximately 11.7MW of electricity.

Efforts to reduce waste arising and increase recycling and composting (bearing in mind that composting and AD are not mutually exclusive) can have an impact on the viability of energy from waste installations, as it can reduce the calorific composition of the waste stream. Towards a Hampshire Energy Strategy concludes that:

'a primary consideration must be to sustain the output of existing EfW facilities from increased diversions from landfill whilst sustaining any improvement in recycling or accessing new resources from other controlled waste streams. The scale of future contribution from waste has to be set against the need to sustain existing facilities. However, the potential for growth still exists whilst the diversion of waste from landfill remains possible. The carbon dioxide savings reflect electrical power exported to the grid. No assumptions are made over future heat capture displacing the need for piped gas'.

The Chineham Energy from Waste facility produces energy, but waste heat is not utilised. There may be opportunities to capture waste heat and distribute to adjacent communities or new development through a district heating network. This is discussed further in Chapter 5.

Potential for utilisation of agricultural waste

Towards a Hampshire Energy Strategy estimated that there would be 9.6MW of electricity generation capacity available from 'farm animal by products (cattle, pigs and poultry)' in Hampshire. The table below outlines the number of livestock in North Hampshire.

Table 27: Livestock in North Hampshire

Livestock	Number of Stock
Cattle	14787
Pigs	8088
Sheep	29244
Poultry	45520

In total, some 150 million wet tonnes (cattle, sheep and pigs) of excreta are produced in the UK, of which approximately 105 million tonnes are returned to the land by grazing. A further 3.5 million wet tonnes of used poultry litter and excreta (1.8 millions dry tonnes) are produced (DEFRA, 2005). Of the farm feed-stocks available, slurry is more suitable for anaerobic digestion than farmyard manure and poultry litter[12]. Use of the Farm Survey (2007) data for Hampshire County suggest that the anaerobic digestion of animal manures and slurries might generate 15.6 million m^3 of biogas per annum[13] (most digesters in the UK are based on pig and dairy farms and used for on farm heating).

Potential for utilisation of water industry sludge

The water industry produces both wet and dry sludge in large quantities which can be diverted for energy recovery. The majority of biomass electricity projects in the UK are sewage gas projects that are less than 2.2 MW in electrical capacity[14]. Anaerobic digestion produces a sewage gas which contains methane and can be used to fuel gas CHP. Energy from Sewage is likely to be delivered at a County level and cannot be led directly by the LPAs.

Delivery considerations for anaerobic digestion

Across the LPA areas, there are a range of potential sources of organic waste available which could be utilised by Anaerobic Digestion processes. The quantity of material available means that AD is viable in the LPA areas, but delivery should ideally be considered at a County level to enable coordination and prioritisation. The establishment of a supply chain is key to delivery. This supply chain would need to both gather suitable wastes, and achieve a mix of wastes which is suitable for combination in AD. The scale of potential of household waste alone in LPA areas may not be enough to justify an AD plant, but the potential from agricultural wastes and other sources is potentially significant if supply chains are put in place. North Hampshire LPAs should look for opportunities to support the development of such supply chains and proposals for AD in the area, and work with local industries and agriculture stakeholders to pool biomass resources for use in central AD plants.

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[12] Lewis, D. (2006) "South West Region Biomass and Biofuels Review" Royal Agricultural College on behalf of the Knowledge West Project

[13] Based on calculator available at www.anaerobic-digestion.com based on DEFRA guidance.

[14] East of England Biomass Foundation Study report, Renewables East, November 2005

4.8 COMBINED HEAT AND POWER

Potential and constraints of CHP

Combined Heat and Power provides a much more efficient way of generating and distributing energy as it makes use of the heat usually wasted in energy production and because it is located close to the development the losses in transmission are reduced. Typically, a standard CHP achieves a 35% reduction in primary energy usage compared with conventional power stations and heat only boilers. However, CHP can also be run using biomass/biogas to provide a low carbon solution, with reductions in emission nearing 100%. The figure below shows the CHP arrangement compared with traditional energy generation.

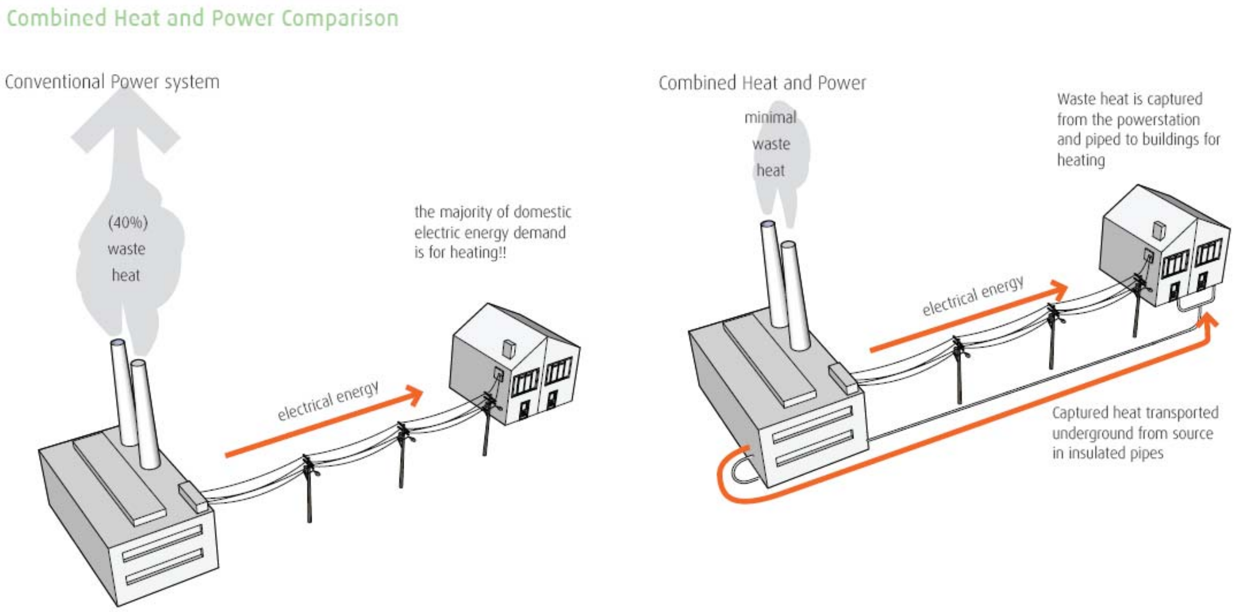


Figure 30: CHP comparison

Scale of potential

The figure below highlights areas which have a heat demand intensity of greater than 3MW/km2 (or 26kwh/m2). These areas are expected to be commercially viable for the installation of a district heating or combined heat and power system based on professional experience. The figure also shows the location of high energy demand facilities such as hospitals, leisure centres and schools. The location of such facilities is key, as district heating schemes often need an 'anchor load' or consistent energy user to operate efficiently. Therefore areas around these anchor loads are priorities for development.

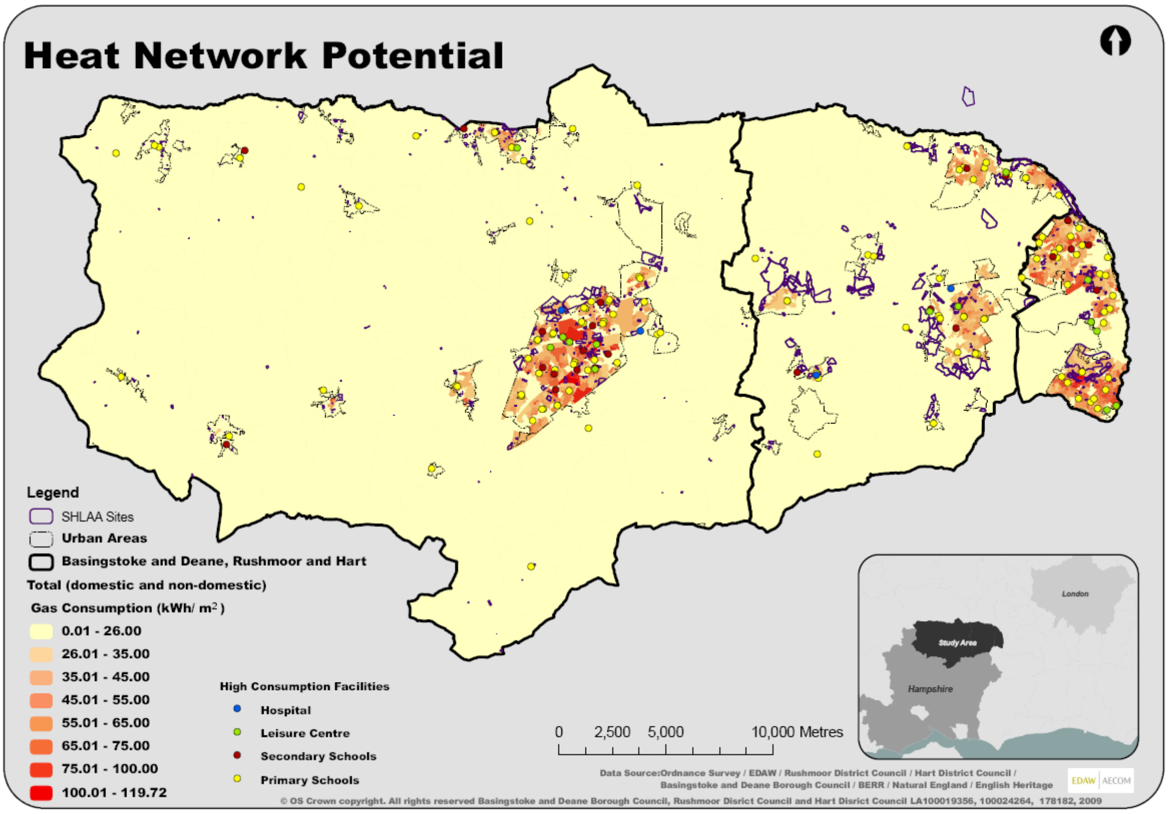


Figure 31: Current distribution of heat density

The heat network could either be connected to a district heating system or a combined heat and power system (which distribute waste heat from the electricity generation process). These systems could utilise gas or biomass as a supply fuel, and the distribution of heat in such a fashion brings great efficiencies as heat demands are balanced across an area. It should be noted that while the introduction of CHP is strongly encouraged at a European and National level, and local authorities play a key role in delivery, CHP will only count towards renewable energy targets where it is fuelled by a renewable or low carbon source such as biomass or biogas. Technology surrounding biomass powered CHP is still developing in the UK but is expected to be perfected over the coming years. Hence, depending on delivery conditions it may be more suitable to implement gas-fired CHP in the interim and convert the fuel source to biomass or biogas as the technology and supply chain develops. However, the introduction of gas CHP is still beneficial as it contributes directly to CO_2 reduction targets through efficient supply of electricity and heat.

The table below shows the expected energy generation and CO_2 savings associated with installation of gas-fired CHP in the three LPA areas to 15% of the viable areas (5% uptake each phase, beginning phase 2). CO_2 reductions could be further increased through a larger take up of heat networks, or through the use of biomass fuel in the place of gas.

Table 28: Effect of introduction of gas CHP into 15% of viable existing areas

LPA Area	2006-2011	2011-2016	2016-2021	2021-2026
Electricity from CHP introduction in existing areas (kWh/year)				
Basingstoke and Deane	0	37,965,643	75,931,286	113,896,928
Hart	0	15,356,716	30,713,432	46,070,148
Rushmoor	0	29,374,439	58,748,879	88,123,318
Heat from CHP introduction in existing areas (kWh/year)				
Basingstoke and Deane	0	57,523,701	115,047,402	172,571,104
Hart	0	23,267,751	46,535,503	69,803,254
Rushmoor	0	44,506,726	89,013,453	133,520,179
Total CO_2 saving over conventional supply (tonnes/year)				
Basingstoke and Deane	0	4,102	8,204	12,306
Hart	0	1,659	3,318	4,978
Rushmoor	0	3,174	6,347	9,521

Delivery considerations

CHP linked to a neighbourhood via a district heating arrangement could meet the home's annual heating, hot water and most, if not all, of their electrical requirements. Higher density housing, typically at least 50 dwellings per hectare, tends to be more commercially viable to reduce district heating infrastructure costs as costs are related to the length of the pipe, although CHP is technically viable at most densities. CHP also works best in mixed use developments as they operate most efficiently near maximum capacity. As different users have different energy use patterns (residential more in the morning and evening whilst offices through the middle of the day) mixed use development allows energy requirements to be balanced.

The size of the facility will be somewhat dependent on the number of homes it is to serve. For a facility to serve 1500 homes, you would probably require a facility of 500m^2 footprint. For biomass powered you would need a fuel storage area as well. The majority of the building could be 4m high, but a section rising to 7-9m would also be needed to house the heat store and there would also be a flue which will need to be a few metres higher than surrounding development.

As CHP works best in higher density areas, siting facilities can become a challenge. With sensitive and creative urban design, there is however, limited reason as to why they could not be able to be integrated into a townscape. The figure below highlights some potential options for urban design of CHP.

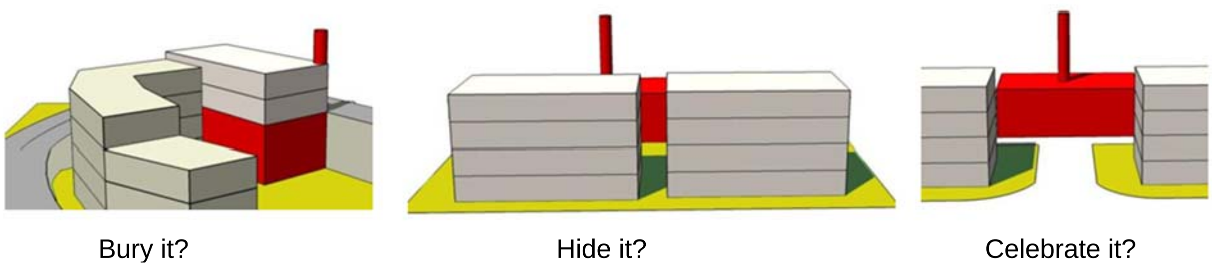


Figure 32: Design options for siting CHP

CHP facilities may be designed to a specification where it is necessary to dispose of waste heat in summer. Suitable locations and methods should be considered in design to ensure this does not have significant environmental effects.

4.9 MICRO GENERATION POTENTIAL

The term micro-generation is used to describe small scale technologies (typically less than 50 kW electric and 100 kW thermal). These technologies are usually based in a building or on a small site, providing energy to one or more buildings. Micro-generation technologies include:

- Heat pumps
- Micro CHP
- Photovoltaics (PV)
- Solar thermal
- Small and micro wind

The installation of micro-renewables in new and existing homes will count towards national and regional targets, and therefore it is important to recognise how much of a contribution micro-generation is likely to make.

Scale of potential

A study for BERR[15] modelled the UK market for micro-generation technologies out to 2050, by simulating the UK consumer base and technologies for both the residential and non residential sectors. A number of assumptions are made based on regional surveys of consumer attitudes to technologies and costs, and their likelihood of purchasing a technology depending on their current house / building type, the current energy price environment, and their "willingness to pay". Using this work and assumptions for a 'medium level' uptake of micro-generation in North Hampshire, the following installation of micro-generation is expected. This scenario entails a substantial change in the uptake of micro-generation. The level of electricity generation shown in the table below is equivalent to every third home in North Hampshire installing 2m^2 of photovoltaic panels.

The table below sets out the estimated potential from a mix of all micro-generation sources, although solar energy presents the greatest micro-generation energy resource in North Hampshire and is discussed in more detail below.

Table 29: Effect of introduction of 'medium level' micro-generation in existing buildings

LPA Area	2006-2011	2011-2016	2016-2021	2021-2026
Micro-generation Electricity Production (kWh)				
Basingstoke and Deane	229,870	597,678	2,064,338	5,719,395
Hart	120,842	314,199	1,085,220	3,006,679
Rushmoor	131,276	341,327	1,178,920	3,266,281
Micro-generation Heat Production (kWh)				
Basingstoke and Deane	469,572	1,159,262	3,889,155	11,257,975
Hart	246,854	609,423	2,044,524	5,918,303
Rushmoor	268,167	662,041	2,221,052	6,429,300
CO_2 Reduction due to Micro-generation in Existing Buildings (tonnes)				
Basingstoke and Deane	58	143	550	1,795
Hart	30	75	289	944
Rushmoor	33	82	314	1,025

[15] The Growth Potential of Micro-generation in England, Wales, and Scotland. Element Energy 2007. BERR

Potential and constraints for solar energy

Compared with the rest of the UK, the solar potential across the study area is good. However, on a global scale, solar technologies do not perform at high efficiencies in the UK as compared to say Colorado, nonetheless, parts of the South East receive as much or more solar irradiation as Germany which has a large installed capacity of solar panels. The figure below shows the solar irradiation in the UK.

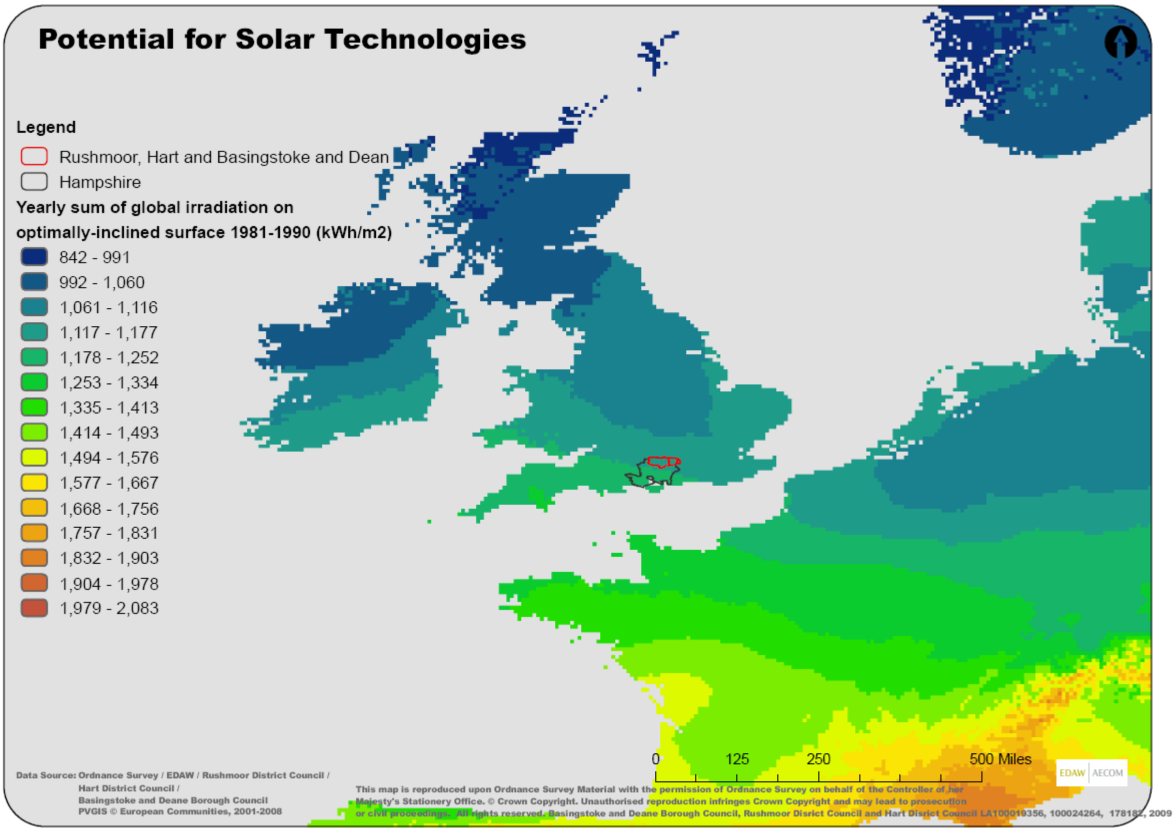


Figure 33: Potential for solar energy in North Hampshire

There are two main types of solar technology that are generally delivered alongside built development. Photovoltaic panels produce renewable electricity can be mounted on structures or used in stand-alone installations. Solar thermal panels are commonly used to directly heat hot water in homes, but can also be used to assist heating. Photovoltaics are currently expensive in comparison to other renewable energy options, but they are one of the few options available for renewable electricity production and are often one of the only on-site options to assist in CO_2 reduction associated with electricity use. Solar thermal panels are more space and cost effective and are well utilised technology for heating hot water.

Scale of potential of Solar Energy

There are around 130,000 houses in the study area. Assuming 2 kWp or 12-16m² of panels per home was installed on half of all homes – the remainder being over shaded or sub optimally orientated, 110GWh of renewable electricity could be generated each year (equivalent to 15 3MW turbines). The table below gives an indication of the scale of potential.

Table 30: Energy potential from PV

Projection	No Homes with 2 kWp installation	No industrial 0.5 MW installations	KWp	GWh elec	~No homes electricity provision
2010	0	0.00	0	0	0
2015	1500	4.00	5500	4.4	1180
2020	2000	6.00	8000	6.4	1930

Delivery considerations for micro-generation in North Hampshire

Solar technologies are widely available and will have a role to play in energy generation, especially on low density development with a substantial amount of exposed roof space. It is expected that the installation of solar thermal panels on the roof of homes and businesses will largely be driven by building regulations. To ensure that solar technologies are effective, south facing roof space should be favoured in building design and masterplanning (through street orientation).

There is the potential for North Hampshire Authorities to incentivise swifter uptake of renewable electricity in the district through a business information awareness campaign and through working with other partners to identify commercial/industrial businesses with larger areas of south facing roof who might either be interested in investing in PV or who would be interested in linking up with an investment body.

Historically, as with the rest of the UK, the take up of solar technologies has been limited by cost. Whereas before the role of solar technologies was largely predicted to be restricted to small-scale on-site development, the introduction of Feed in Tariffs could potentially make roof mounted PV of interest to investors.

Since the South East renewable targets were developed, the Government has published planned feed in tariffs for the generation and export of renewable electricity for a range of micro generation renewables including, PV, as well as Anaerobic Digestion, biomass, small hydro and wind. The table below shows the potential feed in tariff for PV and the figure below provides more details as to how feed in tariffs operate.

Table 31: Feed in tariff for photovoltaics

PV Scale	Potential initial tariff (p/kWh)	Annual degression %
<4kW new build	31.0	7
<4kW retrofit	36.5	7
4-10kW	31.0	7
10-100kW	28.0	7
100kW-5MW	26.0	7
Stand alone system	26.0	7

Feed-in Tariffs

Feed-in Tariffs are to be introduced in April 2010 to replace the support provided by the Low Carbon Buildings Programme and stimulate increased vigour in the take up of installation of small-medium scale renewable electricity generation. The Government intends the FIT system will be simple and user-friendly in order to maximise take up.

The scheme will include:

- Fixed payment from the electricity supplier for every kWh generated (the "generation tariff").
- A guaranteed minimum payment additional to the generation tariff for every kWh exported to the wider electricity market (the "export tariff").
- Generators receiving FITs will also benefit from on-site use: where they use the electricity they generate on-site, they will be able to offset this against electricity they would otherwise have had to buy.
- Technologies included: wind, solar PV, hydro, anaerobic digestion, biomass and biomass CHP, non-renewable micro CHP.
- Tariffs will be paid for 20 years for new projects.
- The tariff levels proposed have been calculated to ensure that the total benefits an investor can be expected to achieve (from the generation tariff, the export tariff and/or the offsetting benefit) should compensate the investor for the costs of the installation as well as provide such a rate of return.
- The government intends to set tariffs at a level to encourage investment in small scale low carbon generation. The rate of return will be established between 5% and 8%.
- The proposed tariff levels for new projects will decrease by predetermined rates each year ("degression"). [The tariff rate agreed at the project outset will be maintained for the 20 year period – this therefore incentivises early take-up for maximum revenue return]

Figure 34: Feed-in Tariffs

4.10 EXPECTED DELIVERY OF RENEWABLE AND LOW CARBON ENERGY THROUGH NEW DEVELOPMENT

Carbon efficient new development will be delivered through a combination of energy efficiency measures and development driven renewable and low carbon energy infrastructure in-line with the Government's commitment to zero carbon development in 2016. This would require around a 70% reduction above the TER with the remaining 30% potentially picked up through a range of 'allowable solutions' to offset the remaining energy requirements. Consequently, new development will deliver a proportion of renewable and low carbon energy which can contribute to the LPA renewable energy targets.

Range and Potential of Technologies Expected for Inclusion with New Development

The selection of technologies included in new development will depend on the level of CO_2 reduction which can be achieved through energy efficiency, and the most cost effective energy generating technologies available for inclusion on-site to reach the required CO_2 reduction. The general range of technologies available for use in new development and their constraints is shown in the figure below.

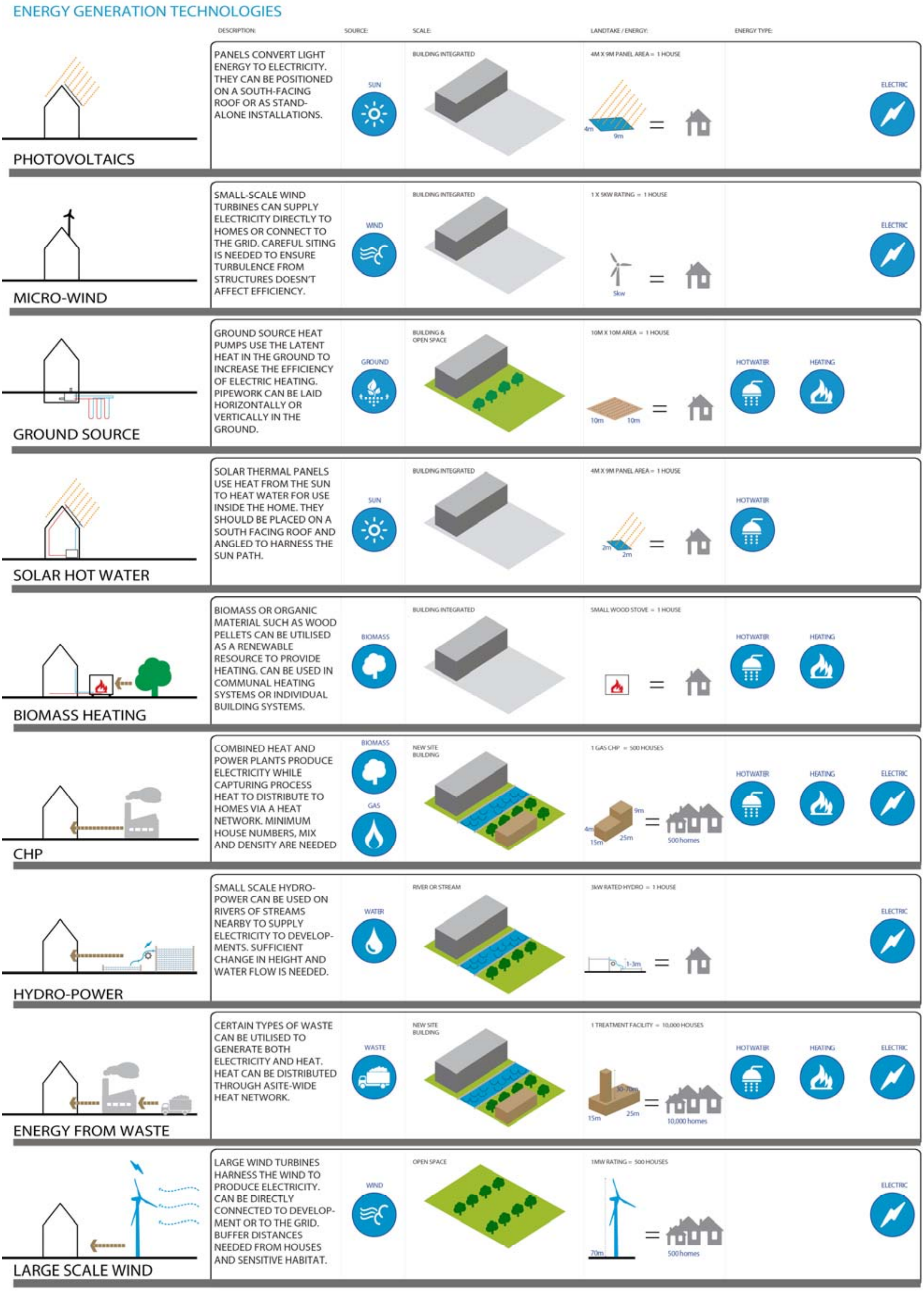
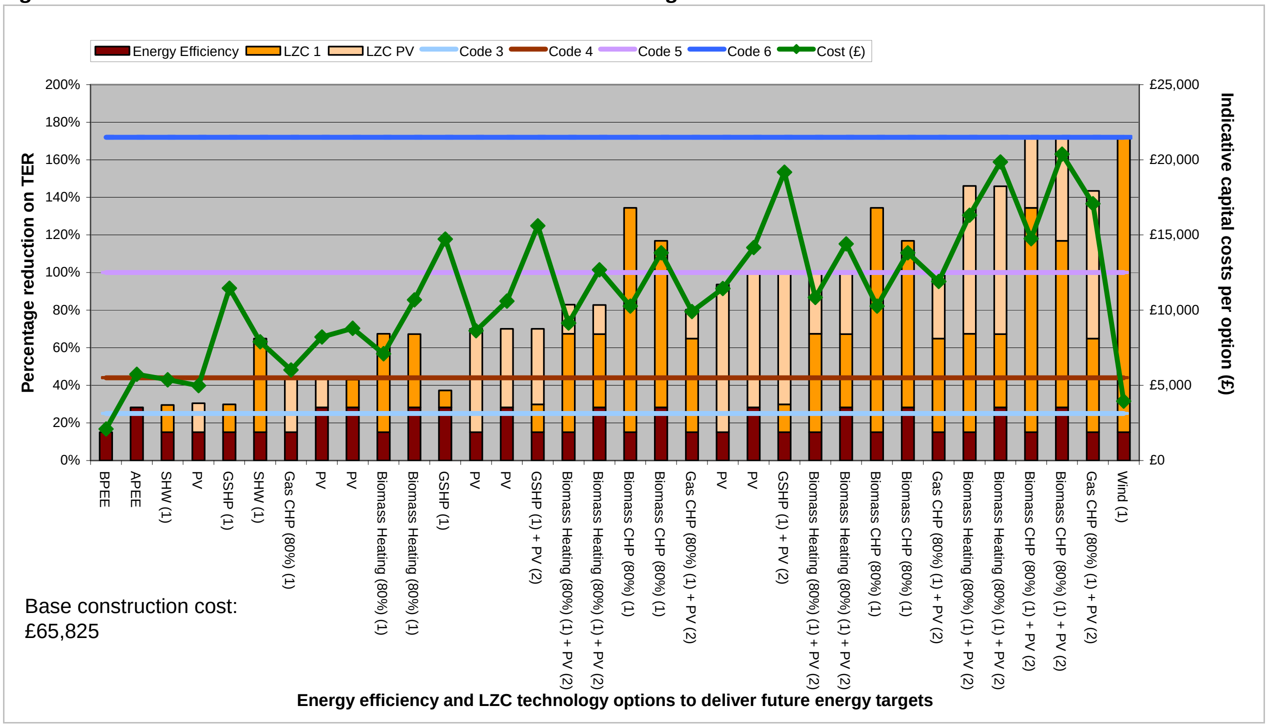


Figure 35: Range of renewable and low carbon technologies available for use in new development

The figure below demonstrates the various costs of combinations of technologies to deliver the energy requirements of level 3, 4 and 6 of the Code for Sustainable Homes. These correspond to expected requirements under building regulations, with the exception that 'zero carbon' under code level 6 requires all CO_2 reductions to be achieved on site (thus increasing cost significantly), while building regulations allow off-site CO_2 reduction through 'allowable solutions'.

Figure 36: Relative cost and carbon reduction of different technologies for a terraced house to meet various code levels[16]



Key

BPEE = Best Practice Energy Efficiency

APEE = Advance Practice Energy Efficiency

SHW = Solar Hot Water

PV = Photovoltaics

GSHP = Ground Source Heat Pumps

CHP = Combined Heat and Power

Scale of Potential

The figure below sets out an expected mix of renewable and low carbon energy generation infrastructure to come forward within new development sites based on the cost profile of different technologies used in new development in order to achieve Zero Carbon requirements as developed through research undertaken by AECOM and Cyril Sweett. This has been used to predict the developer's choice of technology to use onsite. The predictions also take account of urban or rural character and the expected selection of technologies in the area (to determine whether density of development is likely to be high enough for district heating, and if wind power will be efficient). The following figure relates the contribution of different technologies in terms of CO_2 reduction.

16 Costs derived from in-house AECOM data from work undertaken with Cyril Sweett for DCLG

Figure 37: Expected use of renewable and low carbon technologies on new development sites in North Hampshire

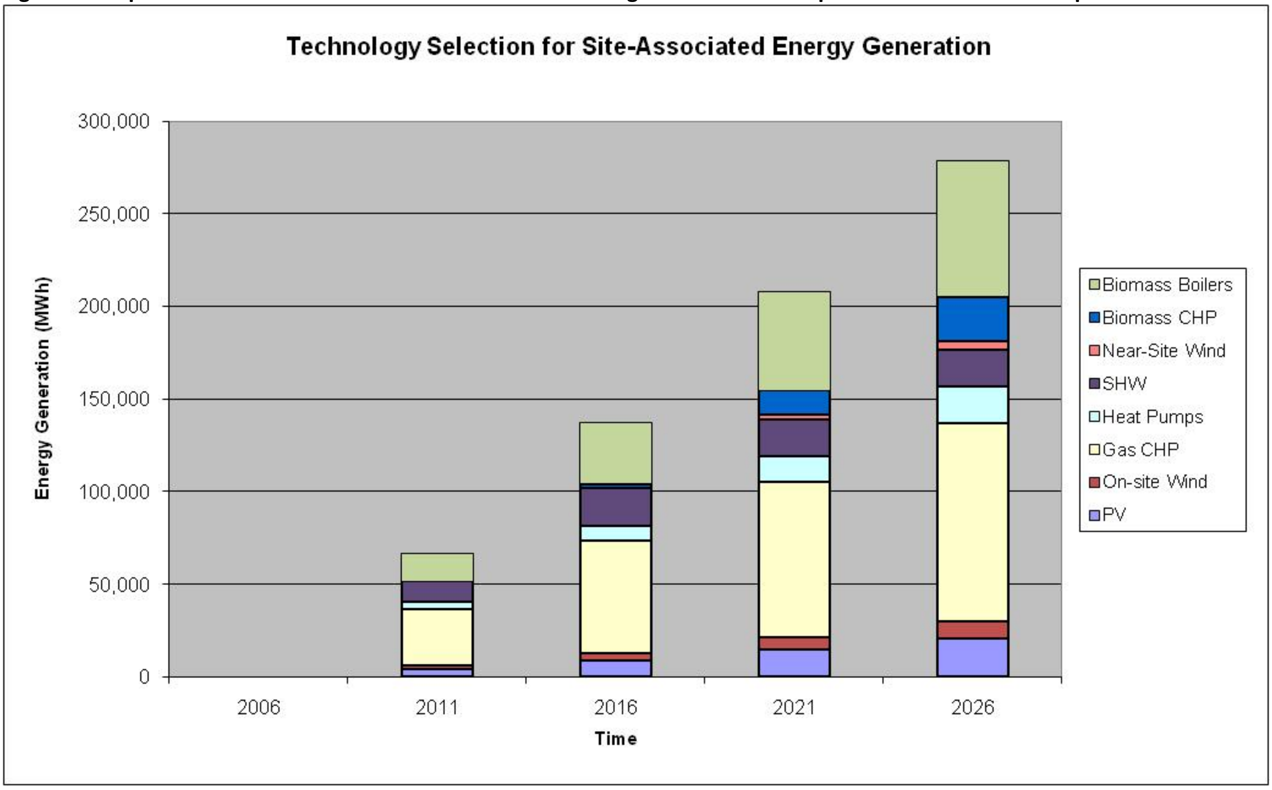
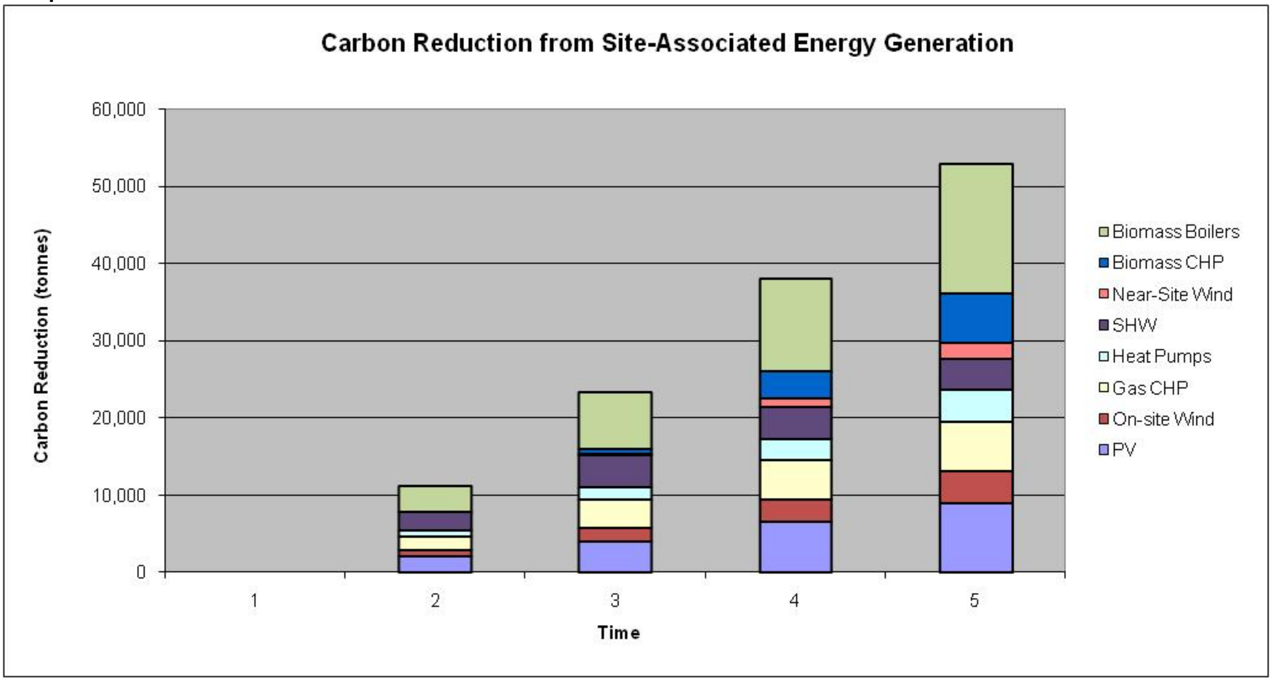


Figure 38: Carbon reduction through use of renewable and low carbon technologies on new development sites in North Hampshire



Delivery Considerations for New Development

- **Good planning and design**: Large cost savings can often be made by planning in low carbon and renewable infrastructure at the start of the design process.
- **Different technologies for different types of development**: A range of technologies assures there are different types which are more suitable for different types of developments.

4.11 CONSIDERING LPA AREA-WIDE RENEWABLE ENERGY TARGETS

Through the analysis above, it is clear that there is substantial renewable and low carbon resource across North Hampshire, though the scale and type of solution varies across the three LPAs. All three LPAs show significant potential for the delivery of renewable and low carbon heat supply, due to the existence of both many opportunities for the integration of district heating networks (in both existing and new development) and an abundant local biomass supply. Micro-generation related to existing homes and installation of renewables to supply heat within new development are also likely to make a significant contribution towards meeting heat targets.

The potential to integrate renewable technologies to supply electricity however, varies across the three LPA areas:

- **Basingstoke and Deane Borough**: Due to the size of the Borough and large amount of countryside included, Basingstoke and Deane has significant local renewable resource potential. There are promising sites available for the installation of large-scale wind turbines and good potential for local collection of biomass sources. Simultaneously, there are key opportunities for installation of district heating, powered by CHP in the urban Basingstoke area.
- **Hart District**: The Hart District also has a significant level of renewable resource available, with a range of good areas where wind may be deliverable, and a very large coverage of woodland which could be managed to source local biomass resource. Hart also has several opportunities for delivery of CHP in its urban areas.
- **Rushmoor Borough**: Rushmoor, due to its urban nature is more constrained in the options for delivery of renewable energy. Nevertheless there is a considerable area of forested land where waste arisings could be used as biomass supply, and there are a few areas where wind may be a possibility. Due to the proximity of small airports in this area, consultation with aviation will have to be undertaken regarding all stand-alone wind turbines in the area, but this will not necessarily prevent delivery. Instead the concentration of opportunities is the urban areas, with wide-spread delivery of CHP and micro-generation. The presence of large development sites in the Borough will also provide opportunities to drive renewable solutions on a wider scale.

The renewable potential of the three districts is shown visually in the ‘Energy Opportunity Plans’ in the next section.

As all LPA areas have a large quantity of urban development, the delivery of their proportion of renewable heat based on the national target (around 12% of heat by 2020) should be adhered to. In terms of electricity generation, targets should be challenging, but deliverable, based on the opportunities and constraints in each LPA area. National targets are aiming towards 30% of our electricity on a UK wide basis being supplied by renewables. Some of this target will be met by nationally-driven projects for off-shore wind, wind-farms, tidal energy etc. Regardless, the scale of the challenge is very considerable, and each LPA area will be expected to play a role in meeting that. Meanwhile, the South East Plan sets a target of 10% of electricity from renewables by 2020 (and 16% by 2026), and background studies show Hampshire is well placed to meet its share. Therefore, this target has been set as the minimum to be achieved in each Borough, and the following scenarios demonstrate how that target could be met in each LPA area (and if those targets can reasonably be exceeded in the time period).

There are various scenarios and combinations of renewables that could be used to deliver against targets. The best scenario will be determined through delivery opportunities and partnerships over time. Some of the possible combinations of opportunities are outlined below to demonstrate the scale of the challenge and possible synergies that may exist in delivery options. Delivery options and constraints are discussed in detail in Chapter 6.

Two scenarios have been tested to illustrate indicative options to meet or exceed targets for heat and electricity by 2020:

Scenario A: Resource focussed delivery: This scenario focuses on utilising the potential of local renewable resources, with minimal input from building-focussed technologies and combined heat and power (CHP).

Scenario B: Built environment focussed delivery – This scenario focussed on the potential contribution from installing Biomass CHP within a portion of the viable areas around existing high density development and waste heat sources, along with increased micro-generation in existing buildings. A biomass CHP network could be introduced through a Council or community led scheme or an ESCo.

Basingstoke and Deane Delivery Scenarios

The tables below show possible combinations of initiatives under each scenario and the resulting percentage of electricity and heat provided through low carbon generation.

Table 32: Scenario A Potential Contributions of Renewables – Basingstoke and Deane

Renewable Resource	GWh Electricity	Gwh Heat	Corresponding Delivery Intervention Needed
Landfill gas	6.2	0.0	Continue existing landfill gas arrangements
Energy from Waste	97.4	0.0	Existing Chineham Incinerator
Large wind power	62.6	0.0	Delivery of 10 2.75MW turbines (100m tall)
Medium wind power	0.8	0.0	Delivery of the equivalent of 100 6kW turbines on individual properties
Biomass Heating	0.0	100.6	Utilising wood-based biomass to heat homes and support industry. Utilising 35% of theoretical arisings from local forestry management. Biomass heating could be introduced to homes off the gas network in rural areas.
Biomass CHP	0.0	0.0	None delivered under this scenario
Anaerobic Digestion	3.0	3.6	Assuming a mix of waste is available to create three small scale AD plants
Micro-generation on Existing Buildings	0.7	4.4	Low up-take case for addition of micro-generation technologies for existing homes
Renewable energy included with New Development (on-site)	34.0	78.3	Expected renewable energy to be included with new development (on-site) following changes to Building Regulations.
Total (GWh)	204.7	186.9	
% of Consumption	25%	12%	*This scenario delivers a large amount of wind power, and utilises local biomass streams.*

Table 33: Scenario B Potential Contributions of Renewables – Basingstoke and Deane

Renewable Resource	GWh Electricity	Gwh Heat	Corresponding Delivery Intervention Needed
Landfill gas	6.2	0.0	Continue existing landfill gas arrangements
Energy from Waste	97.4	0.0	Existing Chineham Incinerator
Large wind power	0.0	0.0	No wind contribution
Medium wind power	0.0	0.0	No wind contribution
Biomass Heating	0.0	0.0	No biomass heating
Biomass CHP	113.9	172.6	Biomass CHP used to supply 15% of the 'viable' areas identified in the heat map
Anaerobic Digestion	0.0	0.0	No AD contribution
Micro-generation on Existing Buildings	2.1	3.9	Medium up-take case for addition of micro-generation technologies for existing homes
Renewable energy included with New Development (on-site)	34.0	78.3	Expected renewable energy to be included with new development (on-site) following changes to Building Regulations.
Total (kWh)	191.4	254.7	
% of Consumption	31%	16%	*This scenario delivers biomass CHP to a portion of 'viable areas'. This would be most suitable in Basingstoke (see following chapter).*

The scenarios above demonstrate that Basingstoke and Deane has a range of opportunities due to both its rural areas and corresponding potential for installation of wind power and generation of biomass, along with significant potential to install CHP in existing urban areas. In both scenarios, the heat target of 12% that is expected nationally is met, and is thus recommended. The electricity target for the South East (10%) is well exceeded in both scenarios. The area already makes a strong contribution to low carbon electricity generation through the utilisation of energy from waste and landfill gas. Therefore, due to additional potential in the area, the local electricity target should be higher. The national target for renewable energy by 2020 is 30% of demand, and Basingstoke and Deane could make a significant contribution towards that target. It is recommended that the electricity target is raised to 20% (where current landfill gas and energy from waste are included).

Hart Delivery Scenarios

The tables below show possible combinations of initiatives under each scenario and the resulting percentage of electricity and heat provided through low carbon generation.

Table 34: Scenario A Potential Contributions of Renewables – Hart

Renewable Resource	GWh Electricity	Gwh Heat	Corresponding Delivery Intervention Needed
Landfill gas	7.8	0.0	Continue existing landfill gas arrangements
Large wind power	18.8	0.0	Delivery of 3 2.75MW turbines (100m tall)
Medium wind power	0.4	0.0	Delivery of the equivalent of 50 6kW turbines on individual properties
Biomass Heating	0.0	71.9	Utilising wood-based biomass to heat homes and support industry. Utilising 25% of theoretical arisings from local forestry management. Biomass heating could be introduced to homes off the gas network in rural areas.
Biomass CHP	0.0	0.0	None delivered under this scenario
Anaerobic Digestion	1.0	1.2	Assuming a mix of waste is available to create one small scale AD plant
Micro-generation on Existing Buildings	0.4	2.3	Low up-take case for addition of micro-generation technologies for existing homes
Renewable energy included with New Development (on-site)	13.8	31.9	Expected renewable energy to be included with new development (on-site) following changes to Building Regulations.
Total (GWh)	42.2	107.3	
% of Consumption	11%	13%	*This scenario delivers some wind power in the more rural areas of Hart, and utilises local biomass streams.*

Table 35: Scenario B Potential Contributions of Renewables – Hart

Renewable Resource	GWh Electricity	Gwh Heat	Corresponding Delivery Intervention Needed
Landfill gas	7.8	0.0	Continue existing landfill gas arrangements
Large wind power	0.0	0.0	No wind contribution
Medium wind power	0.0	0.0	No wind contribution
Biomass Heating	0.0	0.0	No biomass heating
Biomass CHP	20.9	69.8	Biomass CHP used to supply 15% of the 'viable' areas identified in the heat map
Anaerobic Digestion	0.0	0.0	No AD contribution
Micro-generation on Existing Buildings	1.1	2.0	Medium up-take case for addition of micro-generation technologies for existing homes
Renewable energy included with New Development (on-site)	13.8	31.9	Expected renewable energy to be included with new development (on-site) following changes to Building Regulations.
Total (kWh)	43.7	103.7	
% of Consumption	19%	12%	*This scenario delivers some biomass CHP to the 'viable' urban areas in Hart, contributing to both electricity and heat targets.*

Both scenarios show that Hart is capable of meeting the national heat target contribution of 12% of heat demand, and the South East target of 10% of electricity. Due to the comparatively lower density housing the potential for heat networks is restricted to town centre areas, yet the wide coverage of development in the area means that local resources are also limited. Therefore, it is recommended that targets are not raised any further in Hart.

Rushmoor Delivery Scenarios

The tables below show possible combinations of initiatives under each scenario and the resulting percentage of electricity and heat provided through low carbon generation.

Table 36: Scenario A Potential Contributions of Renewables – Rushmoor

Renewable Resource	GWh Electricity	Gwh Heat	Corresponding Delivery Intervention Needed
Landfill gas	0.0	0.0	No landfill potential
Large wind power	18.8	0.0	Delivery of 3 2.75MW turbines (100m tall)
Medium wind power	0.2	0.0	Delivery of the equivalent of 20 6kW turbines on individual properties
Biomass Heating	0.0	28.8	Utilising wood-based biomass to heat homes and support industry. Utilising 10% of theoretical arisings from local forestry management.
Biomass CHP	29.4	44.5	Biomass CHP used to supply 5% of the 'viable' areas identified in the heat map
Anaerobic Digestion	0.0	0.0	No AD contribution
Micro-generation on Existing Buildings	0.4	2.5	Low up-take case for addition of micro-generation technologies for existing homes
Renewable energy included with New Development (on-site)	15.1	34.9	Expected renewable energy to be included with new development (on-site) following changes to Building Regulations.
Total (GWh)	47.8	110.6	
% of Consumption	14%	13%	*This scenario delivers some wind power in the industrial/commercial areas in Rushmoor if viable, and utilises biomass. It is not possible to reach the targets in this scenario without some contribution from CHP.*

Table 37: Scenario B Potential Contributions of Renewables – Rushmoor

Renewable Resource	GWh Electricity	Gwh Heat	Corresponding Delivery Intervention Needed
Landfill gas	0.0	0.0	No landfill potential
Large wind power	0.0	0.0	No wind contribution
Medium wind power	0.0	0.0	No wind contribution
Biomass Heating	0.0	0.0	No biomass heating
Biomass CHP	88.1	133.5	Biomass CHP used to supply 15% of the 'viable' areas identified in the heat map
Anaerobic Digestion	0.0	0.0	No AD contribution
Micro-generation on Existing Buildings	1.2	2.2	Medium up-take case for addition of micro-generation technologies for existing homes
Renewable energy included with New Development (on-site)	15.1	34.9	Expected renewable energy to be included with new development (on-site) following changes to Building Regulations.
Total (kWh)	56.4	170.6	
% of Consumption	23%	20%	*This scenario delivers some biomass CHP to the 'viable' urban areas in Rushmoor, contributing to both electricity and heat targets.*

Due to its urban nature, the primary opportunity in Rushmoor is district heating. When fed by CHP installations in small portions of the viable areas, Rushmoor is capable of exceeding the targets. CHP is essential to both scenarios due to restrictions on other resources in the area. It is recommended that the targets are not raised any further in Rushmoor.

4.12 ENERGY OPPORTUNITIES PLANS

The analysis of renewable and low carbon energy opportunities discussed above, have been compiled to form an 'Energy Opportunities Plan' (EOP) for each of the LPA areas. These plans are given in the figures below. EOPs can be used as a resource in policy and planning to guide key opportunities for consideration. This spatial plan will allow LPAs to identify delivery opportunities both now, and as new development opportunities come forward.

The plan should also be used to inform policy making in the Sustainable Community Strategy and other corporate strategies, and investment decisions taken by the LPAs and Local Strategic Partnerships. 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 EOPs include the following:

- Spatial distribution of opportunities and constraints relating to renewable resources including wind and biomass.
- Areas where the introduction of a district heating network likely to be viable due to the existing intensity of heat demand.

- Sites identified in the draft SHLAAs over 1ha (which may or may not come forward for development). Sites over 1ha are highlighted, as sites of that scale are likely to deliver a larger number of units (say 40+ under regional density targets). Where that scale of development is being delivered, energy opportunities are much greater. Communal systems such as district heating or connected supply from wind or ground source heat pumps for example become more viable than on smaller sites. Therefore, larger sites can be key triggers for delivery of CO_2 reduction, and there may be opportunities to expand district heating networks into neighbouring areas.
- Urban areas where micro-generation technologies should be a focus for integration.
- The location of 'anchor loads' or large, consistent energy users which could form an anchor for district heating or CHP schemes.

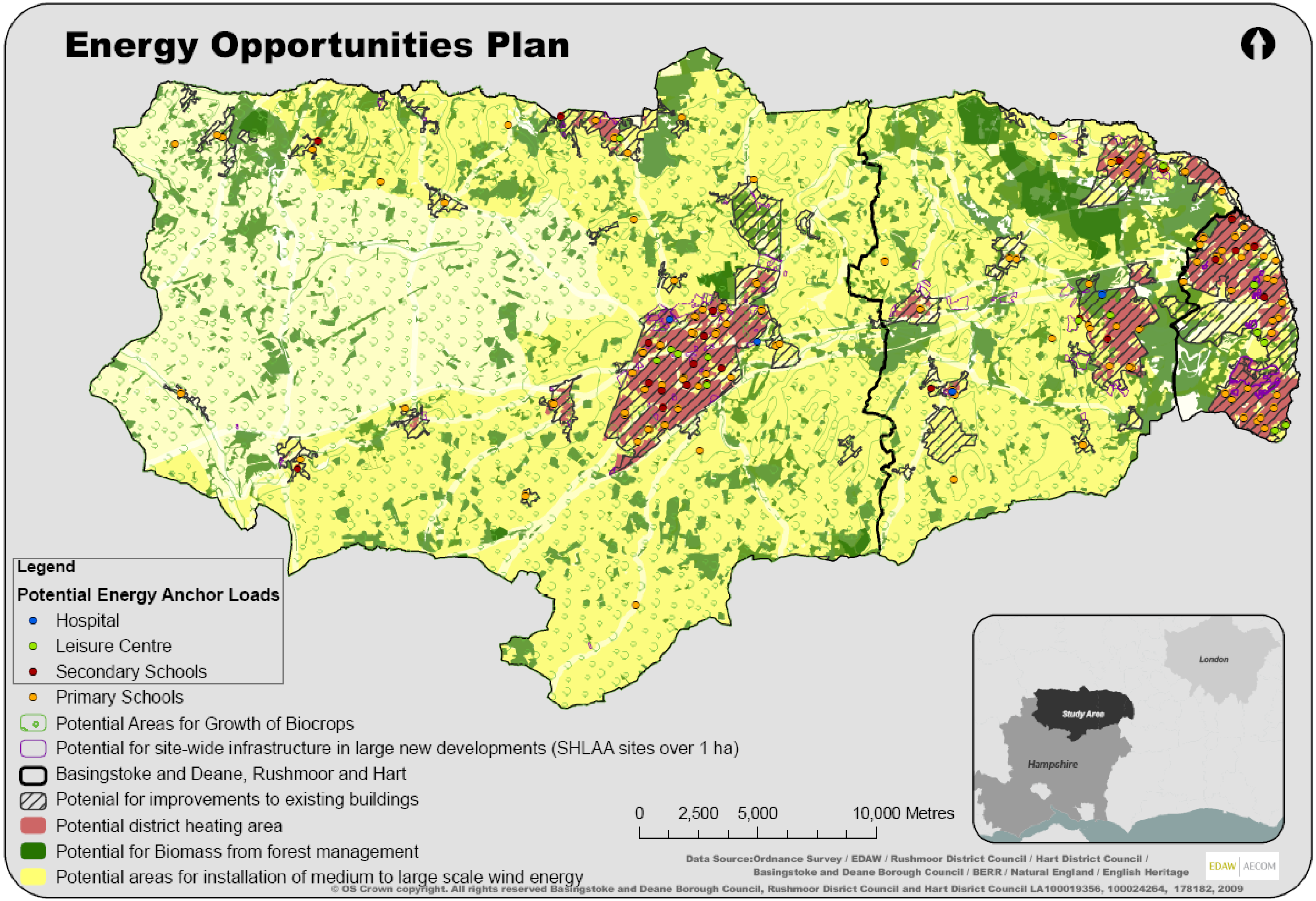


Figure 39: Energy Opportunities Plan for North Hampshire

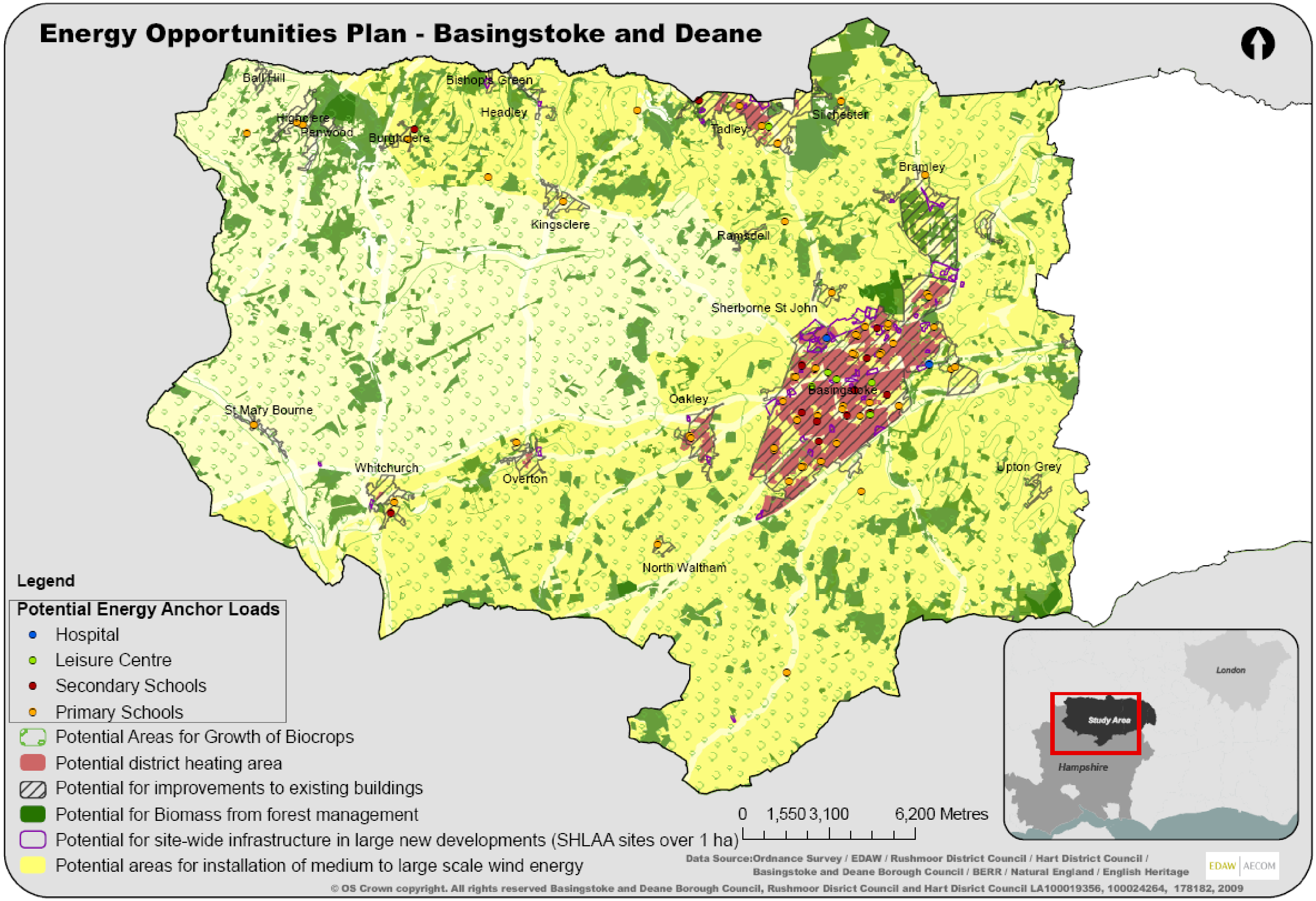


Figure 40: Energy Opportunities Plan for Basingstoke and Deane Borough

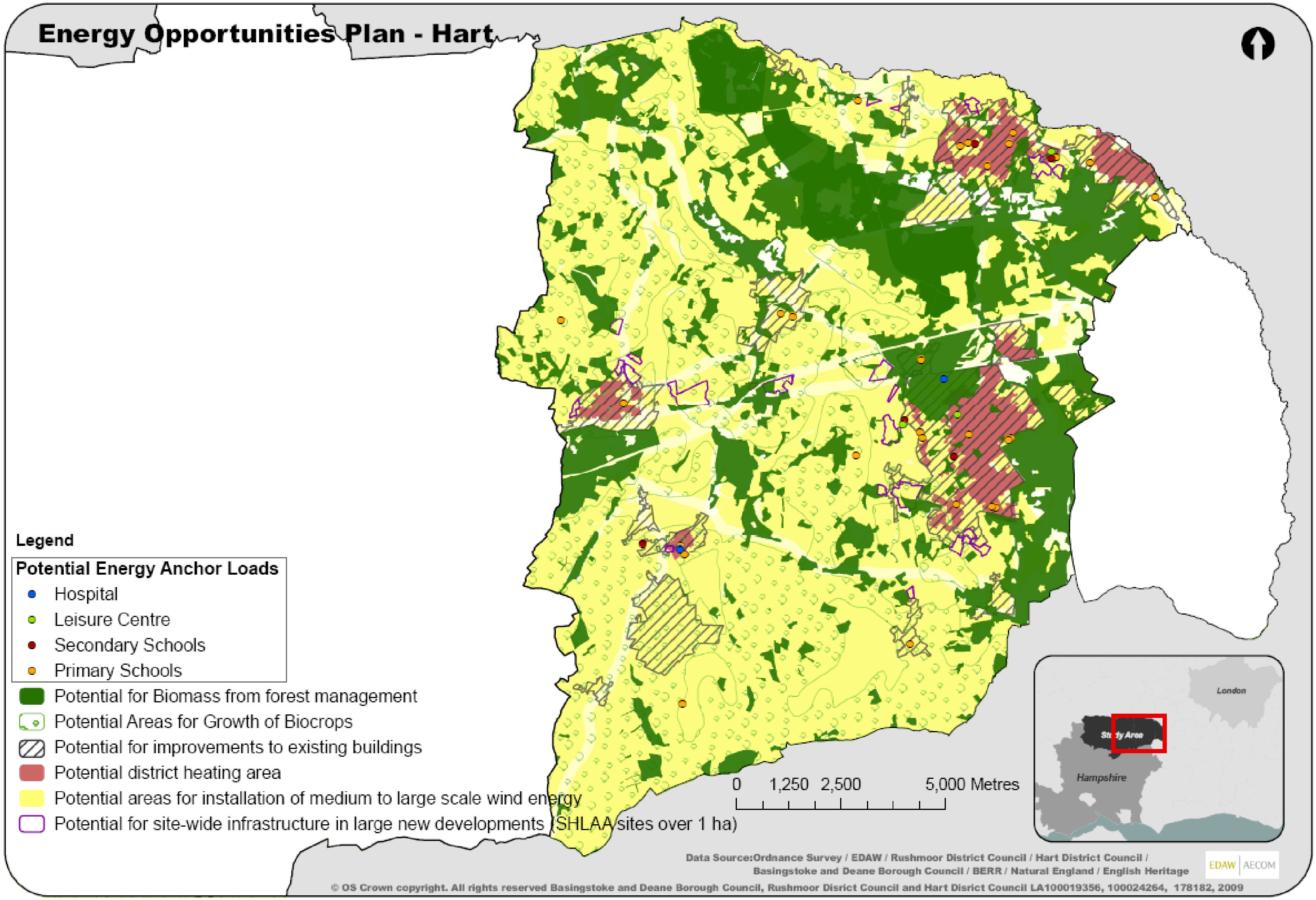


Figure 41: Energy Opportunities Plan for Hart District

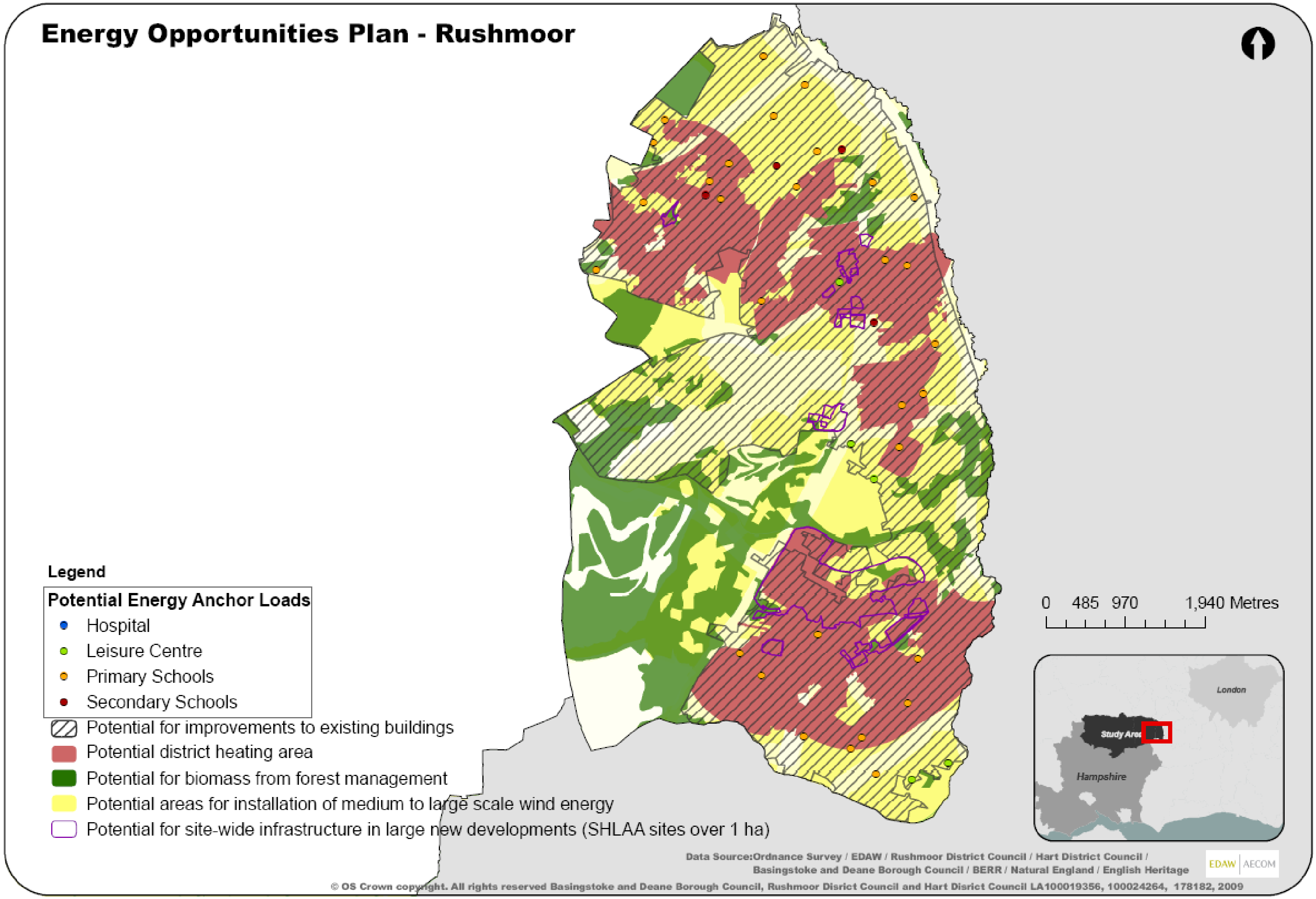


Figure 42: Energy Opportunities Plan for Rushmoor Borough

4.13 KEY CONSIDERATIONS EMERGING FROM THIS CHAPTER

The sections above have considered the resource potential of the three LPA districts. Key considerations emerging from this chapter are:

- There are considerable renewable and low carbon resource opportunities across the LPA areas;
- The scale of potential and types of technologies that are likely to be viable varies across the LPA areas;
- All LPA areas have good opportunities to generate and supply renewable and low carbon heat, and these opportunities should be supported through planning;
- All opportunities are delivery dependent – resource potential in itself does not contribute to targets, therefore focus should be on enabling delivery; and
- An Energy Opportunity Plan has been produced as a planning resource which will allow assessment and prioritisation of delivery of opportunities.

5. Delivery Context

5.1 INTRODUCTION

This section describes the opportunities and constraints concerning delivery of energy-related CO_2 reduction in North Hampshire, the delivery mechanisms and partners and the role of the LPAs. Local delivery opportunities depend on market context along with the role and will of local delivery partners and communities. The role of the LPAs in delivery varies according to the type and scale of energy opportunity available. As described in the chapters above, this study considers three broad energy opportunities, and the delivery context for each varies. Delivery context should be considered against each of the following aspects:

- Existing development:
    - Delivering improvements through energy efficiency;
    - Delivering fuel switches away from high-carbon sources; 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 increased on-site carbon reductions or near-site generation; and
    - Delivering allowable solutions off-site.
- Strategic community-wide interventions:
    - Delivering decentralised low carbon and renewable energy through
        - private investment;
        - community investment;
        - public sector; or
        - a combination of the above in partnership.
    - Delivering low carbon resource supply chains.

The nature of planning for energy at the local level is such that the planning process cannot deliver the opportunities alone; it will require a collaborative approach between the LPAs, Local Strategic Partnerships (LSPs), private developers and the community. The starting point for developing a robust delivery and planning approach is the Energy Opportunities Plan (EOP, figure 39). This provides the basis for designing delivery mechanisms and planning policies. Many of the proposals here have significant financial and organisational implications and further work will be required to explore their potential in greater detail. The purpose of this section is to demonstrate the crucial link between planning and delivery and to highlight where the focus of further work should lie.

Figure 43 summarises the process we have adopted. Figure 44 sets out some of the mechanisms and partners required to deliver the change in North Hampshire. Both refer to three types of energy opportunity: existing development; new development; and strategic community-wide interventions. Each uses the EOP as the starting point for informing the development of appropriate delivery mechanisms and planning policies. The remainder of this chapter considers delivery mechanisms across each energy opportunity. Chapter 6 then follows the same format but focuses on planning policies.

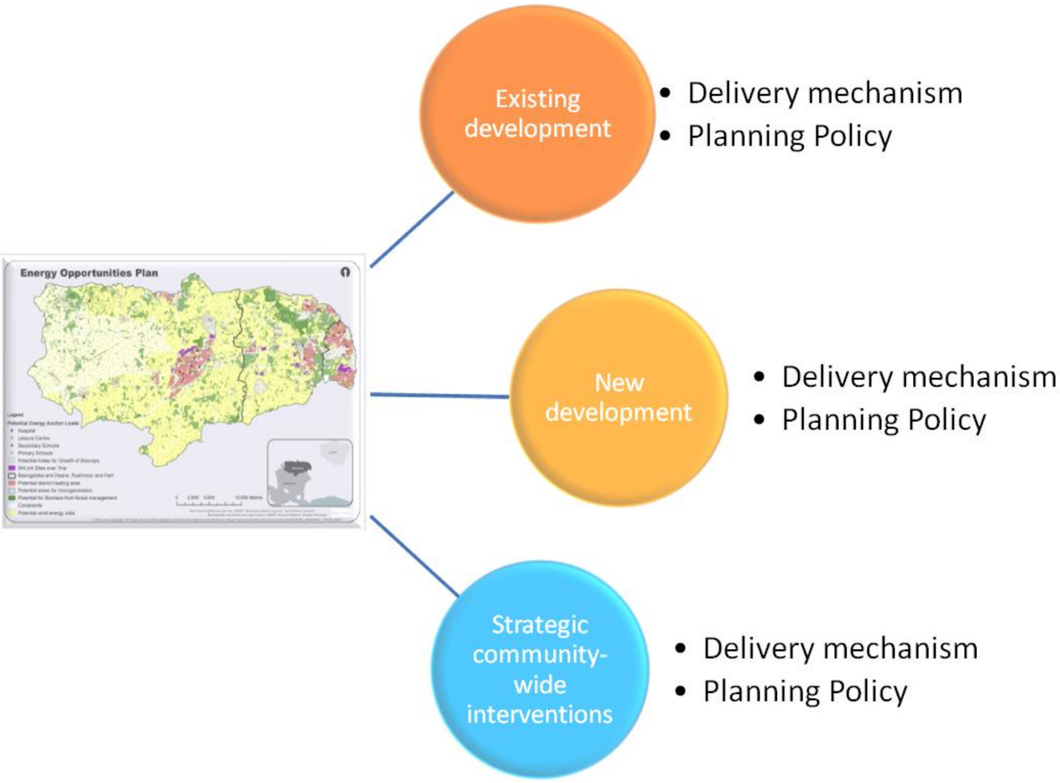


Figure 43: Process delivering and planning energy opportunities in North Hampshire

Energy Opportunity	Delivery Mechanism	Likely Delivery Partner	Planning Policy
Existing development	LA support for microgeneration Powers of Wellbeing Local Development Orders	Local authorities Local Strategic Partners Home / building owners ESCo	Consequential improvements
New development	Building regulations CIL and S106 Local Development Orders Conditions to Public Sector land sales Allowable Solutions	Local authorities Local Strategic Partners Energy developers Housebuilders/ developers/ RSLs ESCo	Increment on target emission rate Full Code target Policies for strategic sites Design and layout
Strategic community-wide interventions	Powers of Wellbeing CIL Local Development Orders Public sector policy and targets Allowable Solutions	Local authorities Local Strategic Partners Energy developers Housebuilders/ developers/ RSLs ESCo Community organisations	Generation target Supporting/criteria policy Install District Infrastructure Connect to District Infrastructure Set aside land Design and layout

Figure 44: Overview of delivery mechanisms, partners and planning policy for energy opportunities in North Hampshire

5.2 EXISTING DEVELOPMENT

The role of planning

In addressing deficiencies in the performance of the existing building stock planning's remit is limited to requiring consequential improvements when an extension or conversion is proposed. This is discussed further in Chapter 6. However, importantly, the EOP can play a key role in identifying delivery opportunities for other local authority departments and partners.

Delivering Energy Efficiency in Existing Buildings

Our estimations of the likely change in performance of existing buildings in chapter 3 show the differences between a 'business as usual' scenario, where energy efficiency measures continue to be encouraged on a national scale with existing measures and initiatives undertaken by the local authority, and a 'higher reduction' situation where further steps are taken to maximise energy efficiency. The CO_2 savings that can be achieved through improvements to existing buildings are substantial and this should be a priority across the three districts, however, a concentrated funding and improvement programme would have to be introduced to trigger the completion of higher cost elements of retrofit. The Councils have a role in working with partner organisations to distribute and focus funding and possible options are explored in this chapter.

This study shows certain areas as having higher heating demand per home than others, and hence in spatial terms these areas can be prioritised for intervention (Figure 45). Since heat loss can be more easily and cost effectively addressed than other efficiency measures, leading to immediate CO_2 savings, it has been prioritised for intervention in this study. The brown coloured area is where home improvement measures such as loft and cavity insulation, double glazing and boiler replacement should be heavily promoted, as these are the least efficient areas on a per home basis. Of course, energy efficiency measures should be promoted in homes and buildings across the LPA areas.

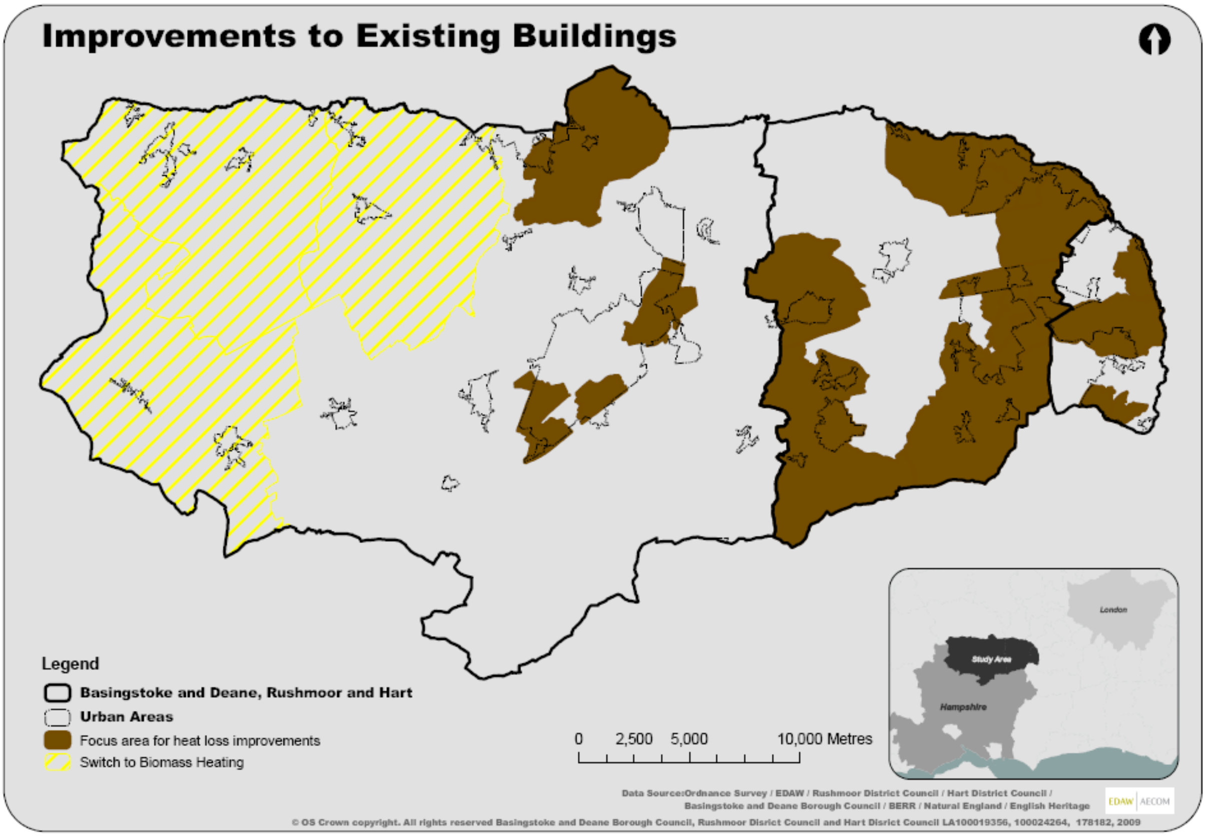


Figure 45: Key areas for focus of improvement of existing homes

Delivering Fuel Switches in Existing Buildings

In the figure above, the areas hatched in yellow are where oil, coal or electric heating systems are thought to be most prevalent in the absence of access to a gas network. Significant CO_2 savings could be made through energy efficiency and efforts to convert these systems to wood burning stoves and biomass boilers. It is expected that conversion of homes that currently utilise oil or coal to use biomass would be straightforward in most cases, but would require development of effective biomass supply chains.

Delivering On-Site Low Carbon and Renewable Energy Technologies

In addition to energy efficiency measures, there is potential to install low carbon and renewable energy micro-generation technologies within existing development. Delivery of low carbon and renewable technologies within existing buildings and communities cannot easily be required by planning, but can be encouraged by the Councils. The Councils should seek to engage communities and highlight the cost-saving benefits of the inclusion of micro-generation, especially with the introduction of the feed-in-tariff[17]. There are also other funding sources available to homeowners and businesses to assist with the capital cost of installation.

Available Delivery Mechanisms

The local authorities have a role to play in addition to central government grants and subsidised energy efficiency offered by utility companies. Local authorities have access to low and zero interest loans, through Salix finance for example, and have the powers to deliver energy opportunities in the existing stock, using Wellbeing Power. Available options currently include:

- Salix Finance is an independent, publicly funded company, set up in 2004, to accelerate public sector investment in energy efficiency technologies through invest to save schemes. Salix works across the public sector including with local authorities. They currently have an interest free revolving fund and a new loans scheme to cover the capital costs of energy efficiency and small renewables projects.
- The Wellbeing Power, introduced through the Local Government Act 2000, enables local authorities to do anything that they consider likely to promote the economic, social and environmental wellbeing of their area unless explicitly prohibited elsewhere in legislation. The Power promotes innovation in the way authorities provide services. This includes setting up or participating in local energy services companies (ESCo) and other joint ventures, supplying heat and/or power. Further discussion of ESCo is included later in this chapter.
- As part of the UK Green Stimulus Package Pre-Budget Report 2008, the Government pledged £100 million of new funding for Warm Front and £60 million to provide 16,000 social houses with energy efficiency and heating measures as part of an accelerated Decent Homes programme. Properties in those areas shown in brown on the Improvement to Existing Buildings plan should be prioritised for funding from this source.
- The Carbon Emissions Reduction Target (CERT) is a legal obligation on the six largest energy suppliers to achieve CO2 emissions reductions from domestic buildings. Funding from the energy suppliers is available to local authorities and Registered Social Landlords (RSL) to fund CO2 reduction measures in their own housing stock and also to set up schemes to improve private sector housing in their area. The main different types of measures that can receive funding under CERT are: improvements in energy efficiency; installation of heat or electricity micro-generation; community heating schemes powered wholly or mainly by biomass (up to a size of three megawatts thermal); and reducing the consumption of supplied energy, such as behavioural measures. Properties in those areas shown in brown and in yellow hatch on the Improvement to Existing Buildings plan should be prioritised for funding from this source.
- Big Lottery Fund Community Sustainable Energy Programme (CSEP) – this has two grant initiatives. Both are available only to not-for-profit community-based organisations in England:
    - Project Development Grants are available for studies investigating the feasibility of installing any combination of the micro-generation technologies highlighted in their shortlist. The maximum grant available is £5,000 or 75% of the study cost, whichever is lower. The programme has a

[17] Due to come into action in April 2010 for micro-generation installations not exceeding 5 megawatts . The tariff will pay generators a guaranteed price for electricity generated and exported to the grid over a period of 20 years (25 for solar PV).

fixed budget of £1m and is expected to distribute grants for between 200 and 400 projects on a first come, first served basis. The money is paid ex ante of any work commissioned.

- o Capital Grants are available for the installation and capital cost of any combination of micro-generation technologies highlighted in their shortlist. The maximum grant available is £50,000 or 50% of the installation and capital cost, whichever is lower. The total fund available is £8 million.

Properties in those areas shown in the yellow hatch and brown areas on the Improvement to Existing Buildings plan should be prioritised for funding from this source. These grants can be sought by the home owner.

The wide range of available finance and support could be co-ordinated by the districts (separately or together) in order to improve uptake and focus on the priority areas identified. Wellbeing powers enable authorities to set up companies and to take part in joint ventures. The three part approach recommended below offers a potentially effective way to co-ordinate the various funding streams and to prioritise areas for installation of micro-generation technologies and energy efficiency improvements. While focussing on priority areas, assistance given through such an approach should also be available to all properties across the three authorities:

- Householder or business purchase – available finance could be used to bulk buy technologies, enabling them to be sold on at a discount to households and businesses. The introduction of the feed-in-tariff nationally in April 2010 gives householders and businesses the opportunity to benefit from more affordable energy generation technologies. The feed-in-tariff offers a guaranteed income for energy generated from a range of micro electricity generating technologies, including PV.
- Householder or business hire purchase – despite the feed-in-tariff, the upfront capital costs of installing technologies can be high. It is likely that the pay-back period will still be longer than the average home turnover (often assumed to be around 7 years). Therefore, a hire purchase arrangement may be suitable. A local authority ESCo, benefiting from the availability of low cast finance to bulk-buy, could lease appropriate technologies to householders and businesses. Rental costs would 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 particular 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.

Table 38: Delivery options for existing development

<table>
<tr><th colspan="2">Delivery options for existing development</th></tr>
<tr><td>Increased insulation</td><td rowspan="3">Technologies and insulation offered through a local authority run scheme, potentially operated using an ESCo, to co-ordinate the range of funding options. Options could include offering households and businesses: purchase; hire-purchase; and rental of space. Priority would be given to those in areas identified in the Improvement to Existing Homes plan.

Programme supported by an awareness raising and education campaign for householders and businesses.</td></tr>
<tr><td>Biomass heating</td></tr>
<tr><td>Renewable and low carbon energy generation</td></tr>
</table>

5.3 NEW DEVELOPMENT

Role of Planning

The Building Regulations currently include minimum building performance standards for energy. The proposed strengthening of these standards in April 2010, 2013 and 2016 for homes and 2019 for non-residential buildings should ensure delivery of zero carbon buildings that include installed low and zero carbon technologies. The role of planning in requiring new development to incorporate such technologies is therefore limited to a supporting one. For example, planning can set more stringent targets ahead of the Building Regulations where the evidence base demonstrates that opportunities exist. PPS1 Supplement actively encourages opportunities to be sought to set higher standards on strategic sites (see Chapter 7).

Delivering CO_2 Reductions in New Development

Building Regulations, supported by planning, are the primary drivers for higher energy performance standards and low and zero carbon energy generation in new developments. The role of local authorities, therefore, is limited to a number of options. The first is to apply conditions to sales of local authority owned land, whereby a lower sale price is agreed with the developer in return for a commitment to meet higher specified energy performance standards. It is recommended that the local authorities identify suitable sites and carry out a separate assessment of whether or not specific and higher sustainability or energy standards should apply. If necessary, appropriate supporting planning policy should then be developed.

A second opportunity is Phase 2 of the Low Carbon Buildings Programme. This is a capital grant scheme from the Department of Energy and Climate Change (DECC) totalling £50m for the installation of micro-generation technologies by organisations including local housing authorities, housing associations, schools and other public sector buildings and charitable bodies. The programme is open to all products and installer companies registered on the Micro-generation Certification Scheme (MCS). Applications can be made for up to 50% (up to a maximum of £200,000) of the cost of installing approved technologies, although the maximum grant levels can depend on the nature of the organisation. The local authorities should seek to install appropriate technologies on their own stock and should work to ensure that those who are eligible are aware of the Programme and what it can offer.

A third opportunity is both a planning and a delivery mechanism, that is to prioritise delivery of energy opportunities through spending of money raised through a Community Infrastructure Levy (CIL). The CIL is expected to commence in April 2010 and 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 through CIL from development in one part of the charging authority can be spent anywhere in that authority area. This flexibility will enable the three Councils, as ‘charging’ authorities, to fund energy infrastructure identified in the energy opportunities plan. The Councils 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 metre squared.
- Consider the impact of a levy on scheme viability.

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. Therefore, an ESCo could be established to manage and co-ordinate delivery of energy infrastructure to support new development and to help enable developers meet the requirements of planning and Building Regulations, including allowable solutions. For example, there will be cases where developers can show that it is not feasible or viable to deliver the proposed planning policies (section 6). In such cases a CIL payment could be used to fund projects in areas identified in the New Development Energy Delivery Opportunities plan (Figure 43).

The New Development Energy Delivery Opportunities mapping work identified two principal types of opportunity where money raised through a CIL fund could be spent: medium to large scale wind turbines near new development sites;

and/or expansion of district heating networks delivered as part of a new development into neighbouring areas with a high heat demand. Near-by wind sites could be connected by private wire to the site to increase the level of 'on-site' CO_2 reduction. The figures below show key draft SHLAA sites (greater than 1 hectare in area), and both possible wind sites or existing areas with a high heat demand where a district heating network could be linked in within 1km of the site boundary.

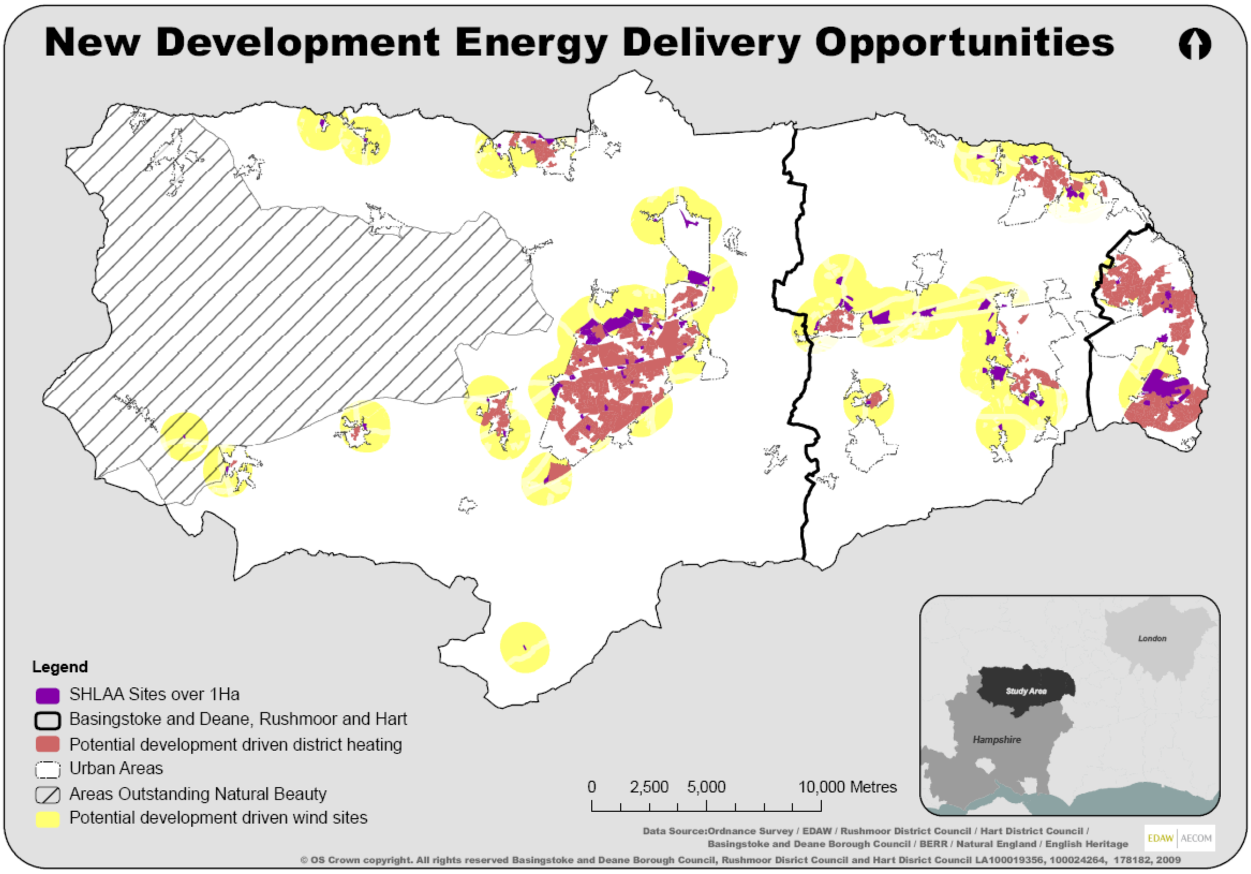


Figure 46: Key large-scale opportunities that could be driven by new development

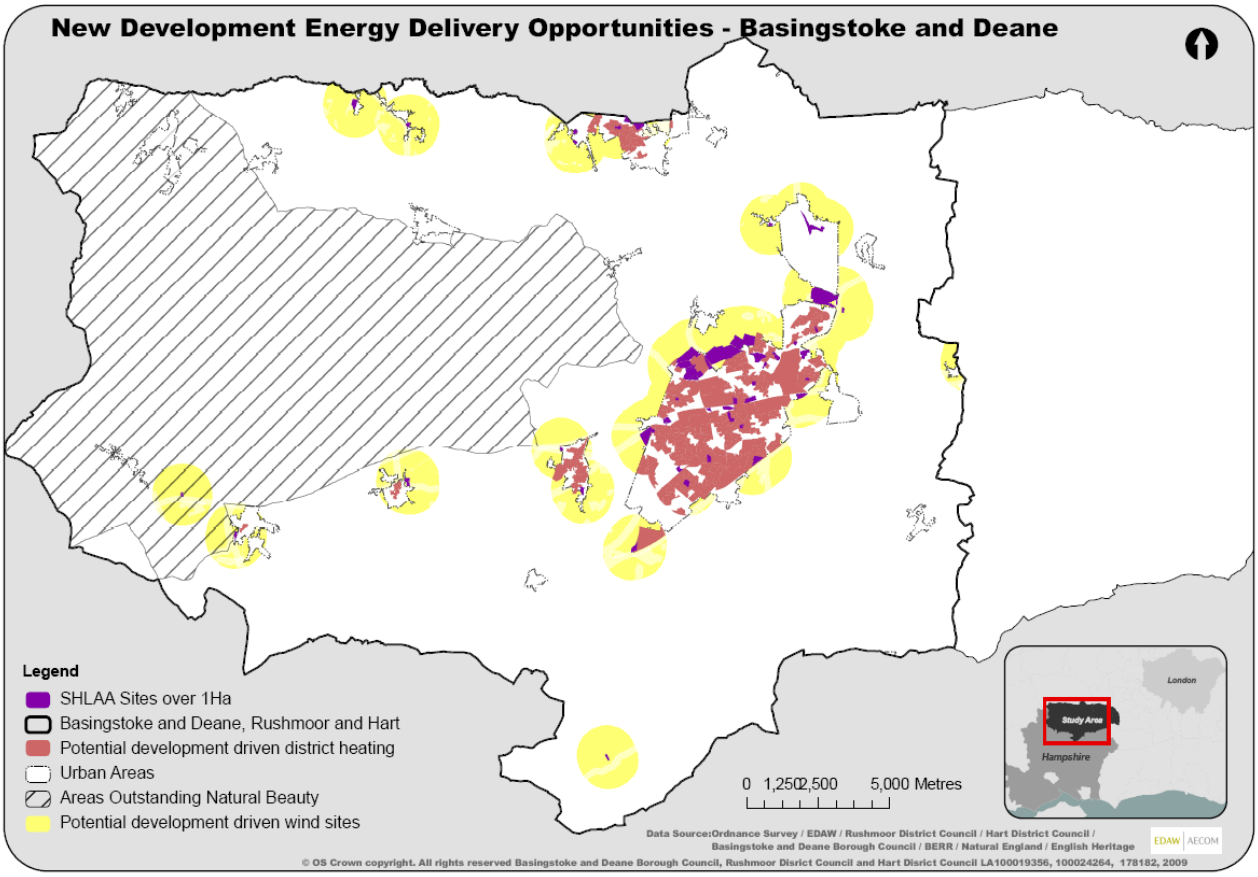


Figure 47: Key large-scale opportunities that could be driven by new development – Basingstoke and Deane

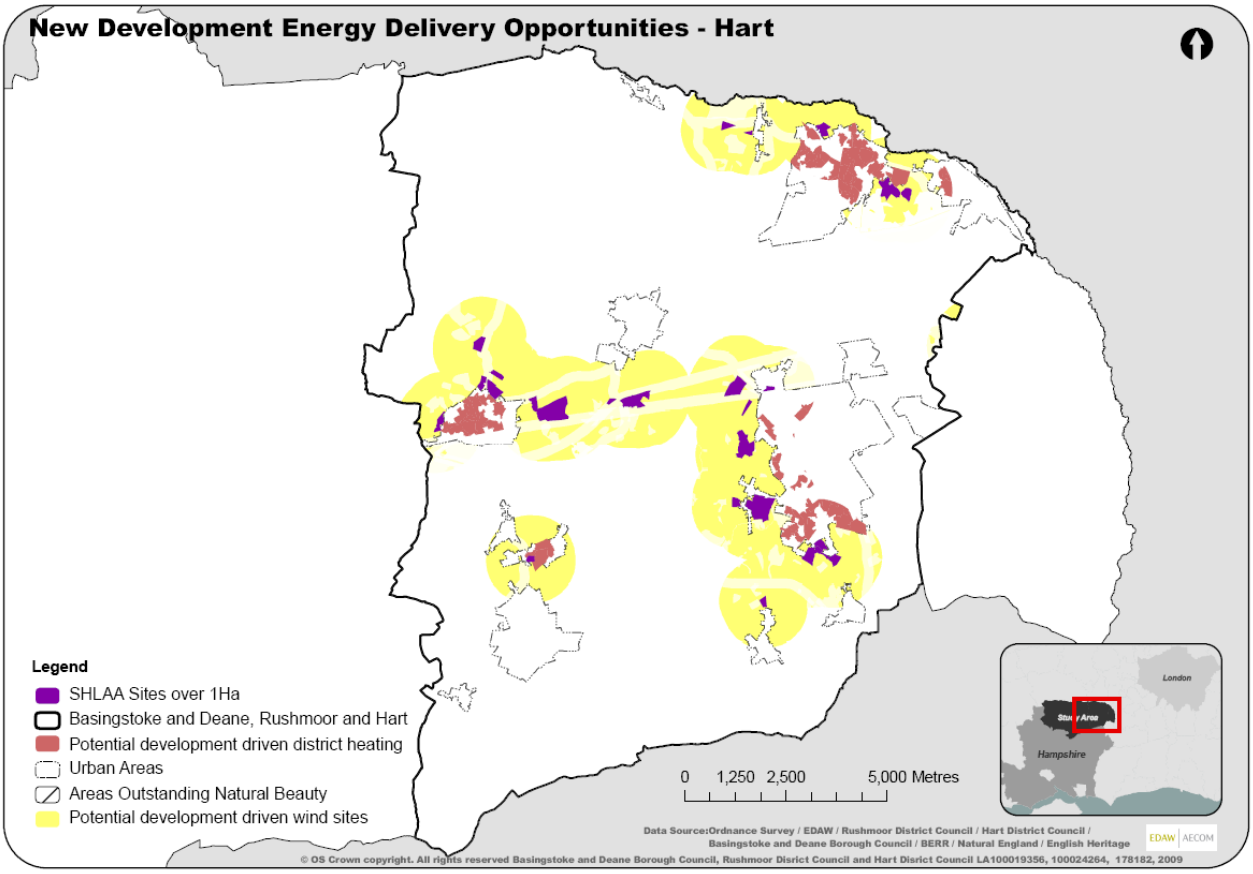


Figure 48: Key large-scale opportunities that could be driven by new development – Hart

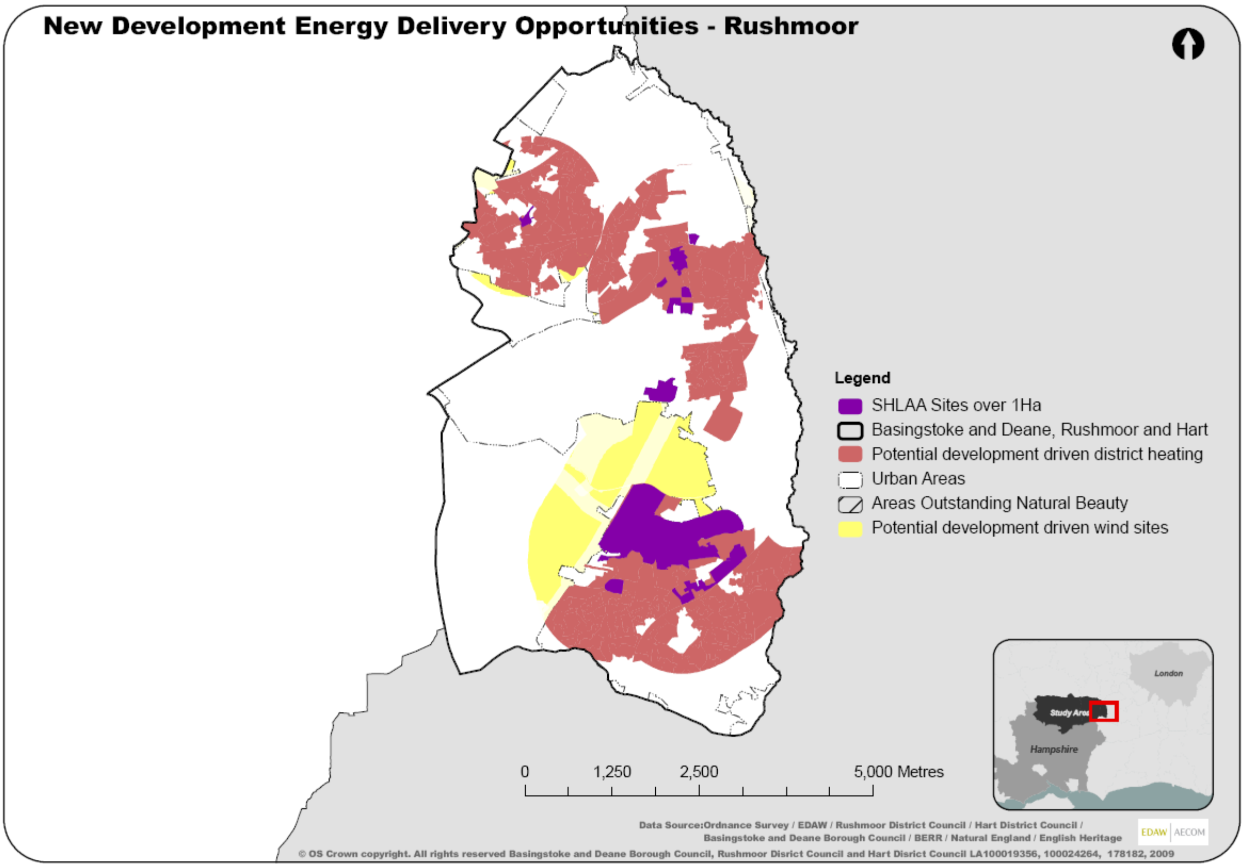


Figure 49: Key large-scale opportunities that could be driven by new development – Rushmoor

Delivering Allowable Solutions

Development post 2016 (domestic) and 2019 (non-domestic) offers a fourth opportunity to deliver low and zero energy in new development by virtue of the requirement through Building Regulations for zero carbon development. This is likely to mean that new development will be required to reach a 70% reduction in CO_2 on-site, leaving the remainder to be delivered through 'allowable solutions'. A final list of allowable solutions will be announced by Government later in 2009 but early indications are that developers will have two broad routes:

- Increased on-site energy efficiency or generation either within the site boundary or through connection of heat technologies directly to the site. Generally, district heating and wind energy will provide excellent and cost effective allowable solution opportunities, but often the integration of these technologies cannot be delivered solely within the boundary of the site since there may be restricted space or heat networks may be more viable when connecting into heat loads off site.
- Alternatively, developers can achieve the remaining CO_2 reductions through off-site reductions. For example, by contribution to the installation or expansion of district heating networks or wind energy elsewhere in the local area.

The latter is of most interest to local authorities since it has some control, through planning and the delivery mechanisms identified above, over the nature and location of off-site allowable solutions. The New Development Energy Delivery Opportunities plan identifies possible locations. Subsequent reviews of Development Plan Documents and other corporate policy documents, once Government policy is confirmed, should identify key 'allowable solutions' and look for opportunities to drive delivery of these solutions in conjunction with new development.

From our modelling of the likely selection of energy strategies by developers, we can expect the CO_2 reductions that will need to be met through allowable solutions to be equivalent to those in table 39. It can be seen that the scale of demand for CO_2 reduction is substantial and by 2026 is equivalent to:

- Introduction of gas CHP to 10% of the estimated 'viable' area of existing community (see New Development Energy Delivery Opportunities plan) where strong heat demand intensities exist; or
- 13 large scale wind turbines (2MW rating).

It should be noted that this scale of contribution will only offset CO_2 increases from new development. The Councils will need to consider these opportunities alongside those for the existing stock and strategic community-wide interventions. The table below sets out the expected off-site CO_2 reduction from new development based on growth outlined in Section 3.4. Note that this only includes demand from residential development. Non-residential development may also demand allowable solutions, but the details of this is yet to be defined by government. Potentially, allowable solutions will be charged at £100/tonne[18], resulting in significant amounts of funding.

Table 39: Predicted cumulative demand for off-site CO_2 reduction through allowable solutions from new residential development (tonnes)

	2006	2011	2016	2021	2026
Basingstoke	0	0	1,513	9,081	16,648
Hart	0	0	355	2,127	3,900
Rushmoor	0	0	464	2,783	5,101

Recommendation: North Hampshire LPAs should develop a plan to deliver allowable solutions in the LPA areas, to ensure funding available from new development is directed towards the best solutions in a coordinated manner.

The Role of an ESCo in Addressing Viability in New Development

The Community Infrastructure Levy (CIL) offers a useful way of providing continuity in delivery mechanisms between proposed planning policies requiring energy and sustainability performance standards ahead of Building Regulations prior to 2016 (Chapter 6) and the likely allowable solutions post 2016. Linked to this is the important issue of viability. Specifically in relation to new development, an ESCo set up to deliver projects funded through CIL or allowable solutions could provide a useful opportunity for reducing the financial burden on developers, thereby improving viability, while increasing the level of low and zero carbon energy delivered.

While this option will require further work beyond the scope of this study, one of the objectives of an ESCo could be to ensure synergy between delivery of its energy projects and phasing of new private sector development. Under such a scenario the ESCo could enter into an agreement with the developer whereby the ESCo commits to installing a district heating network. The responsibility and therefore financial burden for the developer would be limited to installing the secondary network, making space available for an energy centre and possibly payment of a connection fee, potentially operated through CIL. Where phasing synergy cannot be secured the secondary network could be powered by a containerised temporary energy centre.

[18] Impact Assessment of the Zero Carbon Homes Consultation, CLG, December 2008

Table 40: Delivery options for new development

<table>
<tr><th colspan="2">Delivery options for new development</th></tr>
<tr><td>Higher energy and sustainability standards</td><td rowspan="3">Conditions attached to local authority owned land sales

Low Carbon Buildings Programme

Community Infrastructure Levy

Allowable solutions

Opportunities for improved viability and feasibility afforded by strategic sites</td></tr>
<tr><td>Wind energy</td></tr>
<tr><td>District heating networks</td></tr>
</table>

5.4 STRATEGIC COMMUNITY-WIDE INTERVENTIONS

Opportunities for installing technologies and infrastructure at this scale are likely to include medium to large wind turbines, district heating possibly powered by combined heat and power plant and medium to large biomass power stations. They are distinct from the other two groups in that they do not need to be delivered in association with developments, although the two are not mutually exclusive. Schemes are likely to be larger and may significantly contribute towards delivery of authority wide, regional or national energy generation targets rather than off-setting increases in CO_2 emissions or energy demands resulting from new development.

Local authority-led delivery is likely to be crucial to increasing installed capacity and maximising delivery of energy opportunities. These are set out below and will need to be supported by planning policies.

Role of planning

Planning can play a key role in both supporting and delivering renewable and low carbon energy infrastructure. Planning policy and decision-making should support the market development of renewable energy and low carbon, where it doesn't conflict with other planning criteria. Planning can also influence local authority delivery of renewable and low carbon energy, either alone, in partnership with private energy developers or in partnership with the community.

Broadly speaking, there are three areas where planning can influence strategic community-wide decentralised renewable and low carbon energy:

- Providing an overarching supporting policy, along with a set of criteria policies to guide development;
- Identification of suitable sites and opportunity areas; and
- Policies designed to support delivery mechanisms, such as a requirement for new development to connect to a district heating network.

Under its Wellbeing Powers, a local authority can set up its own energy company. As discussed previously, the Councils will also need to play a role in supporting the delivery of energy infrastructure funded by allowable solutions or through policy requirements under the CIL. The various roles and opportunities for the Councils are outlined in more detail in the following sections.

Delivering Decentralised Renewable and Low Carbon Energy through Private Investment

The Energy Market Opportunities plan (figure 39) highlights key areas spatially where market-driven opportunities for the exploitation of wind and biomass energy are likely to be focussed. The wind sites are those with the highest wind speeds where energy developers are expected to look first for opportunities. Many of the opportunities will be delivered by the market with little or no requirement for intervention by the public sector beyond supportive planning policies. However, the Councils can maximise the likelihood of delivery by the market in a number of ways:

- Development of stand-alone wind power is a key market opportunity across the three LPA areas, but particularly in Basingstoke and Deane and Hart. The Councils should seek to positively market development of wind energy, subject to a criteria based planning assessment against key constraints and environmental impacts.
- Merchant wind – this scheme is operated by Ecotricity who build and operate wind turbines on partner sites. Ecotricity take on all the capital costs of the project, including the turbine itself, and also conducts the feasibility, planning, installation, operation and maintenance of the wind turbines. MWP partners agree to purchase the electricity from the turbine and in return receive a dedicated supply of green energy at significantly reduced rates.
- There is also a key market opportunity to establish a biomass supply chain, coordinating both forestry and agricultural waste and growth of bio-crops locally. The Councils should lead or support the development of a supply chain and infrastructure to supply new and existing development with biomass fuel. However, the starting point should be the close coordination of approaches with the wider County or region as activities are likely to be taking place in some form already.
- As with new development, the zero carbon building policy's proposed allowable solutions will place emphasis on LPAs to identify and support delivery of strategic and community scale solutions. There is potentially, therefore, an opportunity to use delivery of energy opportunities across the three Councils as a driver for housing delivery. In other words, where key large-scale opportunities that could be driven by new development have been identified (figure 46) then the value of these energy opportunities to a developer, in terms of potential income from energy sales combined with Renewables Obligation Certificates (ROCs), feed-in-tariff or future renewable heat incentive, could actually drive the delivery of more homes rather than acting as the break on development that some energy targets and requirements currently are.

Table 41: Delivery options for strategic community-wide market interventions

<table>
<tr><th colspan="2">Delivery options for strategic community-wide market interventions</th></tr>
<tr><td>Wind energy</td><td rowspan="3">Merchant wind

Hampshire-wide and local development and coordination of biomass supply chains

Allowable solutions

Renewable Obligation Certificates and feed-in-tariff</td></tr>
<tr><td>Biomass energy</td></tr>
<tr><td>District heating and CHP</td></tr>
</table>

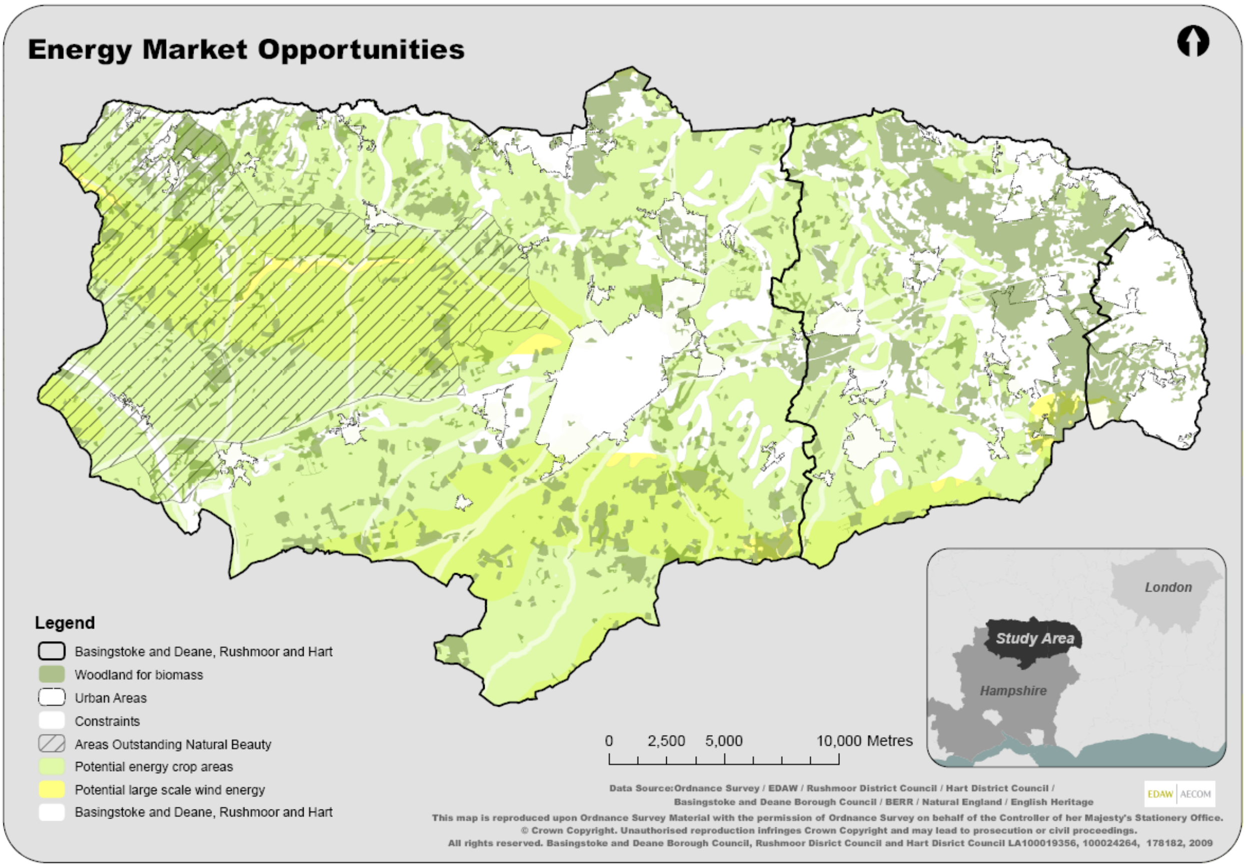


Figure 50: Market delivery opportunities in North Hampshire

Delivering Low Carbon and Renewable Energy through Local Partners

The principle stand alone renewable and low carbon infrastructure opportunities in North Hampshire District come from large and medium scale wind turbines and district heating networks to provide community heat from biomass or gas (preferably with CHP to provide electricity as well). These types of technologies are likely to come forward in one of two ways: through private commercial interest or through local authority and/or community investment. There are three principal reasons why reliance on delivery of energy opportunities through market mechanisms alone may be insufficient to achieve maximum delivery:

1. Where opportunities extend beyond the boundaries of an individual site or development. This is particularly an issue for district heating schemes where viability is determined by a combination of scale, mix of use and density. Individual sites, even larger strategic ones, may not be able to support a network without extending it out into existing developments or connecting it to an anchor load, such as a hospital or civic building. The additional cost and practical challenges of delivering a scheme that crosses new and existing development, areas of multiple land ownership and other infrastructure such as roads, rivers or railways is unlikely to attract commercial developers. It is therefore unlikely that an individual planning application will be forthcoming.
2. Where schemes are marginal. District heating is a well established type of infrastructure in many parts of Europe. In the UK, however, there are a relatively small number of examples meaning that schemes can be marginal.
3. Where schemes are of insufficient size to attract a commercial developer. Wind developers are generally less interested in smaller schemes (those below 5MW may be considered as a very crude rule of thumb) meaning that more constrained, but still windy, sites may go undeveloped. The link to allowable solutions for new development described earlier may offer one solution but this will still leave some opportunities unrealised.

Where market delivery isn't forthcoming North Hampshire LPAs 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 in capital cost and receiving income from selling energy. Generally the largest opportunities regard the implementation of wind power and heat networks.

- Medium and large scale wind – a significant number of the wind opportunity areas identified in the EOP (figure 39) are likely to be attractive to commercial developers. Supportive planning policies and targets should be sufficient to deliver significant installed capacity. However, there will also be sites that, once detailed constraints have been assessed, will be too small to attract the interest of commercial developers. Additionally, securing planning permission for the potential wind turbine locations in more constrained sites could prove difficult for commercial developers if local support cannot be secured.

  In such instances, the local authority 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 would be based on energy sales, Renewable Obligation Certificates (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.

  This kind of delivery approach will be challenging to any local authority. Therefore, to ensure sufficient expertise and resource is devoted to making local authority-led delivery initiative a success it is recommended that a local authority-led ESCo be established: a single ESCo serving all three authorities is possible. Alternatively, where the authorities do not feel an ESCo to be appropriate Partnerships for Renewables is a company that has been set up to deliver wind turbines on public sector land. In return for a turbine the recipient receives an annual return on its investment. Importantly, installation would be limited to publically owned land. In our view, while this option may be less involved and challenging for the Councils the potential to maximise delivery of the EOP and returns on investment make the ESCo route the favoured option. The types of ESCo are discussed in more detail below. Options for community-led delivery, which could provide an alternative to local authority-led delivery, are discussed below.

- District heating with CHP – there are major opportunities across the three authorities for the introduction of heat networks. Some relate to strategic sites, others to areas where sufficient heat density has been identified. For the same reasons as for wind, it is our view that an ESCo would be the best option for delivering networks. However, different elements of a network can be treated differently. The operating costs of the insulated pipes that move heat between the energy centre (which may operate as heat only or CHP) and customers are relatively low. The main cost is installing the pipeline at the start.

  The pipe work, therefore, can be competitively tendered by a local authority-led ESCo and, since the Councils may have access to low interest rates and repayments over a long time period using prudential borrowing, capital costs 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 Councils, the billing and customer service elements could be contracted out to a third party.

  As discussed earlier, delivery of networks as part of new development on strategic sites 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.

Figure 51 shows areas most suited to district heating and medium to large scale wind. It is in these areas where a local authority-led ESCo might want to focus its attention. It should be noted that the hatched areas in the figure below indicate areas where wind development will require consultation with aviation authorities, but that does not necessarily preclude wind development (dependent on exact location of turbines).

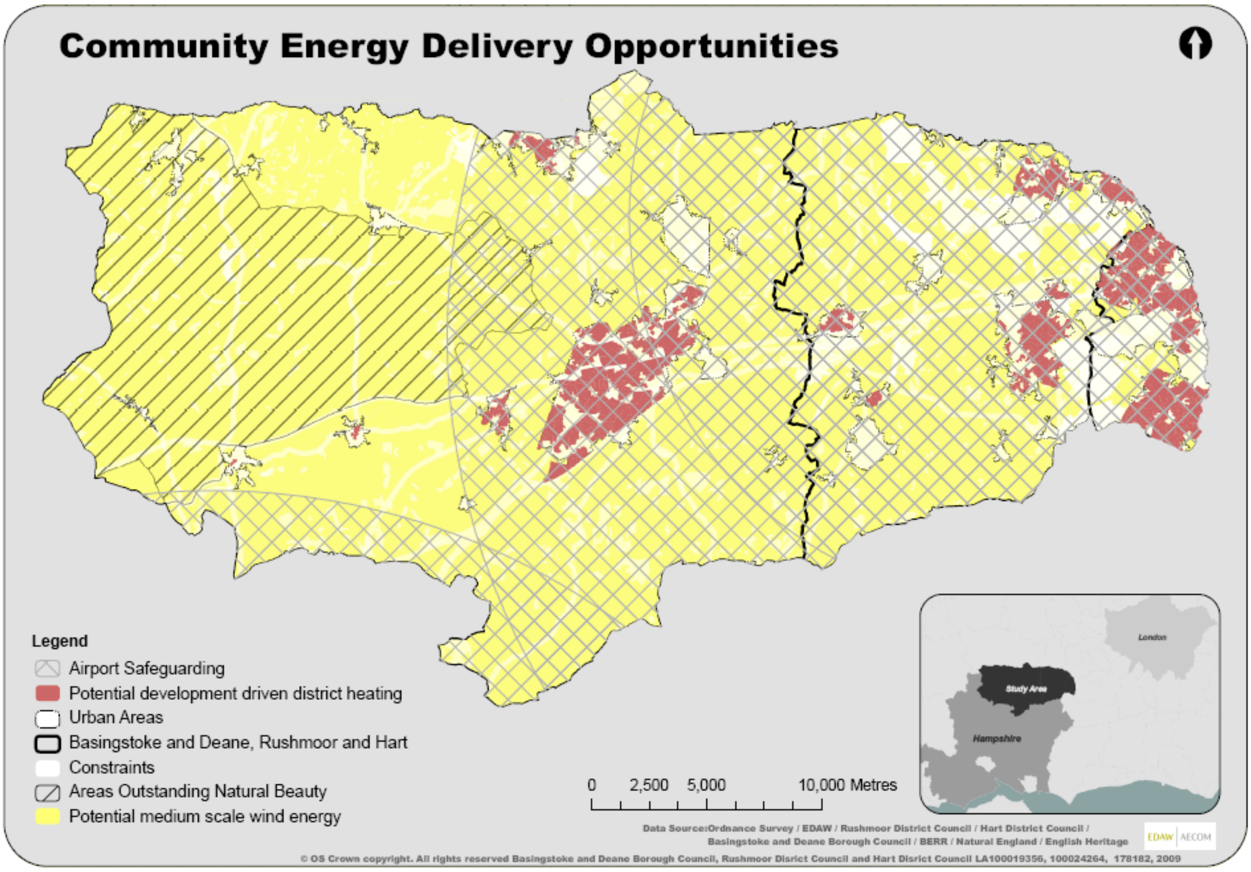


Figure 51: Energy opportunities for focus from local authority-led ESCo

In addition to a local authority-led delivery approach, a number of other community-based options can be considered. These are not necessarily mutually exclusive and could be considered alongside local authority-led delivery. The choice of mechanism or package of mechanisms should be based on further more in-depth work:

- Cooperatives – this is a common delivery mechanism in parts of Continental Europe and a few examples exist across the UK, including Baywind, the first UK wind cooperative. The cooperatives are overseen by Energy for All. Shares are issued to fund development of turbines with investors receiving a stake in the project and annual financial returns. Importantly, community ownership can help to boost support for a wind proposal. The local authority can play a useful role in raising awareness of the potential for community ownership and this could provide a viable alternative to local authority-led delivery. Community wind delivery is discussed in detail later in this section.
- EDF Renewable Energy Fund – EDF customers on the Green Tariff pay a small premium on their electricity bills which is matched by EDF and used to help support renewable energy projects across the UK. This money is placed in the Green Fund and used to award grants to community, non-profit, charitable and educational organisations across the UK. The Green Fund awards grants to organisations who apply for funds to help cover the cost of renewable energy technology that can be used to produce green energy from the sun, wind, water, wood and other renewable sources. Funding will be provided to cover the costs associated with the installation of small-scale renewable energy technology and a proportion of the funding requested may be used for educational purposes (up to 20%). Funding may also be requested for feasibility studies into the installation of small-scale renewable energy technology. There is no minimum value for grants, with a maximum of £5,000 for feasibility studies, and £30,000 for installations. All kinds of small-scale renewable technologies are considered. The closing dates for the applications usually fall on the 28th February and the 31st August.
- Carbon Emissions Reduction Target (CERT) – described earlier.

District heating priority areas

Figure 52 describes those areas where district heating networks should be prioritised. A series of criteria were applied which led to the identification priority locations:

- New development:
  - Large scale mixed use development (at least 500 homes and 10,000m2 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

The figure below shows priority areas for district heating. It should be noted that the extent of the district heating areas is indicative and actual boundaries would have to be defined through further investigation.

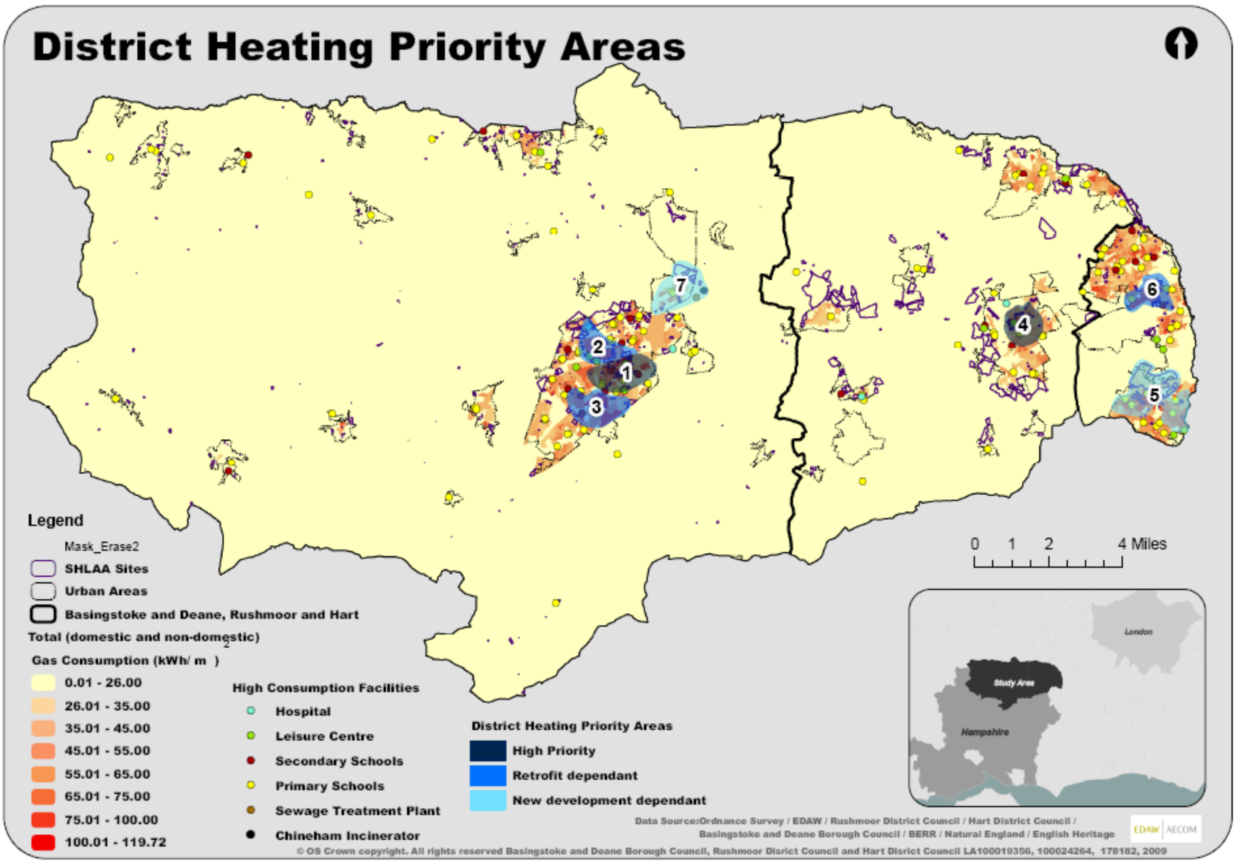


Figure 52: District heating priority areas

The following seven priority sites have been identified:

1. **Basing View and Basingstoke Town Centre** – mixed use strategic site would provide anchor load and location makes it easy to extend network to the town centre. Delivery: can be policy led.
2. **North Hampshire Hospital and adjoining industrial estate (on Kingsclere Road)** – the area has a high heat demand and mixed uses, there may be waste heat available from some industrial users that could be transferred to others. Delivery: complete retrofit, could be supported by financial incentives. There is potential for connection to site 1, if crossing the railway is not financially prohibitive.
3. **Industrial estate on Winchester Road** – the area has a high heat demand and mixed uses, there may be waste heat available from some industrial users. Delivery: complete retrofit, could be supported by financial incentives. There is good potential for connection to site 1.
4. **Fleet town centre** – mixed use site to be re-developed provides good anchor load and good potential for extension in other parts of the town. Delivery: can be policy led.
5. **Aldershot Town Extension and Aldershot town centre** – mixed use strategic site would provide anchor load, but would only be viable at a higher density than currently proposed. The network could then be extended to the existing town. Delivery: dependent on developer's proposals.
6. **Invincible Road industrial estate and Farnborough town centre** – the area has a high heat demand and mixed uses, there may be waste heat available from some industrial users and there is potential for extension to the existing town. Delivery: complete retrofit, could be supported by financial incentives.
7. **Chineham incinerator** – the plant generates electricity but doesn't currently recover heat, this could be harnessed by the sewage treatment works next door, or potentially used to serve new development proposed to the north of Chineham. Delivery: dependent on private companies and developer's proposals.

Of these seven sites, we have further refined the classification into three levels of priority based on their meeting of the criteria and their delivery prospects:

1. Highest priority where sites meet the criteria and a delivery opportunity exists – Sites 1 and 4
2. Constrained existing development where the sites meet the criteria but no delivery opportunity yet exists – sites 2, 3 and 6
3. Constrained new development (5 and 7) – Delivery opportunity but dependent on specification and density of new development

Delivery prospects include whether or not a site is an area of change, such as a site that is allocated or proposed to be allocated. The presence of the delivery vehicle such as an ESCo would help to shift sites in priority level 2 up to level 1. Sites in priority level 3 may be more difficult since strategic community-wide interventions depend on installation of district heating as a chosen option in new development sites (subject to viability). However on these Priority 3 sites, planning should encourage the installation of a district heating system and structuring of urban planning to enable viability of such an installation.

Community wind priority areas

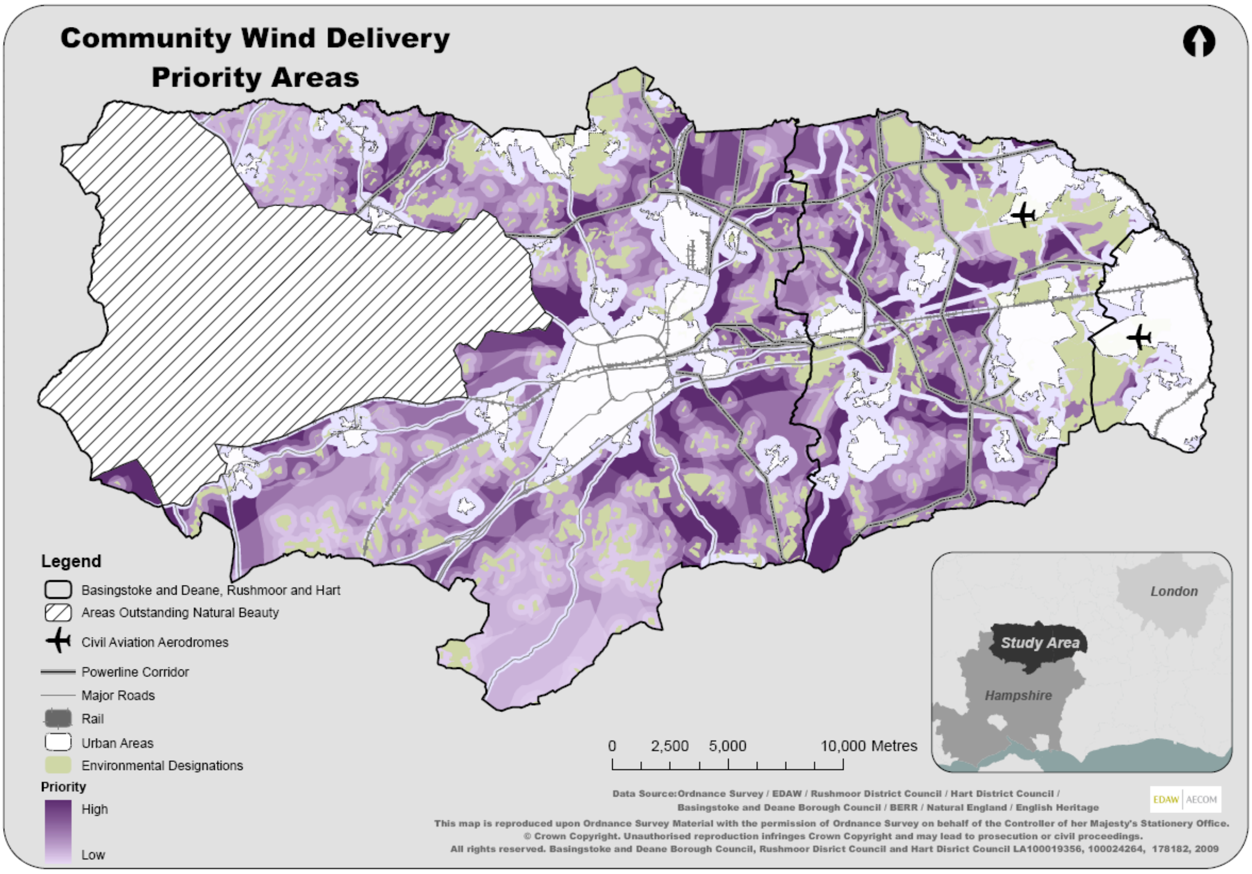


Figure 53: Community wind priority areas

Figure 53 identifies locations where community investment in wind should be prioritised. The aim is to provide a practical resource for community groups in identifying suitable sites where the delivery of a wind turbine should be most straight-forward. Planning policies for these areas should be specifically supportive of planning applications for community-owned turbines. Prioritisation has been based on the following criteria:

- Good local wind resource, consider hilltops, avoid forested areas.
- Close to electricity infrastructure (e.g. 10-30kV power lines, substations) to connect to grid.
- Close to roads, railways for easier transport of components to site.
- Close to the community involved (but not close enough to cause noise issues).
- Consideration of environmentally and archaeologically sensitive areas.
- Consideration of areas of high landscape quality (e.g. AONBs).
- Consideration of local airports and defence structures (e.g. radars and flight paths).
- Consideration of local residential areas.

Clearly some of these criteria are the same as those used to identify market wind opportunities. An important distinction is the proximity to the community involved. Here we have assumed that communities investing in their own wind turbine would be keen to see it, but equally these locations are less likely to be of interest to commercial developers. Similarly, there are overlaps with the New Development Energy Delivery Opportunities plan.

Table 42: Delivery options for strategic community-wide local authority and community interventions

<table>
<tr><th colspan="2">Delivery options for strategic community-wide local authority and community interventions</th></tr>
<tr><td>Wind energy</td><td rowspan="3">District heating priority areas
Community wind priority areas
Local authority-led ESCo
Partnerships for Renewables
Cooperatives
EDF Renewable Energy Fund
Carbon Emissions Reduction Target</td></tr>
<tr><td>Biomass energy</td></tr>
<tr><td>District heating and CHP</td></tr>
</table>

Setting up an Energy Company in North Hampshire

The Wellbeing Power, introduced through the Local Government Act 2000, enables local authorities to do anything that they consider likely to promote the economic, social and environmental wellbeing of their area unless explicitly prohibited elsewhere in legislation. The Power promotes innovation in the way authorities provide services. This includes setting up or participating in local energy services companies (ESCo) and other joint ventures, supplying heat and/or power.

The Energy Opportunities Plan identifies a range of opportunities that are not by their nature deliverable through individual developments or planning applications. A local authority ESCo would be ideally placed to plan, deliver and operate part or all of a district heating network, for example. The implications of this for the local authority are significant. We are no longer simply talking about a set of planning policies; rather success depends on co-ordination between planners, other local authority departments, including the corporate level and local strategic partners. This is a challenging proposition, however, the gains in terms of CO_2 emission reductions and potential delivery against other local authority objectives means that this option needs to be given serious consideration.

Dialogue between AECOM and the Councils has demonstrated that there is enthusiasm for setting up a local authority-led ESCo although the workshop identified important concerns that will need to be fully addressed. The skills needed to set up a local authority-led ESCo will need to be developed. This does not need to be an insurmountable barrier and there are a growing number of 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.

Consideration will need to be given to the extent of private sector or community involvement. 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. ESCo models range from fully public, through partnerships between public, private and community sectors to fully private. The spectrum is illustrated in Figure 54 and discussed in detail in Making ESCos Work[19] and some advantages and disadvantages are set out in Table 43.

It is important to remember that while this type of initiative may be new territory for the LPAs, and indeed for most local authorities, it is fully supported by Government, including in the context of CO_2 reductions and energy.

[19] Making ESCos Work – Guidance and Advice on Setting Up & Delivering an ESCo (London Energy Partnership, 2007)

Recommendation: Councils, with their strategic partners should consider the role that they can play in delivering non-development related energy opportunities.

Recommendation: further work should be undertaken to establish the most appropriate type of ESCo, its remit and relationship with other delivery mechanisms

Table 43: Advantages and disadvantages of ESCo models

	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

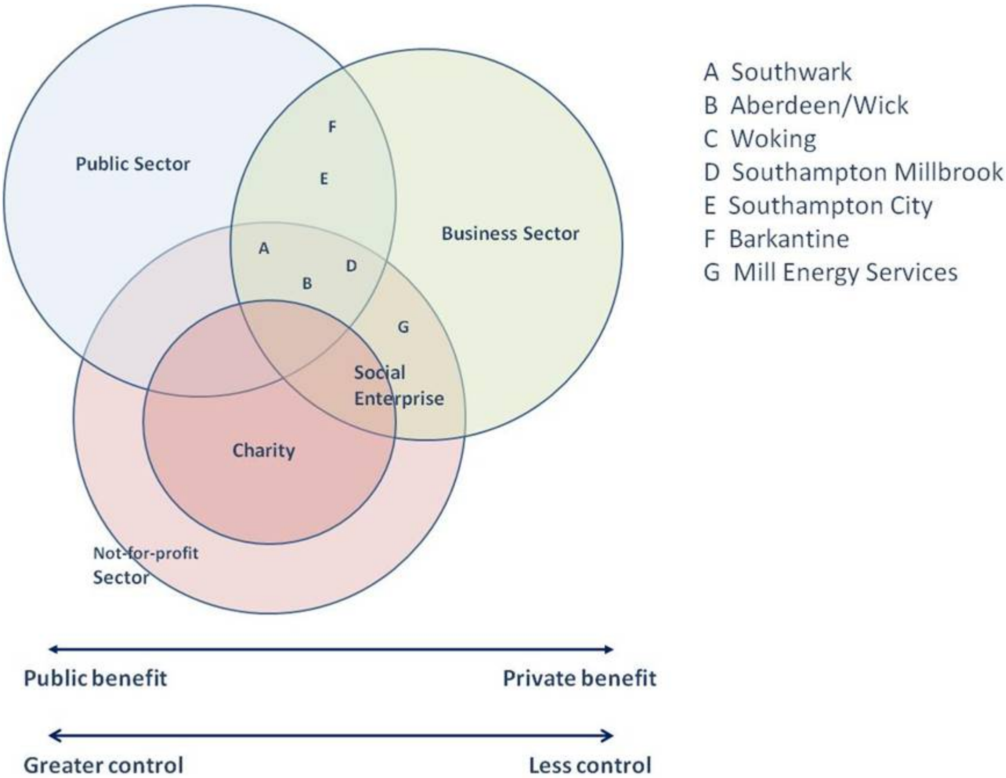


Figure 54: Spectrum of ESCo (Source: Making ESCos Work)

Taking delivery forwards and monitoring

Key to delivering an effective area-based low carbon and renewable energy strategy is successfully drawing on all of the available opportunities. This includes the Comprehensive Area Assessment (CAA) process, which recognises the fact that no single organisation can be responsible for meeting local needs. Alongside the opportunities for a local delivery ESCo are shorter-term Local Area Agreements (LAA) and National Indicators. The Renewable Energy Strategy proposes introducing a renewable energy indicator, but until this time several can be used to deliver energy projects:

- NI 185 – Percentage CO_2 reduction from local authority operations.
- NI 186 – Per capita CO_2 emissions in the local authority area.
- NI 187 – Tackling fuel poverty – percentage of people receiving income based benefits living in homes with a low and high energy efficiency rating.

There are a wide range of delivery mechanisms that can be employed to support planning for energy. Not all will be suitable for North Hampshire and mix is likely to be needed to encompass all of the energy opportunities. This report provides the context for making those decisions. Further work, discussions and advice will be needed to make them happen.

There will be a key role for a range of local actors, led in the first instance by planning. However, to be effective, leadership will be needed at the corporate level with buy-in from the LSPs. The Partnership will need to provide strategic direction for energy policy and delivery of the energy opportunities plan.

6. LPA Area-Wide Policy Recommendations

The previous chapters have developed an evidence base for policy development, based on the policy, energy use and environmental context, the resource potential and delivery considerations. The evaluation of the evidence base has led to the recommendation of district-wide policy options, as set out in the sections below and applicable to each LPA area. These policy options are based on the analysis within this report and the best information available at the time of writing. These policies should be developed by the LPAs in conjunction with the other policies that make up the local development framework and LPAs should consider the effect of policies on the local development context to ensure that they are fit for purpose, viable and achievable. The structure of the chapter follows that of the previous; considering policies applicable to existing buildings, new development and strategic and community-wide interventions.

The Energy Opportunities Plan (EOP) and delivery mechanisms set out in Chapter 5 have informed the policy proposals in this chapter. We propose that the three elements be treated together, meaning that:

- The EOP is either adopted as policy and used to justify planning and other policies and actions, or included as part of a supplementary planning document (SPD); and
- The recommendations form the basis of council-wide discussions on delivery.

The policies proposed here will need to be reviewed if and when the approach to local authority delivery is agreed by the LPAs and their partners. The review will need to consider:

- The nature of the local authority delivery mechanism and the role of planning policy in supporting this. This is particularly important for proposed policy 6; and
- The extent to which existence of this mechanism influences the viability and feasibility of the targets set, and whether more explicit criteria need to be set.

6.1 EXISTING DEVELOPMENT

Planning policy for directly influencing existing development is limited. Therefore, it is important that the delivery opportunities identified in Chapter 5 are developed further in order to improve the energy performance of the existing building stock. The proposed policy should apply to all three districts:

6.1.1 POLICY RECOMMENDATION: CONSEQUENTIAL IMPROVEMENTS TO EXISTING HOMES

Recommendation for new Policy 1: Consequential improvements to existing homes

Planning applications for changes to existing domestic dwellings will be required to undertake reasonable improvements to the energy performance of the existing dwelling. This will be in addition to the requirements under Part L of the Building Regulations for the changes for which planning permission is sought. Improvements will include, but not be restricted to loft and cavity wall insulation, draught-proofing, improved heating controls and replacement boilers.

Applicants will be asked to complete a checklist to identify which measures are appropriate to their home. In the case where the building already includes key energy efficiency measures, no improvements need to be made. The total cost should be no more than 10% of the total build cost.

Policy Justification

The purpose of the policy is to reduce CO_2 emissions from existing housing and off-set any increased heated volume of a dwelling caused by extension. The approach aims to make the most of any straightforward opportunities for improvement that exist. These include loft and cavity wall insulation, draught-proofing, improved heating controls and replacement boilers.

Policy Implementation

The checklist approach is simple – if any of the measures on the list are applicable, they are likely to pay for themselves in energy cost savings in less than seven years, and their combined cost does not exceed 10% of the cost of the building works, they are required. If none of the measures on the list fit the bill, none are required.

Uttlesford District Council has had and has been successfully implementing this adopted policy for three years, and it has been well received by householders. Around 1,400 extensions have been affected by the policy so far, and the total projected savings from measures required as a result are £72,600 and 398,000kg of CO_2 per year.

6.2 NEW DEVELOPMENT

A range of planning policy approaches can be directed at new development. The starting point has been to propose policies that meet the following criteria: readily understandable and implementable by development managers and applicants; do not have an adverse impact on scheme viability; and maximise CO_2 reduction and decentralised renewable and low carbon energy installations. The proposed policies should apply to all three districts.

6.2.1 POLICY RECOMMENDATION: FUNDING DELIVERY THROUGH COMMUNITY INFRASTRUCTURE LEVY

Recommendation for new Policy 2: Community Infrastructure Levy – Energy and CO_2

In order to contribute to the delivery of the Energy Opportunities Plan, all new buildings in North Hampshire will be required to either:

Be subject to a Community Infrastructure Levy, charged at £100 per tonne of CO_2 per building emitted over a 30 year period (or a one-off payment of £3,000 per tonne of CO_2 per building); or

Achieve a 15% reduction in residual CO_2 emissions in all buildings 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 on-site low carbon and renewable technologies and directly connected heat (not necessarily on-site).

Planning approval will be conditional on the provision at the design stage and on completion of design and as-built Building Control Compliance documentation clearly showing the Target Emission Rate (TER) and Dwelling Emission Rate (DER) / Building Emission Rate (BER).

Policy Justification

There is a framework through national and regional policy for inclusion in planning policy of CO_2 emissions targets and higher energy and carbon performance standards than Building Regulations. Changes to the Building Regulations for residential buildings, in 2010 and expected in 2013 and 2016, will bring in tighter standards for CO_2 emissions. After 2016 it will be necessary for all new residential buildings to be built to zero carbon standards, with the equivalent standard for non-residential buildings due to be introduced in 2019.

The proposed policy 2 accelerates the move towards zero carbon, as shown in Table 44 for residential buildings. 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 "carbon compliance;" a combination of energy efficiency measures, incorporation of on-site low carbon and renewable technologies and directly connected heat (not necessarily on-site). The function of the policy is to drive delivery of carbon reductions in North Hampshire. There are key opportunities for wind power and biomass CHP which need to be delivered at a district-wide scale. It is considered essential that immediate action is taken to begin to deliver renewable and low carbon energy in North Hampshire to meet 2020 targets. Allowable solutions may provide funding post 2016, but key opportunities will be missed in the interim. The redevelopment of the town centre areas and strategic sites will be a key opportunity to deliver infrastructure which is likely to start coming forward, at least in part, before 2016.

The additional 15% of residual emissions is not expected to add significant cost to development (see Appendix A). The additional requirement doesn't exceed the 70% overall reduction in regulated emissions expected to be met on-site by 2016 under current government proposals, and is therefore considered feasible. In the case where additional carbon reductions are not feasible on-site or are considered to add significant cost, the 'Carbon Buyout Fund' can be utilised by developers.

Table 44: Comparing North Hampshire new policy 2 with Building Regulations standards

Carbon Compliance Required for Residential Buildings			
Period	**Building Regulations Part L (residential)**	**North Hampshire Councils Additional Reduction on Residual Regulated Emissions**	**Total**
2010-2013	25%	11.25%	36.25%
2013-2016	44%	8.4%	52.4%
Post 2016	70%	Allowable Solutions	Zero Carbon

In setting the minimum level of carbon compliance that all new homes are required to meet, we need to be confident that we are not setting technical standards or costs that are unacceptably high for development. Government has decided[20] that, based on the assumptions in its consultation document on the definition of zero carbon[21], a carbon compliance standard of 70% of regulated energy use is as ambitious as possible for on-site CO_2 mitigation, while being technically achievable on most sites. The additional reductions required by North Hampshire LPAs should therefore be technically feasible on the majority of developments.

Nonetheless, there may be circumstances when it is not possible or desirable to achieve the standards proposed for proposed policy 2. Applicants who feel that they are unable to meet the required standards can pay into a 'Carbon Buyout Fund'. The preferred fund mechanism will be the Community Infrastructure Levy that applies to every building constructed within North Hampshire at a rate to be determined locally. Since the CIL cannot apply until April 2010 and the regulations are still in draft form, this policy recommendation may need to be reviewed post April 2010. Chapter 5 discusses how CIL money can be spent to deliver maximum CO_2 reductions and installed energy.

The aim is to provide a mechanism that helps deliver the EOP, but is also compatible with delivery of 'allowable solutions' post 2016. The proposed levy has therefore been capped at £100 per tonne of CO_2 up to a maximum of £3,000 and has been selected to balance incentives for innovation whilst maintaining confidence in the house building market. The £100 contribution level is based on the Impact Assessment that accompanied the definition of Zero Carbon Homes[22]. The contribution level should be reviewed in tandem with both national and local changes in this policy area.

The costs of meeting proposed policy 2 are therefore transparent and provide certainty to the developers as to the extent of their planning obligations. Diverting these payments into a Carbon Buyout Fund via the CIL could provide the district with an income for investment in low carbon and renewable energy projects, as identified by the EOP. The fund should allow North Hampshire LPAs to strategically coordinate and phase the infrastructure required to deliver community scale energy generation installations such as district heating networks.

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20 Eco-towns and zero carbon homes statement (Minister for Housing & Planning, July 2009)
21 Impact Assessment of the Zero Carbon Homes Consultation, CLG, December 2008
22 Impact Assessment of the Zero Carbon Homes Consultation, CLG, December 2008

Proposed policy 2 does allow flexibility in the ways that applicants mitigate CO_2 emissions and it is expected that in the early years (e.g. the proposed revisions to Part L in April 2010) the most cost effective way to meet the target will be through increased energy efficiency. However, it is probable that as Building Regulations TER increase over time, many will choose to install on-site renewable technologies, which will assist the district in meeting regional renewables targets.

Policy Implementation

The proposed policy should also be simple to operate. Developers will already have to understand TER, DER and/or BER in order to comply with Building Regulations. Similarly, development managers can assess compliance simply by checking whether design stage and as-built Building Control Compliance documentation has been supplied.

In order to comply with the policy, developers will need to demonstrate through within the suite of information supporting their planning application the % energy saving on TER that the development delivers or, a detailed explanation as to why this is an unreasonable requirement. SAP is the Government's Standard Assessment Procedure for Energy Rating of Dwellings. SAP is adopted by government as part of the UK national methodology for calculation of the energy performance of buildings. It is used to demonstrate compliance with building regulations for dwellings. Compliance is achieved by comparing the modelled performance of the dwelling to be built, the Dwelling Emission Rate (DER), with a notional dwelling with the same dimensions built to a standard specification. A percentage reduction in the notional buildings emissions produces the Target Emission rate (TER). To comply with Part L the DER must be less than the TER.

If SAP calculations are carried out by an Accredited SAP Assessor the Building Control Officer and Planner can take documentation produced from approved assessor without having to carry out further checks (as checking is undertaken by the accreditation body). The Part L approval process is signed off by the Building Control Officer at two stages: the design stage before the developer starts on site and the ‘As Built’ stage after air pressure tests have been conducted and performance as built can be modelled.

For a developer to demonstrate compliance with the higher targets set out in planning policy they should provide a Part L1A Compliance Checklist completed by an accredited SAP assessor for each dwelling and a summary table listing all TER and DERs to demonstrate the required % emissions rate has been achieved. This evidence can be requested at design stage, prior to starting on site, and ‘As Built’ prior to handover.

At planning application a description of measures to be undertaken supported by indicative SAP modelling of a sample of dwelling confirming that the target will be met can be requested.

Compliance is measured consistent with Part L on a building level. Houses are required to have individual calculations. Flats can provide multiple compliance calculations on a building by building scale. Development wide aggregation of percentage improvement of DER over TER performance should not be accepted.

For larger developments, a more comprehensive ‘Energy Strategy’ may provide an effective and coherent way to both plan the energy requirements of a development and demonstrate to planners how energy savings have been made. This would set out, as above, the savings gained though passive design, energy efficiencies through building performance and fixtures and fittings as well as any energy requirements generated or offset through on-site renewable and low carbon technology.

Period from 2010 to 2013

From 2010, it is likely that the Building Regulations will require an improvement over 2006 levels of 25% in the regulated CO_2 emissions of residential buildings. The Building Regulations and proposed North Hampshire policy requirements from 2010 are illustrated in the figure below.

Figure 55: Building Regulations requirements proposed for 2010 plus proposed North Hampshire 2010 CO_2 reduction planning policy requirements

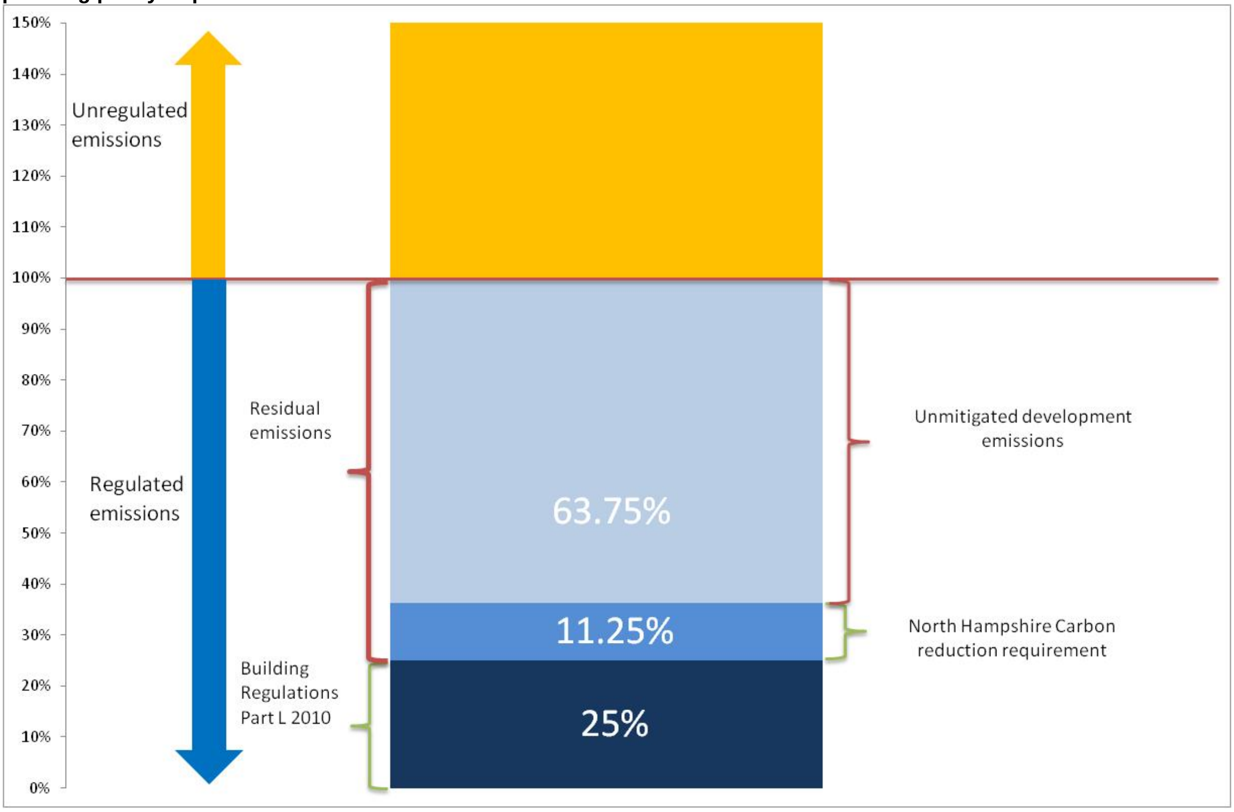


Table 45: Building Regulations 2006 Baseline TER, Building Regulations 2010 updated TER and North Hampshire required TER, and the maximum levy chargeable for some standard dwelling types

Building Type	Building Regulations 2006 TER (annual tonnesCO_2)	Building Regulations 2010 TER (annual tonnesCO_2)	North Hampshire required TER (annual tonnesCO_2)	Emissions Subject to Levy (annual tonnesCO_2)	Levy cost (£)
Detached	2.20	1.65	1.40	0.25	**£740.84**
Semi	1.61	1.21	1.03	0.18	**£544.01**
End	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**

The table above gives an indication of the maximum levies that are likely to be incurred by standard dwelling types between 2010 and 2013, if built to minimum Building Regulations standards.

It should be noted that on certain sites, there may be other factors, beyond capital cost, affecting the decision of whether to invest in additional carbon compliance or make a payment into a Carbon Buyout Fund. For example, the applicant may also be the building occupant, or, in the case of an RSL, 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 installing micro-generation technologies. Where the developer is planning to provide commercial rents, they may also have an interest in reducing energy costs for communal areas. Building occupiers will also benefit from reduced risk and security of supply.

Applicants may also be able to market zero or low carbon developments at a premium. An example of this is seen in the mindset of developers responding to existing on-site renewable energy policies across England. Many have viewed this as an opportunity to lead the field in the designing, constructing and marketing of low carbon buildings – with the opportunity to sell them at above market rate. This "marketability" aspect may increase in the future as homeowners become more aware of the energy performance of new buildings through the energy labelling measures that came into force in the UK in 2008 following the EU Energy Performance in Buildings Directive.

Period from 2013 to 2016

From 2013, it is expected that the Building Regulations will require an improvement of 44% over 2006 levels in the regulated CO_2 emissions of residential buildings. There are currently no proposals for changes to the standards for non-residential buildings in this period. Building Regulations and proposed North Hampshire policy requirements from 2013 are illustrated below.

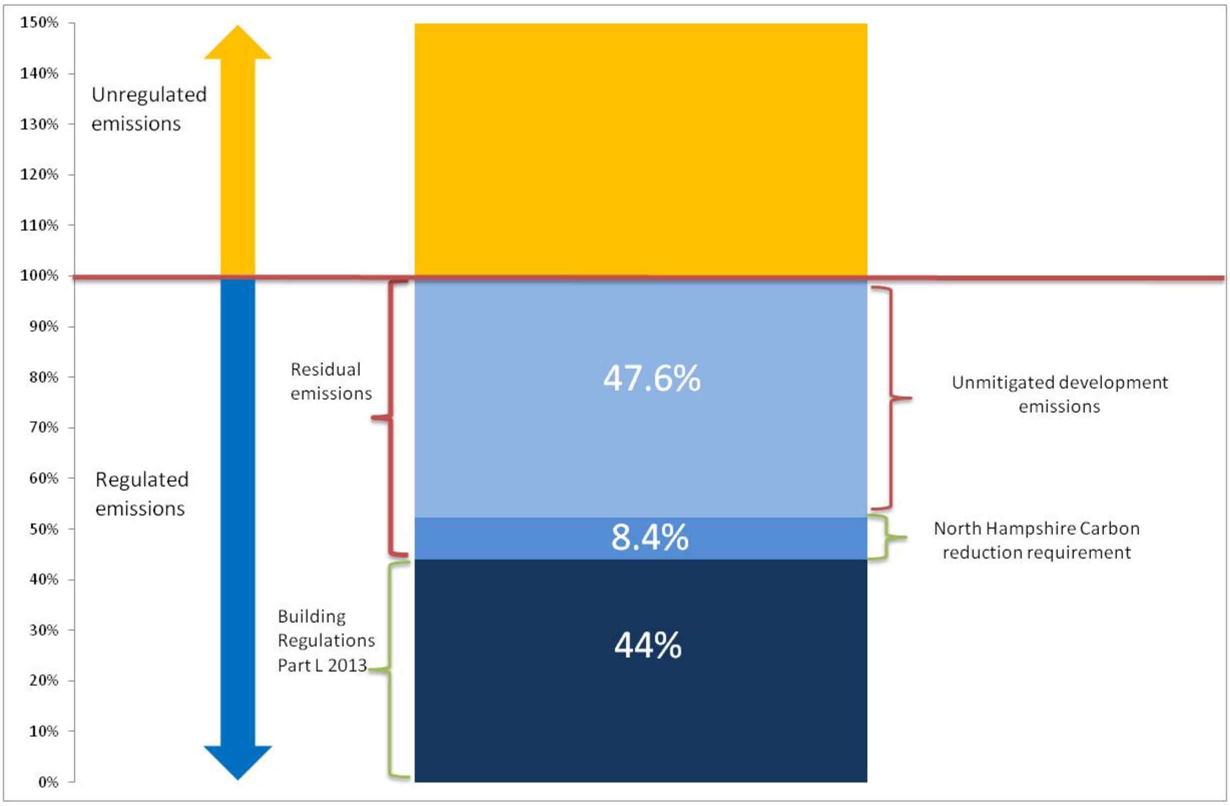


Figure 56: Building Regulations requirements proposed for 2013 (applicable to new residential buildings only plus proposed North Hampshire 2013 CO_2 reduction planning policy requirements

Table 46: Building Regulations 2006 Baseline TER, Building Regulations 2013 updated TER and North Hampshire required TER, and the maximum levy chargeable for some standard dwelling types

Building Type	Part L 2006 TER (annual tonnesCO_2)	Part L 2013 TER (annual tonnesCO_2)	North Hampshire required EER (annual tonnesCO_2)	Emissions subject to levy (annual tonnesCO_2)	Levy cost (£)
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**

Examples of the levies that are likely to be incurred by standard dwelling types from 2013 are presented in the table above.

Post 2016

Current government policy suggests that all new residential buildings will be required to be zero carbon from 2016. Developers will have to reduce regulated CO_2 emissions by up to 70% “carbon compliance” i.e. through improved energy efficiency measures, on-site low carbon and renewable energy generation or connection to off-site heat. The remaining regulated as well as unregulated emissions will have to be offset through allowable solutions. In 2016, the additional reduction in the TER required by the proposed new North Hampshire policy will be 5% of total building CO_2 emissions. This 5% could be included within allowable solutions, but due to the uncertainty around allowable solutions, this acts as an alternative for use if suitable in the future. The Building Regulations and proposed North Hampshire policy requirements from 2013 are illustrated below.

Government has announced that all new schools will be expected to be zero carbon by 2016. Guidance is likely to be introduced as to how new school buildings will meet this standard. Other non-residential buildings will incur the same costs as in the period 2010-2016, unless changes to the Building Regulations are introduced that alter the trajectory to zero carbon.

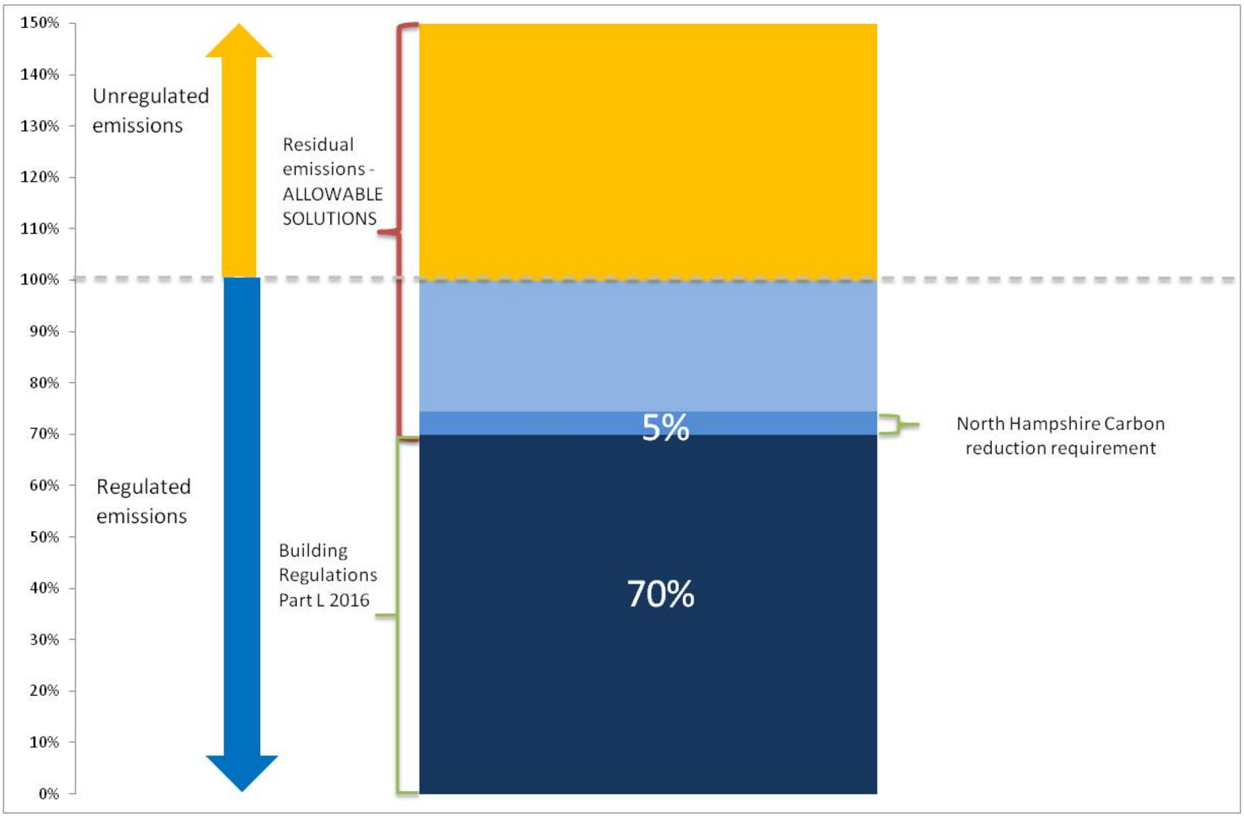


Figure 57: Building Regulations requirements proposed for 2016 (applicable to new residential buildings only plus proposed North Hampshire 2016 CO2 reduction planning policy requirements
CO_2 reduction requirements

Post 2019

All new buildings are expected to be required to be zero carbon. Guidance is likely to be introduced by central government as to how non-residential buildings will meet this standard.

6.2.2 POLICY RECOMMENDATION: SUSTAINABLE CONSTRUCTION TARGETS FOR NEW DEVELOPMENT

Recommendation for new Policy 3: Sustainable Design and Construction

All new residential developments in North Hampshire are required to meet full Code for Sustainable Homes standards or equivalent. These requirements will not come into effect until successive updates to Part L of the Building Regulations become mandatory:

- **At least Code level 3 will be required for all new homes once updates to Part L come into effect (currently scheduled for April 2010).**
- **At least Code level 4 will be required for all new homes once updates to Part L come into effect (currently scheduled for 2013).**

All new non-residential developments in North Hampshire over 1000 square metres gross floor area are required to achieve the BREEAM "Very Good" standard or equivalent, with immediate effect (relevant versions of BREEAM are available covering offices, retail, industrial, education and healthcare).

Compliance with this policy will require submission of final Code certificates and post-construction BREEAM certificates, as appropriate.

Table 47: Comparing North Hampshire new policy 3 with Building Regulations standards

Period	Building Regulations Part L	North Hampshire Councils
2010-2013	25% reduction of regulated CO_2 emissions compared to 2006 Building Regulations (equivalent to Code for Sustainable Homes Level 3 Energy Requirements)	Full Code Level 3 required
2013-2016	44% reduction of regulated CO_2 emissions compared to 2006 Building Regulations (equivalent to Code for Sustainable Homes Level 4 Energy Requirements)	Full Code Level 4 required
Post 2016	Zero carbon (including all regulated and unregulated emissions in line with the Government definition)	Full Code Level 4 required

Policy Justification

The PPS1 Supplement allows local authorities to require levels of building sustainability in advance of those set nationally where local circumstances warrant them. Issues around water, waste and recycling, ecology and land use, pollution and Lifetime Homes sections should be prioritised by the LPAs as being of particular relevance to North Hampshire. The South East area will be disproportionately affected by climate change, frequent summer droughts and winter flooding, changes in the landscape as well as changes in habitats and species composition, habitat fragmentation and changes in soils, agricultural land use, recreation and tourism and cultural heritage. This means that actions must not only be taken to reduce the impacts of climate change by reducing CO_2 emissions, but also to adapt proposed development to the effects of climate change and other environmental damage. The Code for Sustainable Homes is the voluntary Government-backed building assessment tool that covers a full range of sustainability issues including, but not restricted to, energy and CO_2 emissions.

This report includes an evidence base for the need for energy and water targets in the North Hampshire area. The Code for Sustainable Homes requires mandatory credits for energy and water, and hence these are the most inflexible items that are directly tied to the Code Level specified. There is flexibility in the other aspects covered by the code, and each of these depend on site-specific conditions as to whether the credits can be achieved. Hence, a LPA-area wide evidence base has been deemed unnecessary for the other aspects. Overall viability and cost related to all aspects of the Code for Sustainable Homes and BREEAM is given in Section 2 of this report. Individual applications should assess the viability of meeting the standards proposed on a site-by-site basis.

The policy does not require residential building to meet standards beyond Code Level 4. At levels 5 and 6 the current mandatory criteria for water use create strong drivers for greywater recycling or rainwater collection systems. 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 North Hampshire. The proposed policy 3 Code targets could be reviewed in response to any future changes in Code water criteria for Code Levels 5/6.

Policy Implementation

A Code for Sustainable Homes and/or BREEAM pre-assessment should accompany the planning application to provide assurance that the design will achieve the required rating. An interim design stage certificate is required before construction can start on site and, following completion, the post-construction review (PCR) and subsequent formal certification is required. Where cost associated with a pre-assessment is considered unreasonable due to the size and/or type of development, negotiations should be made with the planning authority to ascertain supply of details of how the policy can be met.

6.3 STRATEGIC SITES

PPS1 Supplement encourages setting specific policy and targets for strategic sites where greater opportunities exist to reduce CO_2. Three strategic sites in the study area have been considered in detail in Chapter 7. LPAs should also seek opportunities to set higher targets on other sites that come forward where significant potential is present.

6.4 STRATEGIC COMMUNITY-WIDE INTERVENTIONS

The third policy area addresses strategic, stand-alone energy opportunities and those that are not necessarily related to specific development proposals.

6.4.1 POLICY RECOMMENDATION: RENEWABLE ENERGY

Recommendation for new Policy 4: Renewable Energy

Applications for low carbon and renewable energy installations will generally be supported in the area. The area is seeking new renewable energy generation capacity to deliver an appropriate contribution towards the UK Government's binding renewable energy target. Therefore:

BASINGSTOKE AND DEANE

At least 166GWh of renewable electricity by 2020 (approximately 20% of total electricity demand in Basingstoke and Deane).

At least 195GWh of renewable heat by 2020 (approximately 12% of total heat demand in Basingstoke and Deane).

HART

At least 37GWh of renewable electricity by 2020 (approximately 10% of total electricity demand in Hart).

At least 105GWh of renewable heat by 2020 (approximately 12% of total heat demand in Hart).

RUSHMOOR

At least 46GWh of renewable electricity by 2020 (approximately 10% of total electricity demand in Rushmoor).

At least 105GWh of renewable heat by 2020 (approximately 12% of total heat demand in Rushmoor).

Policy Justification

The binding national renewable energy target of 15% of total energy to be generated from renewable sources by 2020 can be delivered through a combination of renewable electricity, heat and transport fuel. The Government's July 2009 Renewable Energy Strategy indicates that this is likely to comprise: 30% of total electricity from renewables; 12% of total heat; and 10% of total transport fuel. Planning has a key role to play across all three but the focus of this study is on electricity and heat, therefore, the targets relate to these elements only.

The 30% target for electricity will be met in part through contributions on a national scale, through off-shore wind installations and other major projects, however a substantial proportion still needs to be delivered on land and across the country, following where opportunities exist. The South East has set an overall target of 10% of electricity from renewables by 2020 (16% by 2016), where Hampshire as a whole is recognised as being able to deliver its portion of that target. The scenarios in Chapter 4 consider the ability of each LPA area to deliver their portion of this target, and if it can be reasonably exceeded. Policy recommendations have been made accordingly. Due to the wide range and scale of potential in Basingstoke and Deane, along with significant existing installations, the electricity target has been raised to 20%.

The 12% heat target on a national scale will be delivered and supplied primarily in conjunction with the built environment, and therefore, all LPAs should contribute their portion of that target where significant opportunity exists to generate renewable heat. All three LPAs demonstrate significant potential for inclusion of renewable heat, and therefore the national target is recommended for policy.

The targets included in the proposed policy are calculated from the expected energy demand baseline derived in Chapter 3. The energy and heat modelling indicates that the proposed targets are challenging but deliverable. The nature of the renewable energy resource in North Hampshire means that much of this is likely to be delivered through larger wind turbines, however, small and medium scale wind, solar photovoltaics and other technologies will also play an important role. The role of the local authority and communities as delivery agents will be important and is explored in more detail in Chapter 5.

Policy Implementation

The Councils may wish to support the policy and targets by setting criteria by which decisions will be taken. In the context of national policy in PPS22 and the PPS1 Supplement and the Regional Spatial Strategy, these would need to cover all or some of the following: local amenity; ecology; landscape and visual impact; cultural heritage; the technologies; weighing up impacts and benefits; and community involvement and ownership.

6.4.2 POLICY RECOMMENDATION: DELIVERING THE ENERGY OPPORTUNITIES PLAN

Recommendation for new Policy 5: Delivering the Energy Opportunities Plan

Decentralised, low carbon and renewable energy is a priority for the Council. Planning applications for new development in North Hampshire will need to demonstrate how they contribute to delivery of the current 'Energy Opportunities Plan'.

Policy Justification

The various key decentralised renewable and low carbon energy opportunities across the district have been used to create an EOP (Figure 39). The EOP acts as the key spatial plan for energy projects in the LPA areas. It underpins the policies, targets and delivery mechanisms described here and can set out where money raised through the Carbon Buyout Fund/CIL will be spent. The plan should also be used to inform policy making in the Sustainable Community Strategy and other corporate strategies, and investment decisions taken by the local authority and Local Strategic Partnerships in North Hampshire.

Policy Implementation

The EOP should be incorporated into SPD or development plan documents and corporate strategies and should regularly be updated to reflect new opportunities and changes in feasibility and viability. The EOP should be used as a tool to inform applications and assessment, though it should not be used to restrict scope or locations of proposals, where they are shown to be viable.

6.4.3 POLICY RECOMMENDATION: PRIORITY AREAS

Recommendation for new Policy 6: Priority areas

The Councils will favourably consider applications for development which will support the following energy priority areas:

1. District heating priority areas

Basing View and Basingstoke Town Centre

North Hampshire Hospital and adjoining industrial estate (on Kingsclere Road)

Industrial estate on Winchester Road

Fleet town centre

Aldershot Town Extension and Aldershot town centre

Invincible Road industrial estate and Farnborough town centre

Chineham incinerator surrounds

These areas will be considered by the delivery ESCo as priority areas for installing district heating systems.

Development within the priority area should install the secondary elements of a district heating network (i.e. from the wider network to properties), unless it can be shown not to be viable or feasible, and work closely with the ESCo to ensure compatibility of systems. Should development come forward prior to a district heating network being in place, developers will be required to provide a containerised energy centre to provide 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.

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

Where applicants demonstrate that connection to a district heating network is not feasible or viable they should contribute financially to the Carbon Buyout Fund/CIL.

2. Community wind priority areas

All areas highlighted in the Community Wind Priority Areas plan

Applications will be encouraged from community groups and individuals in priority areas.

Applications are also encouraged for wind energy developments directly related to new domestic and non-domestic developments, particularly in areas identified in the Energy Delivery Opportunities Plan.

Policy Justification

The planning policy approach represents the application of national policy to the specific North Hampshire context. The PPS1 Supplement on Planning and Climate Change and PPS22 (Renewable Energy) are both supportive of wind power. Specifically in relation to district solutions, the Supplement requires the following:

- Along with criteria based policies, identify suitable sites for decentralised and renewable or low carbon (DRLC) energy and supporting infrastructure.
- Expect a proportion of energy supply for new development to be secured from DRLC energy. This can involve utilising existing and fostering new opportunities to supply development. For example, co-locating potential heat customers and suppliers, requiring development to connect to an identified system or to be able to in the future, setting out how proposed development should contribute to securing the DRLC energy system from which it would benefit, and facilitate connection.

The priority areas have been identified based on the criteria set out in Chapter 5 and in response to the requirements of the PPS1 Supplement. Further policy justification is included in Chapter 5. The purpose of the policy is to prioritise district heating and community wind in areas where opportunities are the greatest (see Figures 52-55)

Policy Implementation

Developments within or near the district heating priority areas should investigate the feasibility of the opportunity within the site (and surrounding the site as far as possible). The planning application should provide details of how the opportunities will be implemented to allow the LPAs to coordinate delivery of potential across the priority areas. Where installation of infrastructure is not possible, details of the viability assessment should be given with the application.

In order to provide additional certainty to the installation of district heating networks it is recommended that a Local Development Order (LDO) is designated, either for district heating networks across the council areas or specifically in priority areas. Introduced in the 2004 Planning and Compulsory Purchase Act and amended by the 2008 Planning Act, LDOs grant permission for types of development specified in the Order and by so doing, removes the need for a planning application to be made by the developer. The PPS1 Supplement supports their use in bringing energy projects forward. A pilot is underway for the Barking Power Station strategic heat main promoted by the London Development Agency. Barking and Dagenham have recently received funding for a pilot project using a LDO for implementing a district heating system.

7. Strategic Site Analysis

7.1 INTRODUCTION TO THIS CHAPTER

PPS 1 Climate Change Supplement sets out a requirement that:

'…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'

This chapter focuses on opportunities particular to three strategic development sites, one in each LPA area. It considers their potential to exceed the area wide targets for low carbon energy and Code for Sustainable Homes and BREEAM standards Strategic sites, due to their size and/or location are often key delivery vehicles to achieve high carbon reductions in an LPA area. The following sites were selected, one for each Council in the study area:

- Aldershot Urban Extension (Rushmoor BC)
- Basing View (Basingstoke and Deane BC)
- Queen Elizabeth Barracks (Hart DC).

The sites were selected through consultation with Council representatives and represent the key site opportunities in the LPA areas at this point in time. There are also other large sites coming forward in the area, where higher targets may be achievable. The analysis and process of examination demonstrated here should be applied by the council as other sites come forward, and targets and site specific policy should be set accordingly.

7.2 INFLUENCE OF SITE PROPOSALS

For each site the predicted energy demands were calculated based on information currently available on the proposed building mix and the potential for CO_2 savings associated with each low or zero carbon (LZC) technology was considered.

It is important to note that the energy demands calculated for all three strategic sites are based on information currently available, which is likely to change as the masterplans for the sites progress. Changes to the proposed building uses could have significant impacts on the expected energy demands; furthermore the phasing strategies will significantly impact the timing of energy demands and may affect the technical viability of some of the low and zero carbon solutions considered. Accordingly, viability of targets and policy should be tested through an energy strategy conducted alongside the planning application for these sites. This study looks to identify key areas of opportunity and set out the likelihood that the site is capable of meeting higher targets.

For example, a shift towards more residential focussed schemes would have the effect of reducing the overall electricity demand and CO_2 emissions compared to a scheme of predominantly office and retail. This is illustrated by table 48, which shows gas, electricity and CO_2 benchmarks per m^2 for 5 standard building types. The traffic light shading shows where demands or emissions are high (red) or low (green). The significant variation in the figures on a m^2 basis highlights how significant the effect of changing the balance of building uses within a masterplan can be once the benchmarks are applied to total floor areas. It will therefore be important to iteratively review the energy demand estimates as the masterplans are developed.

Table 48: Relative energy benchmarks (Gas and Electric) for different building types[23]

Varying energy benchmarks for different building types						
		Commercial				Residential
		General office	High street agency	General retail	Large non-food shop	Average residential
Gas	kWh/m²	120	0	0	170	60 - 90
Electric	kWh/m²	95	140	165	70	30 - 48
CO_2	kg/m²	69	27	32	85	25 - 37

Also denser development is less energy intensive. Large detached homes have a much greater heat requirement and greater heat loss than terraced homes or flats in apartment buildings due to their increased surface to floor area ratio. Typically a development where a greater proportion of the overall housing mix is apartments and terraced homes will have a lower energy demand than a development which consists more predominantly of detached homes.

Compact masterplans also facilitate a greater number of options for delivering heat and power to homes in a low carbon way. The higher density helps to make district heat and power options more economically viable, it also means that more space may be available for the siting of wind turbines onsite.

7.3 RENEWABLE AND LOW CARBON TECHNOLOGIES CONSIDERED

Given below are the technologies that were considered, as well as some issues relating to their technical and financial viability that determined whether they could be applied to the strategic sites.

Enhanced energy efficiency

There are no site specific opportunities or constraints associated with this issue as enhancing energy efficiency does not have a spatial implication at a masterplan scale, but only affects the internal layout of buildings. There is however likely to be a financial constraint as energy efficiency measures beyond a certain standard progressively become a less cost effective way of achieving CO_2 reductions. The advantage of enhancing energy efficiency is that the need for onsite renewables and low carbon technologies to deliver carbon compliance levels will be reduced.

For non-residential buildings the improvements are likely to focus on the specification of more efficient services more than on building fabric changes as the CO_2 savings achievable with building fabric improvements are relatively limited. The savings achievable by careful specification of services within the building (e.g. lighting, ventilation) are very significant and generally can outweigh savings achievable by LZC technologies, unfortunately the extent of these savings are very difficult to estimate at such an early stage due to the immense variation possible in non-residential building types and designs.

Gas fired Combined Heat and Power (CHP)

CHP is most cost effective at a large scale, connected to a district heating network and serving a mix of building types with relatively consistent electricity and heating demands. CHP systems are generally coupled with district heating networks however these are typically only cost effective on developments of high density as the length of pipes required is low relative to the energy being distributed.

Solar water heating (SWH)

Solar water heating has been successfully used in various building types but has little CO_2 reduction potential in commercial building uses (e.g. offices, retail, leisure etc) where demand for hot water is low relative to the overall building energy demand. SWH is more attractive for use in homes, where it is well proven and can contribute up to ~13% CO_2 saving. New homes (after 2013) will be required to deliver a greater level of CO_2 saving than can be delivered using just SWH and the technology may be less favoured in future as it competes for demand with other technologies such as biomass heating and natural gas or renewable fired CHP all of which can contribute much higher levels of CO_2 saving. These technologies also meet energy demands for space heating and - in the case of CHP – with the added advantage of electricity generation.

[23] Standards from AECOM modelling

Wind turbines

Micro (building mounted) wind turbines have not been considered for this assessment as early feedback from field trials (by BRE, Carbon Trust and EST) has shown limited energy outputs from small turbines installed in urban and sub-urban locations where wind conditions are turbulent.

The potential for large scale wind at a district scale is discussed separately in Chapter 4. It is worth noting that any potential large scale turbines are unlikely to help meet Code for Sustainable Homes or BREEAM targets for any of the strategic sites. This is because a direct connection to the site would be required via a private wire network, which is only generally financially viable within a distance of 1-2km and none of the strategic sites are that close to a good wind resource unrestricted by exclusion zones.

Solar Photovoltaics (PV)

Other than wind turbines, photovoltaics (PV) are the only renewable energy technology delivering electricity. PV is likely to play a major role in delivering future targets for onsite CO_2 reduction as replacing electricity has higher CO_2 saving potential than replacing heat; this is due to the fact that standard (fossil fuel powered) electricity generation and distribution is a very carbon intensive process. The energy output from PV is only limited by the amount of suitable area for accommodating panels, and by cost. Good design should be able to maximise the area which can be used for mounting PV panels, which need to face South at a 30^{o} pitch. Valley roofs or flat roofs can be used where conventional pitched roofs cannot be orientated to face South. PV is well suited both to residential and non-residential installations as all building types require electricity and generation and demand profiles are not an issue as excess electricity can be sold to the Grid.

PV have a high capital cost however they are becoming more competitive with other LZC technologies and the economics of the technology is likely to be further improved in the future with the introduction of Feed in Tariffs from April 2010.

Ground Source Heat Pumps (GSHP)

The technical viability of ground source heat pumps for any of the strategic sites has not been considered in detail at this stage as this would require a detailed ground condition survey and the potential CO_2 savings from this technology are relatively low compared to other LZC options to make this worthwhile doing at this stage. For all three sites it has been assumed that ground conditions are suitable for installing the ground loops required for GSHPs.

In terms of spatial implications GSHPs have limited impact on masterplans as the ground loop can be buried in a vertical borehole and the heat pump would only require a small space within the building. Where more space is available, for example where there are houses, the ground loop can be laid horizontally by burying it in the garden, which reduces installation costs. For flats it may be necessary to use vertical boreholes, which do not require large outdoor areas to be kept free from buildings.

GSHP have particularly high potential in commercial buildings as they can meet both heating and cooling loads, however they do compete with other LZC technologies that are more effective at saving CO_2 such as CHP. In terms of financial viability, the capital cost of GSHPs is high, particularly if a vertical borehole is required, for this reason we have currently assumed that GSHP would only be viable for commercial buildings and houses but not flats.

Energy benchmarks used to calculate energy demands for non-residential buildings do not provide a breakdown of the electricity consumption therefore it was not possible at this stage to define the cooling demand of buildings. This means that the calculated CO_2 savings associated with GSHPs only show the savings from ground source heating but not ground source cooling. The extent of these additional savings can only be assessed once more detailed information on building types and their energy demands becomes available.

GSHPs can deliver Code Level 3 energy requirements (or Level 4 when combined with other technologies). However much of the benefit from GSHPs is due to the technology taking advantage of the ‘fuel factor’ for electricity; this means that the calculated TER is higher than if the base case were gas heating, therefore making it easier to meet the target improvements set by the Code. The use of this fuel factor for heat pumps is being reviewed for future versions of Building Regulations[24], meaning that in future GSHPs may not be as advantageous as under current regulations.

Biomass heating and CHP

The region where the three strategic sites are located has significant woodland that is progressively being managed more effectively to maximise the potential for wood fuel production. The Biomass Energy Centre based at the Forestry Commission headquarters in Alice Holt and Thames Valley Bioenergy based in Newbury are actively working with woodland owners to develop local wood fuel supply chains in the region. Furthermore the development of the Whitehill Bordon Eco-Town in East Hampshire is likely to help further kick-start local wood fuel generation and distribution in the region. Because of these various initiatives and the high presence of woodland in areas surrounding the strategic sites, it has been assumed that sufficient local wood fuel will be readily available to allow the strategic sites to implement biomass heating or CHP.

Biomass heating is well suited for low density housing as this type of development has relatively high heating demands and most likely will have sufficient space to accommodate solid fuel storage. This technology can generally achieve Code Level 4 on its own, without need for additional renewable technologies. It is however not very well suited to non-residential buildings as these generally have high electric loads but relatively low heating loads, furthermore they often have plant room accessibility limitations. There are however some non-residential building types with high heating demands (e.g. schools, hospitals, clinics) that can be well suited to biomass heating.

Biomass CHP, as gas CHP, is best suited for large, dense, mixed developments and is the LZC technology discussed here with the highest potential for on-site CO_2 savings. It can meet the energy requirements of Code for Sustainable Homes Level 5 (100% reduction on regulated emissions) and can deliver greater savings if sized to meet the development's electrical demand – although this does mean that some of the heat generated may be wasted, if no suitable end uses for it can be found. This is due to the heat to power ratio associated with CHP engines.

7.4 USING BREEAM AND CODE FOR SUSTAINABLE HOMES

Code for Sustainable Homes and BREEAM as assessment methods are discussed in Chapter 2 of this document. It is important to remember that although the energy requirements for BREEAM and Code for Sustainable Homes assessments are very stringent and are often the limiting factor to achieving higher ratings/levels, they are not the only item covered under the assessment schemes. Other issues include:

- Water
- Materials
- Waste
- Pollution
- Health & Wellbeing
- Management
- Ecology
- Transport (BREEAM only)

In the case of the Code, in order to achieve Levels 5 and 6 there is an onerous mandatory requirement to reduce internal water consumption to 80 litres per person per day. This would involve the use of rain and grey water recycling systems, which are generally implemented on a dwelling by dwelling or block by block basis. Because of their local implementation, there are no foreseen spatial constraints associated with achieving this target in any of the three strategic sites, however there would be a financial implication. It may be possible to reduce the need for individual systems and therefore cost implications on any of the sites if a non-potable groundwater source is available and can

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

be distributed across the site for low grade uses. A water study would be required to investigate this opportunity. The evidence base for water use requirements is discussed further in Chapter 8.

Other categories do not generally have a significant spatial implication and when they do (i.e. ecology, transport), they are not mandatory and therefore if necessary they can generally be avoided by targeting other areas. This means that there are no foreseen spatial issues in any of the strategic sites that would preclude achieving Code Level 4 or BREEAM Very Good. However it is worth noting that when higher levels/ratings are being targeted, there is progressively less flexibility in losing credits in favour of others. Therefore, although achieving a high score in ecology is not compulsory in order to achieve Code Level 5, not doing so may make it very difficult to meet the overall score if, for example, the unit design means that daylighting credits cannot be achieved. These credits can be achieved in a more cost-effective manner if sustainable design is introduced in the early site planning stages.

With regards to BREEAM, the new version (2008) sets very stringent requirements for energy consumption reduction in order to achieve an Excellent rating; however in commercial buildings LZC technologies cannot often achieve the required CO_2 savings alone as internal services specifications have a far greater impact on total building CO_2 emissions. This means that the limiting factor for achieving BREEAM ratings higher than ‘Very Good’ is generally a financial one, i.e. how much money is available to specify the most efficient building services, rather than a spatial one, i.e. how much PV fits on the roof or is there enough space for a wind turbine to be installed on site. There is insufficient evidence at this stage to show the total capital cost uplift associated with delivering BREEAM 2008 targets, for this reason the introduction of a policy target requiring non-residential buildings to achieve BREEAM Excellent is not recommended until further investigation is undertaken on financial viability.

7.5 STRATEGIC SITE 1: ALDERSHOT URBAN EXTENSION (AUE)

Rushmoor BC have produced a Supplementary Planning Document for the Aldershot Urban Extension, which has been adopted in March 2009. This document[25] outlines proposals for the extension of Aldershot Town including a preliminary masterplan and indicative areas schedules.

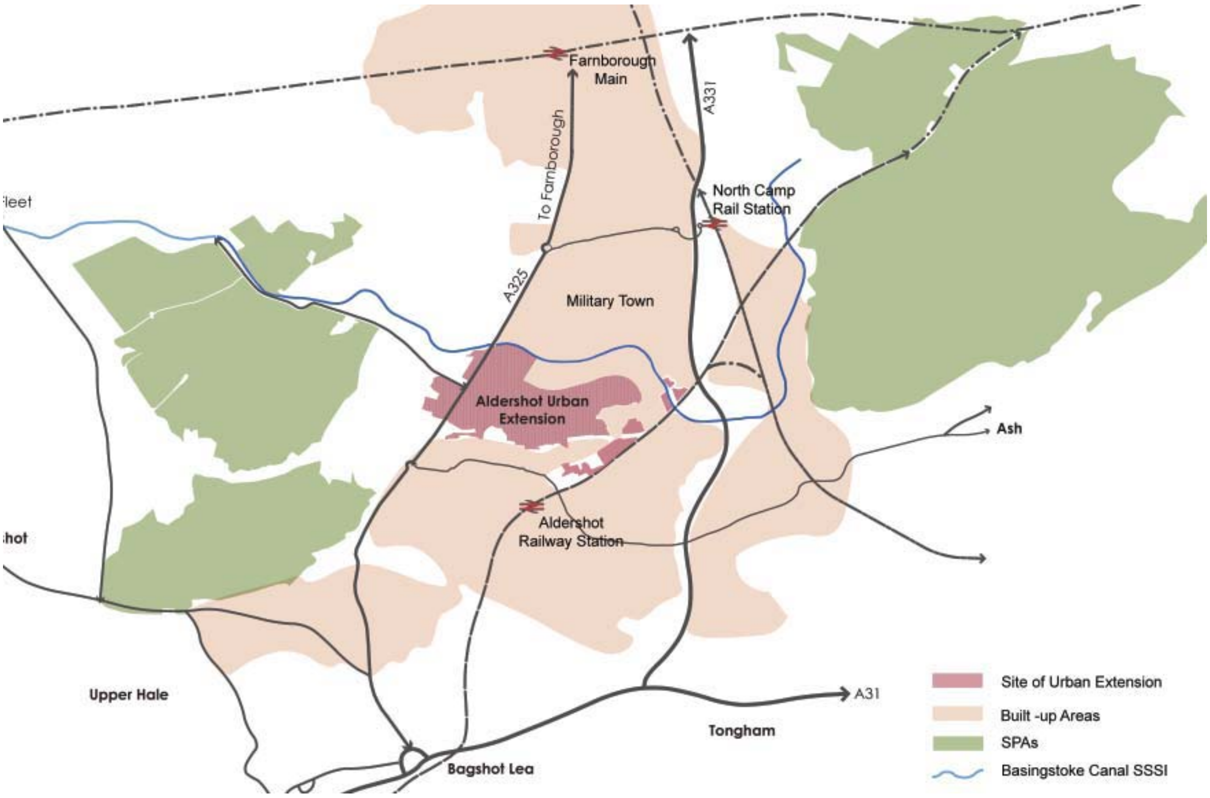


Figure 58: Aldershot Urban Extension location (ref: Aldershot Urban Extension SPD)

The figure above shows the location of the site in between Aldershot town centre and the military town. The extension is proposed to include 4,500 new homes at a density of 45-50 dwellings per hectare. The following area schedule and unit type assumptions were made when carrying out the assessment:

Table 49: Calculation assumptions

Domestic	Number of units
Houses	1,350
Flats	3,150
Non-domestic	**Floor area (m²)**
Offices	4,000
Retail	3,000
Supermarket	500
Restaurants	1,000

The Aldershot Urban Extension proposed masterplan in the figure below shows how the different land uses are expected to be distributed. The detail in terms of building areas within each of these zones and the proposed development phasing is not known at this stage, therefore energy demands have been estimated based on a number of assumptions and irrespective of development phasing.

25 http://www.rushmoor.gov.uk/index.cfm?articleid=7538

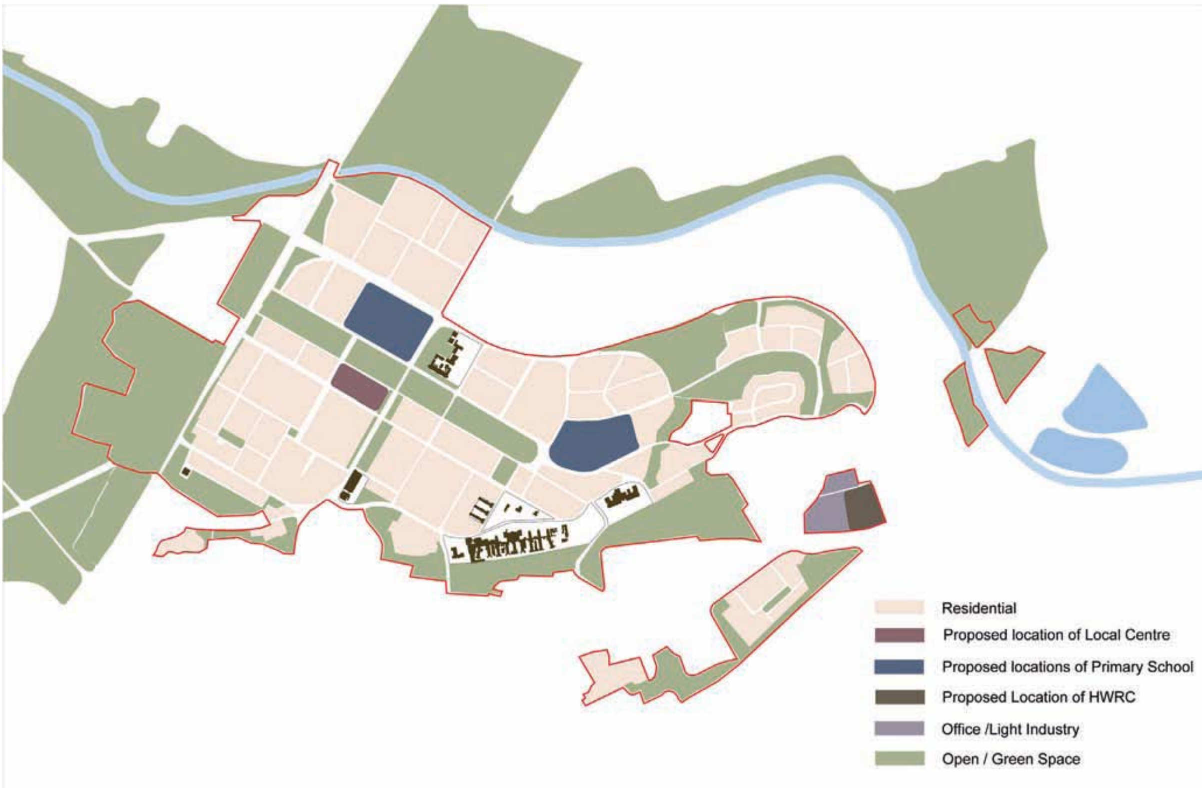


Figure 59: AUE proposed masterplan (ref: Aldershot Urban Extension SPD)

The AUE SPD currently includes the following requirements for Code for Sustainable Homes and BREEAM levels:

'The Council will expect all housing in the first phase of development to achieve a level of performance rating equivalent to BREEAM 'Very Good' or Code Level 4, with at least 10% of units achieving a level of performance equivalent to BREEAM 'Excellent', or Code Level 5 (100% improvement on 2006 Building Regulations) as per the Code for Sustainable Homes.

This will need to be supported by a commitment to achieve certification under an appropriate scheme at the detailed design stage. The standards set out in the Code for Sustainable Homes are shown below:
The Council will expect subsequent phases of development to achieve further improvement on these sustainability standards, so that by 2016 all housing will achieve Code Level 6.'

AUE predicted demands

The assumptions relating to proposed building numbers and areas were used to estimate energy demands and total CO_2 emissions for the site, which are shown below.

Table 50: AUE predicted energy demands and CO_2 emissions

	Heat demand	Electricity demand	CO_2 emissions
	MWh/year	MWh/year	tonnes CO_2/year
Domestic	24,527	13,370	10,400
Non-domestic	903	1,165	667
Communal		1,937	817
Total	25,429	16,472	11,885

These estimates have been calculated using industry standard energy benchmarks (kWh/m^2) for different non-residential building types and Part L energy models for indicative house and flat types. At this stage no allowance has been made to take account of reduced demands that may result from the introduction of minimum standards for energy efficiency through future versions of Part L of the Building Regulations.

Opportunities and constraints for low and zero carbon technologies

Enhanced energy efficiency - improved fabric and services specifications

Preliminary calculations suggest that advanced efficiency building standards for housing have the potential to save 12% of the predicted AUE CO_2 emissions. Modelling on various unit types suggests that it may be possible to achieve a 25% reduction on TER (Target Emission Rate) (minimum requirement for Code Level 3) with energy efficiency alone, however this is unlikely to be a cost effective option. Higher levels of the Code cannot be achieved by energy efficiency alone.

Non-residential buildings would also benefit from the specification of efficient building fabric and services, the extent of CO_2 savings across the site in this case would be limited due to the low proportion of non-residential uses relative to housing.

Gas fired Combined Heat and Power (CHP)

The masterplan outlined in the AUE SPD proposes a density of development which is deemed too low to make a district heating system viable, therefore the use of gas CHP is considered unviable for the whole site.

Increasing the density of development in part of the site where the non-residential uses are concentrated (i.e. the Local Centre) has the potential to make a district network served by gas CHP for at least part of the site viable.

Preliminary calculations suggest that, if all of the site could be of a high enough density to be served by gas CHP, the predicted CO_2 emissions could be reduced by 17%. Gas fired CHP with advanced efficiency building fabric typically delivers the 44% CO_2 savings required to meet Code Level 4, however it is not sufficient to meet higher Levels, even if combined with PV.

Solar Water Heating (SWH)

Good design should mean that there are no constraints to the use of SWH as it should be possible to design roofs to accommodate the panels and the internal layout of flats and houses should be designed to accommodate sufficient hot water storage.

Preliminary calculations suggest that, if a solar water heating system could be accommodated on all houses and flats, the total AUE CO_2 emissions could be reduced by 7%. SWH alone is not sufficient to meet the energy requirements of Level 3 of the Code. A small proportion of unit types could reach Level 3 with a combination of energy efficiency and SWH, however higher levels of the Code would not be achievable with this strategy.

Wind Turbines

The urban location of the AUE site means that there are no suitable locations on or near the site for one or more large scale wind turbines, however the playing fields just north of the canal could potentially be used for the installation of a medium-scale turbine that could be connected directly to the AUE site.

Preliminary calculations suggest that one 850kW turbine (approximately 44m to 50m hub height, 52m rotor diameter) could reduce predicted site CO_2 emissions by 10%. The Level of the Code that can be achieved by this installation is dependent on the number of units served. This wind turbine is not sufficient to meet Code Level 3 or above for all units therefore it could be connected to only a small number of units on site, in order to allow them to reach the required rating. If Level 5 is required, a smaller number of units can be connected than if Level 4 is being targeted. The exact number of units that could be served by the turbine cannot be ascertained until more information is available on the development layout and area schedule.

Adding the maximum amount of photovoltaics on the roofs in combination with the wind turbine would extend the number of units that could achieve Level 5, however this is dependent on the roof area availability and layout of the individual unit types.

It should be noted that the MoD ownership of the land in question and the proximity of a small airport to the north of the site could preclude the installation of a wind turbine near the AUE site. Any issues may be able to be resolved but will require detailed investigation and the usual issues relating to wind turbine installation (e.g. noise, buffer zones etc.) would still have to be addressed before this option is taken forward.

Photovoltaics (PV)

Preliminary calculations suggest that, if PV panels were installed on all available roofs, AUE CO_2 emissions could be reduced by approximately 30%. PV has the potential to achieve Code Level 3 and possibly Level 4 (with advanced energy efficiency), depending on the amount of suitable roof area available. Even in a medium density development it is highly unlikely that sufficient roof space could be provided to achieve Level 5 with energy efficiency and PV alone.

Ground Source Heating (GSHP)

Preliminary calculations suggest that installing GSHPs to all houses and commercial buildings could save 3% of the predicted AUE CO_2 emissions. The use of GSHPs makes it possible to reach Code Level 3 but to reach Level 4 PV would also be required. GSHPs meet the heating demand therefore can only successfully be coupled with PV or wind as all other LZC technologies also provide heating. Air source heat pumps could be used as an alternative and would have similar effects.

Biomass heating and CHP

The relatively medium density of development means that a district heating network across the site would not be financially viable, however individual biomass boilers could be installed to supply houses and communal systems could be installed in blocks of flats. The medium density of development means that it should not be a problem to accommodate solid fuel storage on site and it should be possible to design the roads to accommodate wood fuel delivery vehicles. Commercial buildings could also be served by biomass heating systems, provided that they have a sufficient heating and hot water demand to grant the installation. Generally commercial buildings have a higher electricity demand than heat demand, therefore tend to be better suited to CHP.

Preliminary calculations suggest that installing individual biomass boilers to all houses and communal systems to block of flats would reduce the predicted site CO_2 emissions by 29%. Biomass boilers alone typically are sufficient to meet the energy requirements for Level 4 of the Code. Adding a PV installation is possible, however it is very unlikely that there would be sufficient roof space to install enough PV to reach Level 5.

Summary - Opportunities and constraints for low and zero carbon technologies

In this study we have considered two deliver scenarios – one where the current proposed density of development is delivered, and one where the density of development (at least in part) is increased to trigger viability of combined heat and power. The higher density scenario considers a density of 55 dwellings/hectare – this level of density could have implications for layout and housetype mix. The two scenarios demonstrate the effect that planning and urban design can have on CO_2 reduction delivery.

Table 51: Current Density Scenario

Current density scenario (market driven) Estimated CO_2 emissions: 12,000 tonnes CO_2/year
Opportunities: Advanced building specs – save 12% CO_2 emissions 850kW wind turbine in fields north of the canal (44m or 74m hub height, 52m rotor diameter) – save 10% Solar water heating on houses and flats – save 7% PV on roofs everywhere – save 30% GSHP for houses (individual) and commercial – save 3% Biomass boilers (individual) for houses – save 11% Communal biomass boilers for flats – save 18%
Constraints: Wind may well not be an option due to the proximity of the MoD and airport to the north of the site. There may be issues with RADAR interference. The medium density of development makes district heating unviable, limiting the potential for achieving high levels of the Code.
Achieving energy standards for Level 4
Options: • PV and advanced efficiency • Biomass boilers (individual for houses, communal for flats)
Achieving energy standards for Level 5
Options: • Unviable for whole site, could possibly be achieved for some units • Would need biomass boilers (individual for houses, communal for flats) + substantial PV on roofs and elsewhere • Wind turbine connected to some units could achieve Level 5
Achieving energy standards for Level 6
Options: • None

Increasing the density of development in at least part of the site would make district heating viable, therefore allowing higher levels of the Code to be reached. A higher density mix of house types also lowers overall energy demand. The summary table below shows how opportunities and constraints would change assuming a higher density of development.

Table 52: High Density Scenario

High density scenario (CHP driven) Estimated CO_2 emissions: 11,500 tonnes CO_2/year
Opportunities: Advanced building specs – save 10% CO_2 emissions 850kW wind turbine in fields north of the canal – save 11% Solar water heating on houses and flats – save 7% Gas CHP across site – save 17% PV on roofs everywhere – save 22% GSHP for houses (individual) and commercial – save 2% Communal biomass across site – save 27%
Achieving energy standards for Level 4
Options: • Advanced efficiency and gas CHP • Gas CHP and PV • Biomass boilers (individual for houses, communal for flats or communal across the site)
Achieving energy standards for Level 5
Options: • Biomass boilers (individual for houses, communal for flats) + PV (more than there is roof area) • Biomass CHP
Achieving energy standards for Level 6
Options: • Advanced efficiency + Biomass CHP + possibly PV (depending on sizing of biomass CHP)

With the density as proposed the development can achieve the proposed target of Code Level 4, with perhaps some units reaching Code Level 5, however it would not be viable to target a higher Code level across the site.

The proposal outlined in the SPD for 10% of units to achieve Level 5 may be achievable, depending on how the detailed masterplan is developed. The target will only be achievable if 10% of the development has a low enough density to accommodate extensive PV. The units would have to achieve the Level 5 requirement of 100% reduction in regulated emissions with advanced energy efficiency, biomass heating and PV on the roof. Alternatively, if a medium-scale wind turbine is sited on or near the site it could serve some units to achieve Level 5.

Level 6 cannot be achieved with the current density proposed. The development would have to be dense enough to allow the installation of district heating and CHP.

BREEAM and other sustainability standards

There are no spatial constraints that would preclude non-residential buildings on the AUE site to achieve the targeted BREEAM Very Good rating or higher. As previously mentioned, there is insufficient evidence at this stage to suggest that requiring an Excellent rating would be financially viable, therefore setting a higher BREEAM standard for the AUE site is not recommended at this stage.

At this stage there are no foreseen spatial constraints associated with other sustainability issues that could preclude higher levels of the Code or BREEAM ratings from being achieved.

Policy recommendations

The AUE SPD currently proposes Code for Sustainable Homes and BREEAM requirements. This study has outlined opportunities and constraints concerning delivery of energy-related CO_2 targets on the site, according to the masterplan proposed. As a result, the following recommendations can be made for consideration by the Council in further development of the SPD and site requirements:

- Maintain the proposed policy requirement to achieve Level 4 of the Code for Sustainable Homes and set a requirement for a small proportion of the development to achieve Level 5. The proportion required to achieve Level 5 should be tested for viability once a more detailed masterplan is developed. Three options can be pursued: either developing the proportion to meet Level 5 at such low density that sufficient PV can be installed on the roof to meet the requirement, installing a medium-scale wind turbine, or developing it at high enough density and in proximity of mixed uses in order to make district heating and CHP viable.
- The fields to the north of the development site present an opportunity for the installation of a medium wind turbine. A policy could be introduced to force the detailed investigation of the feasibility of such an option. Alternatively an indirect approach may be to develop a masterplan where the units required to achieve Code Level 5 are in the proximity of the wind opportunity area. With this approach it is likely that developers will investigate the viability of wind as an option to achieve Level 5, as this may be cheaper than on site solutions.
- Maintain the proposed policy requirement for all non-residential buildings to achieve a BREEAM Very Good. Requirements for BREEAM Excellent should be investigated in terms of financial feasibility.
- The requirement to meet Code for Sustainable Homes Level 6 by 2016 should be reviewed. Code Level 6 will be very difficult to achieve under current density proposals. It is expected that Building Regulations will require new development to be 'zero carbon' after 2016, but it is important to distinguish that the definition of zero carbon proposed under building regulations differs to that currently included in the Code for Sustainable Homes (which requires CO_2 reductions to all be achieved within the site boundary). Assuming that zero carbon requirements will come through Building Regulations, this requirement could be removed, and achievement of other sustainable construction aspects can be enforced through LPA-wide application of Code for Sustainable Homes Level 4.

7.6 STRATEGIC SITE 2: BASING VIEW

Basingstoke and Deane BC are proposing to regenerate part of Basingstoke town centre, including the Basing View site limited to the north by the railway line and to the east by the Ringway and located slightly to the east of the railway station. A masterplan has not been produced yet, however in September 2008 the Borough Council produced a design code for the site which was published for consultation. The Design Code gives preliminary guidance on the density and type of development proposed, which was used to estimate likely energy demands and test the potential for CO_2 savings.

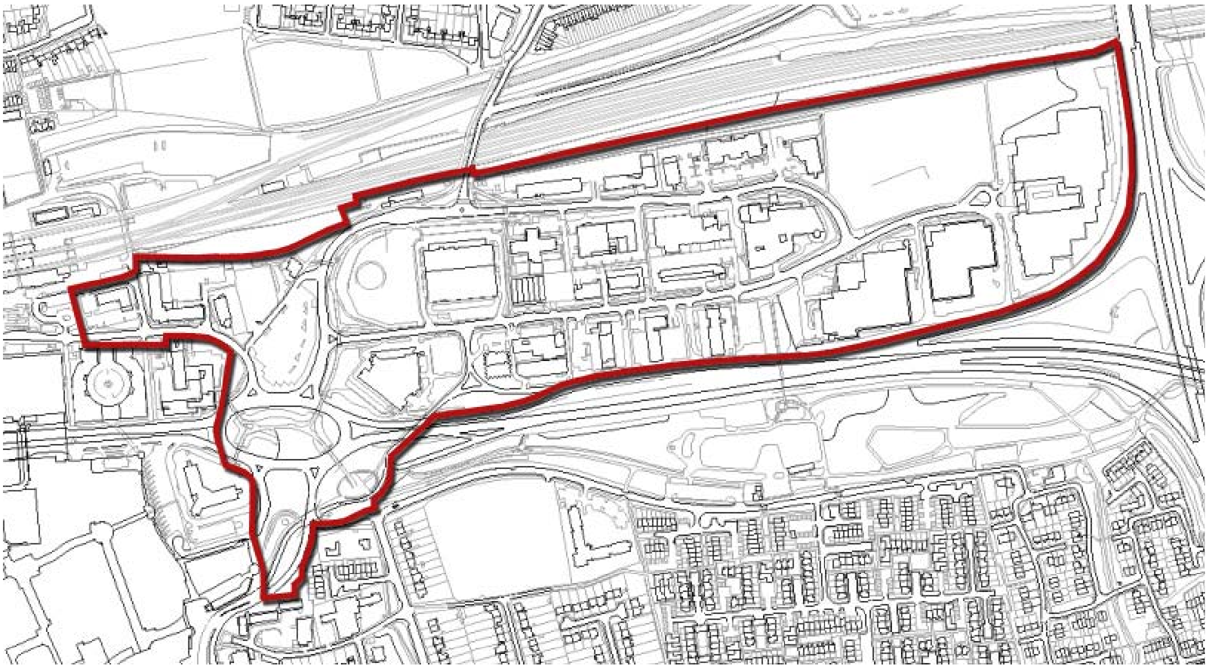


Figure 60: Basing View location (ref: Basing View Design Code consultation)

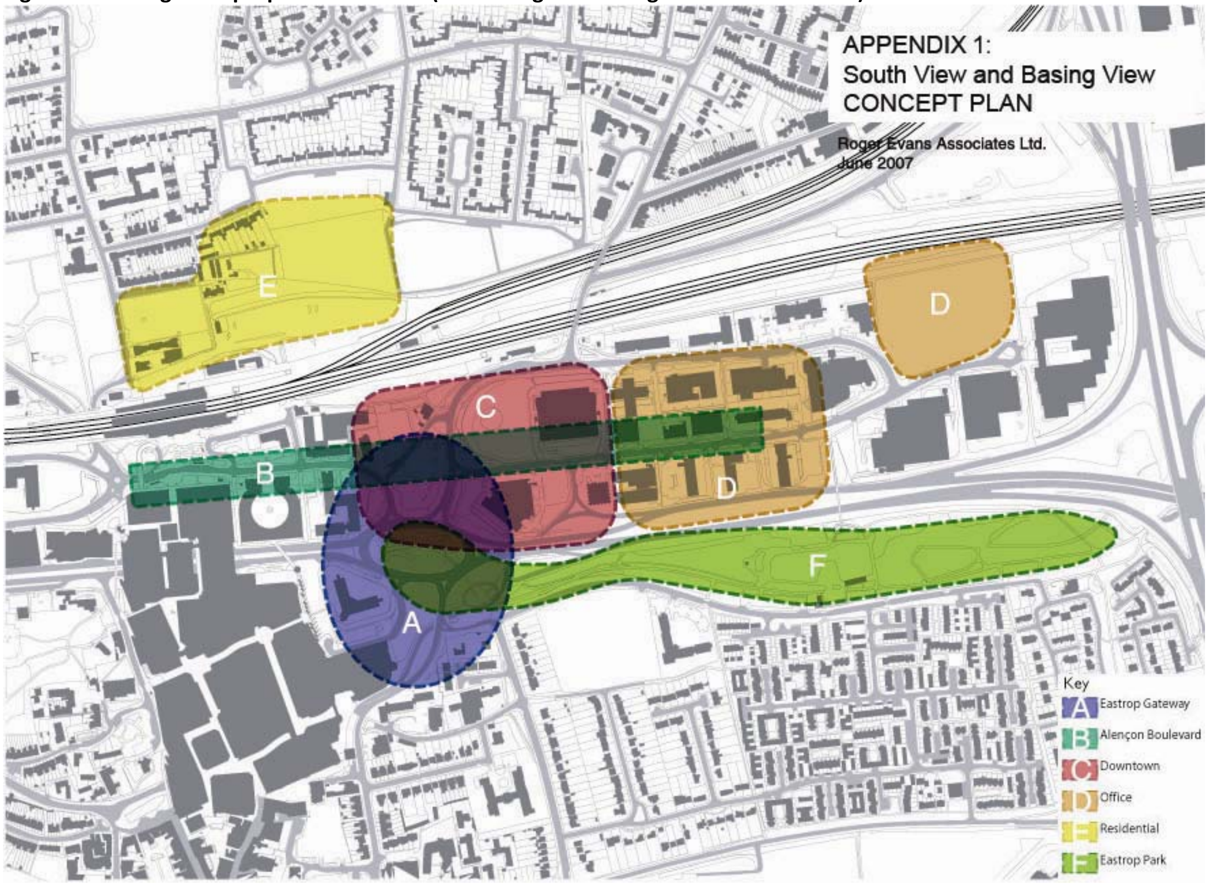
The figure above shows the location of the site south of the railway and east of the Ringway. The Basing View site is proposed to consist only of non-residential building uses with a total floor area of 70,000m^2 (in addition to what is already built). A split of uses was not given in the Design Code therefore the following indicative area schedule was assumed when carrying out the assessment:

Table 53: Calculation assumptions

Domestic	Number of units
Houses	0
Flats	0
Non-domestic	**Floor area (m²)**
Offices	25,000
Retail	10,000
Hotel	15,000
Restaurants	10,000
Leisure	10,000

The figure below gives an indication of what different building uses are proposed for the site. The detail in terms of building areas within each of these zones and the proposed development phasing is not known at this stage, therefore energy demands have been estimated based on assumptions and irrespective of phasing.

Figure 61: Basing View proposed land uses (ref: Basing View Design Code consultation)



Basing View predicted demands

The assumptions relating to the proposed building numbers and areas were used to estimate energy demands and total CO_2 emissions for the site.

Table 54: Basing View predicted energy demands and CO_2 emissions

	Heat demand	Electricity demand	CO_2 emissions
	MWh/year	MWh/year	tonnes CO_2/year
Domestic	0	0	0
Non-domestic	16,050	8,100	6,532
Total	16,050	8,100	6,532

At this stage no allowance has been made to take account of reduced demands that may result from the introduction of minimum standards for energy efficiency through future versions of Part L of the Building Regulations.

Opportunities and constraints for low and zero carbon technologies

Enhanced energy efficiency - improved fabric and services specifications

Due to the limited information available on building types proposed for Basing View it was not possible at this stage to predict the extent of CO_2 savings achievable by improving energy efficiency across the site. Previous experience would suggest that total CO_2 emissions could be reduced by 5-10% with relatively low additional cost. Considerably higher savings can be achieved by careful specification of building services however these cannot be quantified without modelling specific building types.

Gas fired Combined Heat and Power (CHP)

The mixed use nature of the Basing View development presents a good opportunity for the use of gas CHP as the energy demand profiles are expected to be reasonably stable throughout the year. The high density of development and location in the town centre also presents a good opportunity for installing a district heating system to serve the Basing View development and potentially be extended into the wider town centre in the future. The heat demand map in chapter 4 shows high heat demand intensity in the area surrounding Basing View, so this is a prime opportunity to drive delivery of low carbon infrastructure.

The presence of dense development with high heat demands directly to the south of the railway station presents a very good opportunity for extension of the district heating system and Churchill Way, which runs along the bottom of the Basing View site towards the town centre, presents an easy connection route. It is in fact likely that many utilities already run along that route, therefore retrofitting a district heating pipeline should be easier than having to go through a developed area.

The presence of the railway and Ringway to the north and east of the site however could prove a constraint to the extension of the district heating network in other directions towards the industrial estates to the north west and north east of Basingstoke town centre. The constraint is mainly a financial one as it is possible to cross a railway line or major road with a district heating main, but it is a costly and bureaucratic process.

Preliminary calculations suggest that serving the whole site via gas CHP with district heating could reduce predicted site CO_2 emissions by 20%. Although the use of gas CHP would achieve some credits under the energy section of BREEAM, it would not be sufficient alone to provide sufficient CO_2 savings to meet the minimum energy requirements for an Excellent rating.

Solar Water Heating (SWH)

As previously mentioned solar water heating is generally more suited for residential installations and, as the Basing View development does not include any residential buildings, SWH has not been considered in detail at this stage.

It is worth noting that if a hotel is to be part of the proposals for Basing View, SWH could prove to be a valuable technology to reduce the CO_2 emissions of the building and therefore may be worth considering at a later stage. Even with the presence of a hotel, the overall contribution to CO_2 savings from SWH across the whole Basing View site would be limited and unlikely to be worth pursuing as SWH would be competing with a site wide approach powered by CHP.

Wind Turbines

The urban location of the Basing View site means that there are no suitable locations on or near the site for one or more large scale wind turbines. Any large scale wind installations off site are unlikely to be of use to allow building on site to achieve high BREEAM ratings as the turbine would have to be directly connected to the building and it would be necessary to prove that the installation is “additional” (i.e. would not have taken place were it not for the development it is connected to) and suitably regulated.

Photovoltaics (PV)

Non-residential buildings are well suited for PV installation as they often have large roof areas and good design can maximise the area suitable for PV installation. Furthermore, depending on the building design, it may even be advantageous to install panels on facades. This provides a double benefit as it saves the cost of standard facade cladding materials and provides electricity generation capacity at the same time.

Preliminary calculations suggest that installing PV on all available roofs could reduce site CO_2 emissions by 8%. Using all south facing facades could potentially reduce emissions by a further 5%. PV would provide a useful contribution to achieving credits in the energy section of BREEAM, however it would not be sufficient to meet the minimum requirements for BREEAM Excellent unless combined with a variety of energy efficiency improvements.

Ground Source Heating (GSHP)

Due to the high density proposed for the site, if a communal GSHP system were to be considered for the Basing View site, the main constraint is likely to be the amount of energy that can be extracted from the ground or groundwater on site. A detailed study would be required to assess whether the local resource is sufficient to serve the whole site or only part of it.

Preliminary calculations suggest that installing a communal GSHP system to all commercial buildings could save 10% of the predicted Basing View CO_2 emissions. Integrating ground source cooling would increase CO_2 savings and make the installation more cost effective.

Biomass heating and CHP

As previously mentioned, the mixed use nature of the Basing View site is well suited for the use of combined heat and power, therefore biomass CHP would be recommended over biomass heating only. Although the site is located in an urban location, the proximity to the railway line and the Ringway presents a great opportunity for the use of biomass fuel instead of gas. The good transport links will make it very easy to deliver solid fuel to the site without significantly affecting the masterplan layout.

The system can be designed to generate sufficient electricity to meet the zero carbon definition, however this approach means that heat is generated in excess due to the heat to power ratio of biomass CHP systems. The best approach would then be to use this excess heat to serve existing buildings rather than waste it by releasing it into the atmosphere.

Summary - Opportunities and constraints for low and zero carbon technologies

Table 55: Current density scenario

Current density scenario Estimated CO_2 emissions: 6,500 tonnes CO_2/year
Opportunities: Gas CHP with district heating – save 20% CO_2 emissions PV on roofs everywhere – save 8% PV on south facing facades – save possibly 5% GSHP communal system – save 10%, more if including cooling Biomass CHP – 100% if required
Constraints: The site is high density so there is no opportunity for large-scale wind. A 15kW wind turbine could possibly be located in the field to the north east of the site but this area is currently earmarked for office space. The turbine would only save 0.02% of the site's CO_2 so has very low potential. A requirement to retain some of the existing buildings would make it harder, but possible, to install a district heating network. The site is defined to the north by the railway line and to the east by the Ringway, these are major constraints that would affect the potential to extend the district network to serve the commercial buildings on the eastern side of the Ringway and north of the railway.

Redevelopment of Basing View is a great opportunity to install a district heating network with potential for extension to the commercial area to the south west of the site (just south of the railway station), which currently has a very high heat density. Extension to this area is likely to be viable as Churchill Way provides a good route to extend the pipework without major disruption to existing utilities and services.

Considering the wider Basingstoke area, extending the district heating system to the large commercial area in the north eastern corner of the circle drawn by the Ringway would present a high CO_2 saving potential. This is because of the presence of an industrial estate with high heat density and the proximity to North Hampshire Hospital, which is a good anchor load for CHP. However this area is a long way from the Basing View site and it is separated from it by the railway line and medium density development, therefore a connection of the two sites is unlikely to be financially viable.

The industrial estates in the south of the circle defined by the Ringway (i.e. around Winchester Road) also present a great opportunity for retrofitting a district heating network. This area presents a greater opportunity as it would be easier to extend a district network started in Basing View, via the town centre, and then south towards Winchester Road, rather than crossing the railway to the north. Unfortunately housing to the south of the site and to the south and east of Basingstoke town centre is mostly medium density, meaning that the potential for extending the network to serve housing is relatively low.

The proximity of major roads and the railway means that the CHP connected to the district heating network could potentially be served by biomass in the long term, without major impact on the town or the masterplan design. This means that it would be possible to achieve zero carbon on site.

BREEAM and other sustainability targets

The location of the Basing View site is advantageous for the few credits that relate to issues external to the building. The proximity to the railway station and town centre means that the transport credits should be easily achievable; furthermore the fact that the site is likely to be currently of low ecological value means that a number of credits can probably easily be achieved for improving its ecological value.

The high potential for the use of CHP and district heating also means that there is also opportunity for the buildings at Basing View to achieve a high number of credits in the energy section.

The combination of these site characteristics means that it may be financially viable to target an 'Excellent' rating.

Policy recommendations

Based on the analysis undertaken in this study, the following recommendations can be made:

- Maintain the proposed policy requirement for all non-residential buildings to achieve a BREEAM Very Good.
- If a cost assessment specific to the Basing View site shows that achieving a BREEAM Excellent is economically viable, this should be required by policy. If the cost assessment shows that BREEAM Excellent across the site is not viable, it may still be possible to set a policy requirement for a proportion of buildings on the site to meet the higher standard.
- Set a policy requirement for the feasibility of district heating and CHP (biomass and gas) to be thoroughly investigated, including the potential delivery mechanisms that could manage a system at Basing View but also extend the network to the town centre in future.
- An energy strategy, including phasing requirements, should be developed for the entire site and surrounding area. This will guide the development of low carbon infrastructure in a coordinated way, and ensure that individual developments on the site can be taken forward in a carbon and cost-efficient manner.
- There is an opportunity for Basingstoke and Deane Borough Council to lead the integration of a district heating system (powered by CHP or otherwise) to serve the Basing View site and surroundings. The Council could lead the process, functioning as an energy company, or partner or engage an Energy Services Company (ESCo). Opportunities for delivery are discussed in Chapter 5.

7.7 STRATEGIC SITE 3: QUEEN ELIZABETH II BARRACKS (QEB)

Hart DC have highlighted the Queen Elizabeth II Barracks site in Church Crookham as a priority area for redevelopment in their Local Plan (Replacement) adopted in December 2002. This document[26] outlines what the Council expects from proposals for the redevelopment of the site. A planning appeal for the site was dismissed in July 2008. Some information provided in the planning submission and the guidelines within the Local Plan were used to make assumptions on building uses and number of units likely to be developed on site.

Figure 62: Queen Elizabeth Barracks site location (ref: QEB Planning application documents Feb 2007)

The figure above shows the location of the site to the south of Church Crookham, near Fleet. The extension is proposed to include approximately 1,000 new homes at an average density of 40 dwellings per hectare; some non-residential uses are also proposed including a health clinic and a school. The following area schedule and unit type assumptions were made when carrying out the assessment:

Table 56: Calculation assumptions

Domestic	Number of units
Houses	916
Flats	100
Non-domestic	**Floor area (m²)**
Offices	1,000
Retail	1,000
Clinic	1,000
School	1,500

It should be noted that the modelled scenario above is indicative of the types and scales of development likely to come forward on the site. An energy strategy alongside a planning application would still need to be developed to test targets and make clear proposals for carbon reductions.

The site is constrained by a significant area of woodland that has to be retained for its biodiversity and amenity value, meaning that built development has to take place away from these areas. The masterplan proposed as part of the appeal (given in the figure below) is a good illustration of this. For this strategic site even less information than the other two sites is currently available on what building types are actually going to be developed, therefore the results

[26] http://localplan.hart.gov.uk/lp.htm

are very dependent on the assumptions made. As for the previous sites, the assessment is irrespective of development phasing.

Figure 63: Queen Elizabeth Barracks proposed masterplan (ref: QEB Planning appeal documents Feb 2007)

QEB predicted demands

The assumptions relating to the proposed building numbers and areas were used to estimate energy demands and total CO_2 emissions for the site, which are shown in the table below.

Table 57: QEB predicted energy demands and CO_2 emissions

	Heat demand	Electricity demand	CO_2 emissions
	MWh/year	MWh/year	tonnes CO_2/year
Domestic	6,844	3,560	2,830
Non-domestic	545	390	270
Communal		8	3
Total	7,389	3,958	3,104

The same benchmarks and assumptions were used as for previous strategic sites.

Opportunities and constraints for low and zero carbon technologies

Enhanced energy efficiency - improved fabric and services specifications

The density of development expected would mean that building fabric improvements can have a considerable positive impact as houses have higher surfaces exposed to the elements that would benefit from improved heat retention.

Preliminary calculations suggest that advanced efficiency building standards for housing have the potential to save 13% of the predicted QEB CO_2 emissions.

Gas fired Combined Heat and Power (CHP)

The financial viability of CHP is dependent on the intensity of heat demand, as cost escalates where extensive lengths of heat networks have to be laid. The QEB is proposed to consist of a type of housing and an amount of non-residential uses that is likely to result in relatively low density energy demand, therefore may not provide a consistent anchor load throughout the year. At this stage, it is expected that the QEB site will have an average density of 40 dwellings/ha, and within this study it is assumed this density will be fairly even across the site. However, CHP may become a more favourable option if masterplanning of the site can create a denser 'core' centred around the non-domestic uses. In this case, the heat densities may be such that a CHP network could be provided to service the higher density portion of the site (and expand out in future if viable). Furthermore the location of the site in a low energy demand density area means that the potential for extending a district heating network outside the QEB site is low. At this stage, the site is not deemed favourable for the use of CHP and district heating unless masterplanning can create a denser core area where heat loads become suitable.

Solar Water Heating (SWH)

The density of housing proposed for this site makes it an ideal candidate for site wide installation of solar water heating as it should be possible to design most homes with a suitably oriented roof and sufficient internal space (i.e. airing cupboard) to accommodate a SWH system. However as previously mentioned, SWH has a limited potential to help achieve high levels of the Code for Sustainable Homes.

Preliminary calculations suggest that, if a solar water heating system could be accommodated on all houses and flats, the total QEB CO_2 emissions could be reduced by 9%.

Wind Turbines

The suburban location of the QEB site means that it is within the exclusion zone for large scale wind turbines. The density of development proposed however means that It may be possible to locate a number of small to medium-scale ground mounted wind turbines in the open spaces dotted throughout the development (e.g. on the edge of playing fields, by playgrounds, at the end of large gardens). A masterplan could be developed to take this into account therefore ensuring that the space available is used effectively to improve the public realm but also facilitate the integration of small to medium-scale ground mounted wind turbines.

Small to medium-scale wind turbines may have a limited CO_2 reduction potential for the site as a whole, however they would allow at least a small proportion of units to achieve higher standards of the Code than is achievable in the rest of the site.

Preliminary calculations suggest that installing 10 6kW wind turbines within the site could save 0.2% of the predicted CO_2 emissions; however connecting a turbine directly to one or two houses could provide a necessary contribution to allow these units to achieve even Level 6 of the Code. A preliminary assessment suggests that certain types of houses could reach Code Level 6 by a combination of: energy efficient fabric, biomass heating, PV on the roof and one or part of a small wind turbine. A 6kW turbine alone connected to a house may be sufficient to meet the requirements for Code Level 3 (depending on unit type), but would not be sufficient to meet higher levels without contributions from other interventions.

It should be noted that the assumption made here that 10 6kW turbines could be installed on site is an arbitrary one. The number and size of turbines that could be integrated successfully is totally dependent on the masterplan layout and could probably be increased if the issue is taken into account from a very early design stage.

Developers of the site may wish to seek opportunities to install a large-scale opportunity near the site. As shown in the new development analysis in Chapter 5, the QEB site is located adjacent to areas of rural open space where large-scale wind may be viable. The site could invest in an off-site wind turbine and connect it to the site directly by private wire to reach higher carbon reduction targets. An off-site wind turbine may also be deliverable through 'Allowable Solutions' depending on the limitations imposed under emerging government guidance.

Photovoltaics (PV)

As is the case for SWH, the density of the development makes it well suited for the integration of PV as it should be possible to design most buildings to have a large, suitably oriented roof area.

Preliminary calculations show that installing PV on all buildings has the potential to reduce the site's CO_2 emissions by 29%. As previously mentioned, PV has the potential to achieve Code Level 3 and possibly Level 4 (with advanced energy efficiency), depending on the amount of suitable roof area available. Even in a low density development it is highly unlikely that sufficient roof space could be provided to achieve Level 5 with energy efficiency and PV alone, but it may be possible for some dwelling types. Although a dwelling will most likely never have sufficient roof area to achieve Level 6 with PV alone, PV will still be required in combination with other technologies (e.g. wind and biomass) to allow Level 6 to be reached.

Ground Source Heating (GSHP)

Because of the limited amount of non-residential buildings proposed for the QEB, the site does not present great opportunities for the use of this technology. Installation of individual systems to houses is possible but other LZC technologies can generally provide more cost effective solutions to achieving CO_2 savings.

Preliminary calculations suggest that installing GSHPs to all houses and non-residential buildings could save 9% of the predicted QEB CO_2 emissions.

Biomass heating and CHP

As is the case for gas CHP, feasibility of biomass CHP may be restricted due to the density and lack of anchor loads at the QEB site, however the density and high proportion of housing is advantageous for the use of biomass heating only.

Large units with external space are well suited for the use of individual biomass boilers, which have high CO_2 saving potential but have considerable space requirements (for the boiler and fuel store). Non-residential uses such as schools and clinics are also well suited to biomass heat as they have a high space heating demand unlike offices, which generally require more cooling than heating.

Preliminary calculations suggest that installing individual biomass boilers to all houses and communal systems to block of flats would reduce the predicted site CO_2 emissions by 30%. Further savings could be achieved by using biomass also in the school and clinic. As previously mentioned biomass boilers alone typically are sufficient to meet the energy requirements for Level 4 of the Code. Depending on the units type, adding PV may be sufficient to reach Level 5.

Summary - Opportunities and constraints for low and zero carbon technologies

Table 58: QEBII predicted energy demands and CO_2 emissions

Current density scenario Estimated CO_2 emissions: 3,100 tonnes CO_2/year
Opportunities: Advanced building specs – save 13% CO_2 emissions Solar water heating on houses and flats – save 9% PV everywhere – save 29% GSHP for houses (individual) and commercial – save 9% Biomass boilers individual for houses and communal for blocks of flats – save 30% A number of 6kW wind turbines (hub height 9m or 15m, rotor diameter 5.5m) could be installed in suitable open spaces (e.g. by playing fields; needs to be 30-50m away from buildings). Assuming 10 6kW turbines can fit – save 0.2%
Constraints: The density of development makes district heating unfavourable, limiting the potential for achieving high levels of the Code. Masterplanning could explore layout to determine whether a portion of the site could be served by a district heating and CHP system.
Achieving energy standards for Level 4
Options: • PV and advanced efficiency • Biomass boilers (individual for houses, communal for flats) • CHP and district heating for a higher density 'core' area if viable
Achieving energy standards for Level 5
Options: • Advanced efficiency + biomass boiler + PV for small units with good roof area only • CHP and district heating for a higher density 'core' area if viable
Achieving energy standards for Level 6
Options: Houses in lower density areas could achieve it by: • Advanced efficiency + biomass heating + PV + half the output from 6kW turbine (i.e. sharing one turbine with another house) • Connection to one or more large-scale wind turbines off-site could enable the whole site to reach Code

Level 6, but this hinges on viability of off-site delivery. A higher density mixed use core could: • Possibly install biomass-fired CHP and district heating

Development on the site is proposed to be of a density which is in keeping with the surrounding area and will meet the southeast target density of 40 dwellings/hectare overall. However, as QEB is a mixed use development, masterplanning options may create a higher density mixed use 'core' where there may be an intensity of heat demand that would make district heating and CHP financially viable. Viability would have to be further tested alongside the masterplanning process.

Code Level 4 required by the District wide policy after 2013 in Chapter 5 can be achieved across the site at the current proposed average density. Code Level 5 and Level 6 will only be achievable on certain unit types, depending on the roof area available for PV and external space available for small scale wind turbines. This means that there are no spatial constraints to stop Hart DC from setting a target for a small proportion of the development to achieve Level 5 or 6 of the Code, however in order to assess what a suitable proportion might be further testing will be required once a draft masterplan is developed. If a district heating and CHP system is found to be viable in the masterplanning process, higher Code levels may be possible in the areas served by that system.

Level 6 cannot be achieved across the site with the current proposed density. For the whole site to meet Level 6 the density should either be high enough to make district heating viable, or direct connection to one or more large scale wind turbines off site would have to be arranged.

There are no foreseen obstacles to dwellings at QEB achieving the required water standards for achieving Level 5 and 6 of the Code, as there should be sufficient space to accommodate rainwater and greywater recycling. The only constraints would be financial.

BREEAM and other sustainability targets

There are no spatial issues relating to QEB that would preclude non-residential buildings on site from achieving a BREEAM 'Very Good' rating. However the lack of frequent public transport links and the fact that the site is currently it may be impossible for some buildings to achieve a rating higher than 'Very Good'. Because of this it is not recommended to require higher BREEAM standards at QEB. However, the council could require testing of feasibility of key buildings to reach BREEAM 'excellent'.

There are also no obstacles expected in achieving good scores in all other areas except the ecology section. There may be issues here as the current nature of the site may mean that some features of ecological value will have to be removed to make space for development. Even if the overall ecological value of the site is improved by introducing new features elsewhere, there could still be some loss of credits because some existing features are removed. Not achieving all credits in the ecology section does not preclude achieving high Levels of the Code or BREEAM ratings as they are not mandatory credits, however it would make achieving high ratings/levels a less flexible and most likely a more costly process.

Policy recommendations

- Maintain the proposed policy requirement to achieve Code Level 3 up to 2013 and Level 4 of the Code for Sustainable Homes after 2013.
- Alongside the masterplanning process, the feasibility of the integration of CHP and district heating to service a higher density core of development should be investigated. The investigation of district heating should be strongly encouraged, and masterplanning arrangements should be supported that enable the viability of such systems without adversely affecting other design criteria.
- Set a requirement for a small proportion of the development to achieve Level 5. The proportion required to achieve Level 5 should be tested for viability once a detailed masterplan is developed. A proportion of

development will have to be of low enough density to allow homes to accommodate sufficient PV and small scale wind capacity to achieve the required 100% reduction in regulated CO_2 emissions.

- An energy strategy should be completed for the site which will determine the type and phasing of technologies for inclusion.
- The feasibility of installation of a large-scale wind turbine off-site to contribute to the site's carbon reductions (either through private wire connection or through 'allowable solutions' if applicable) should be investigated by the developer. If feasible, this should be encouraged through planning.
- Maintain the proposed policy requirement for all non-residential buildings to achieve a BREEAM 'Very Good', though some key buildings could test feasibility against BREEAM 'Excellent'.

8. Water Use and Supply Evidence Base

8.1 INTRODUCTION TO THE CHAPTER

This chapter considers the issues and opportunities regarding the use and supply of water to the built environment in the three LPA areas. It acts as a standalone evidence base for the development of local policies, but also assists in building a local evidence base for the use of wider sustainable construction targets for new development. Assessment tools like the Code for Sustainable Homes and BREEAM (as described in detail in Chapter 2), assess water use as one aspect of the accreditation. Energy and Water credits under the scheme tend to be those with which the highest cost and least flexibility is entailed. Other aspects of sustainable design covered by these accreditation schemes depend on site-specific opportunities and constraints, and cannot be assessed at a LPA area-wide scale. Therefore, the development of a water evidence base can act to support the recommendation of the use of the Code or BREEAM on a LPA area-wide scale, and give confidence around the drivers and constraints to inclusion of various targets.

This chapter firstly discusses the policy context, before considering the physical context in North Hampshire, and the technical and financial feasibility of utilising water targets.

8.2 POLICY CONTEXT

National Policy

Future Water, the Government's water strategy for England (February 2008) sets out expectations for water supply, water efficiency and water treatment to 2030. It articulates proposals to achieve an average household water consumption across England of 130 litres per person per day (and where possible 120l/p/d depending on 'new technology development and innovation'), down from the current average of 150 litres. It also addresses water charging, surface water management and water pollution.

DEFRA and DCLG published a joint policy statement in July 2007 called **Water Efficiency and New Buildings** that made clear their intention to legislate on water efficiency through Building Regulations and changes to the Water Fitting Regulations. It proposed a residential minimum standard of 125 litres per person per day (almost equivalent to Code for Sustainable Homes level 1-2, plus 5 litres to allow for external water use) and fittings performance efficiency regulations for toilets, urinals and taps to have an impact on the non-residential stock and an indirect effect on existing stock. In May this year, DCLG released the draft Building Regulations Part G Approved Document with proposals for meeting the water efficiency standards through the use of the **New National Water Efficiency Calculator for New Homes**. Local authorities can choose to go beyond Building Regulations on water efficiency if the local context makes this possible.

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

Regional Policy

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

NRM1: Sustainable Water Resources and Groundwater. In preparing LDDs, LPA will: … ii) identify any circumstances under which new development will need to be supported by water efficiency standards exceeding extant Building Regulations…

NRM3: Strategic Water Resources Development. …In considering applications for new water resources schemes, consideration should be given to …iii) presence of alternative options and environmental impact including water efficiency in new and existing properties.

NRM4: Sustainable Flood Risk Management. In the preparation of LDDs … LPA should … iii) require incorporation and management of SUDS, other water retention and flood storage measures to minimise direct surface run-off, unless there are practical or environmental reasons for not doing so.

CC1: 'Achieving sustainable levels of resource' use is a sustainable development priority for the South East.

CC2: Adaptation to climate change will be achieved through 'incorporating sustainable drainage measures and high standards of water efficiency in new and existing stock.

CC3: The South East's ecological footprint should be stabilised by 2016 and reduced by 2026, by such actions including: 'adaptation of existing development to reduce its use of energy, water and other resources'.

CC4: Design and construction of all new development, and the redevelopment and refurbishment of existing building stock should consider 'how all aspects of development form can contribute to securing high standards of sustainable development including aspects such as energy, water efficiency and biodiversity gain'.

The South East Plan set out that: *'In particularly water-stressed areas, local planning authorities may seek higher standards for water efficiency than those set nationally, through their local development frameworks. This will need to be proportionate and evidence based, and will be tested through the planning process.'*

This evidence base explores the local context to determine whether higher targets can be imposed in the LPA areas.

Local Policy

Basingstoke & Deane Borough Council

The Council is currently preparing the Basingstoke and Deane **Local Development Framework (LDF)** which will replace the currently adopted Local Plan as the Borough's statutory development plan. Central to the LDF is the Core Strategy, which provides an overarching vision, spatial objectives and policies to guide development and change in the Borough up to 2026. Core Strategy Issues and Options consultation was conducted between January and March 2008. The strategic importance of water efficiency is highlighted in the Issues and Options. Issue 18 recognises the need to:

1. *Ensure improved water efficiency and demand management measures such as rainwater harvesting or grey water recycling are used in new developments. This would need to be supported with enabling mechanisms and incentives, potentially supported by changes in legislation.*

2. *Identify and implement solutions to issues such as large scale sustainable urban drainage systems and attenuation ponds within developments.*

Until such time as the Core Strategy is adopted, 'saved' policies within the Basingstoke Local Plan 1996-2011 (adopted 2011), together with the South East of England Plan provide the basis for the determination of planning applications in the Borough. Policy E1: Development Control states that all new development proposals should conserve water and minimise water use.

Hart District Council

The emerging **Hart District Core Strategy** sets the long-term strategic planning objectives for the district and identifies the broad locations for delivering the housing growth requirements established in the South East Plan. The council published Core Strategy Preferred Options in 2006 for public consultation. Although subsequent changes in national guidance have necessitated revisions to the Core Strategy, the Preferred Options provide a useful indication of the direction of planning policy in Hart.

It stages that the Council will encourage sustainable development by 'Requiring all new development proposals to include evidence of water-saving measures and to include, wherever possible, the use of sustainable urban drainage schemes (SUDS) and permeable hard surfacing'.

Until the adoption of the Core Strategy, the **Hart District Local Plan 1996 - 2006** remains the statutory development plan for the district. As a result of changes to the planning system arising from the Planning and Compulsory Purchase Act 2004, some of the policies and proposals in the Hart District Replacement Local Plan (adopted on 22nd June 2006) and the First Alterations to the Hart District Replacement Local Plan (adopted 23rd December 2006) have subsequently expired. In April 2009 the Council published a Saved Policies Plan which captures saved policies from both the original Replacement Local Plan and First Alterations in a single document. Delivering sustainable development is the overall aim of the Plan and safeguarding the districts resources and assets is identified as a key objective within this overarching goal.

Hart have included a section in the **Design and Access Guidance** where the application is required to demonstrate how the use of appropriate SUDs has been incorporated into the proposed development and how water efficiency including grey water recycling has been implemented.

Rushmoor Borough Council

Rushmoor's emerging **Core Strategy** – '***Rushmoor 2026'*** – sets out a long term vision and spatial policies to guide development in the borough to 2026. A submission draft version of the Core Strategy was prepared for consultation between December 2006 and January 2007 but was withdrawn in June 2007 at the request of Rushmoor Borough Council.

Until the Core Strategy is adopted by the Council, the **Rushmoor Local Plan (Review) 1996-2011** (adopted 2000) remains the statutory development plan for Borough. One of the Plan's overarching objectives is to promote and encourage sustainable development and maintain the borough's environmental quality. Policy ENV16, which sets out the overarching development control criteria for major developments suggests applicants should have regard *"to the need to conserve energy, by considering orientation and exposure to prevailing wind and incorporating design and construction features which will reduce energy demand".*

8.3 PHYSICAL CONTEXT

The South East is one of the driest regions in the UK and the most populous. Low average annual rainfall combined with increased demand for water use driven by strong population, employment and housing growth mean that the region has less water available per head than anywhere in the UK. The drought which affected the South East between 2004 and 2006 was one of the most severe in the past 100 years with four drought permits and three drought orders issued in 2006. Climate change means such events are likely to occur with increasing frequency.

DEFRA recently released **UK climate projections 2009** which clearly indicate that summer drought events look likely to increase in frequency in future. Medium emissions scenarios for summer precipitation suggest there is a 50% probability of 10% reduction in precipitation across much of England by the 2020s and a 30% reduction focussed in the south east by the 2080s.

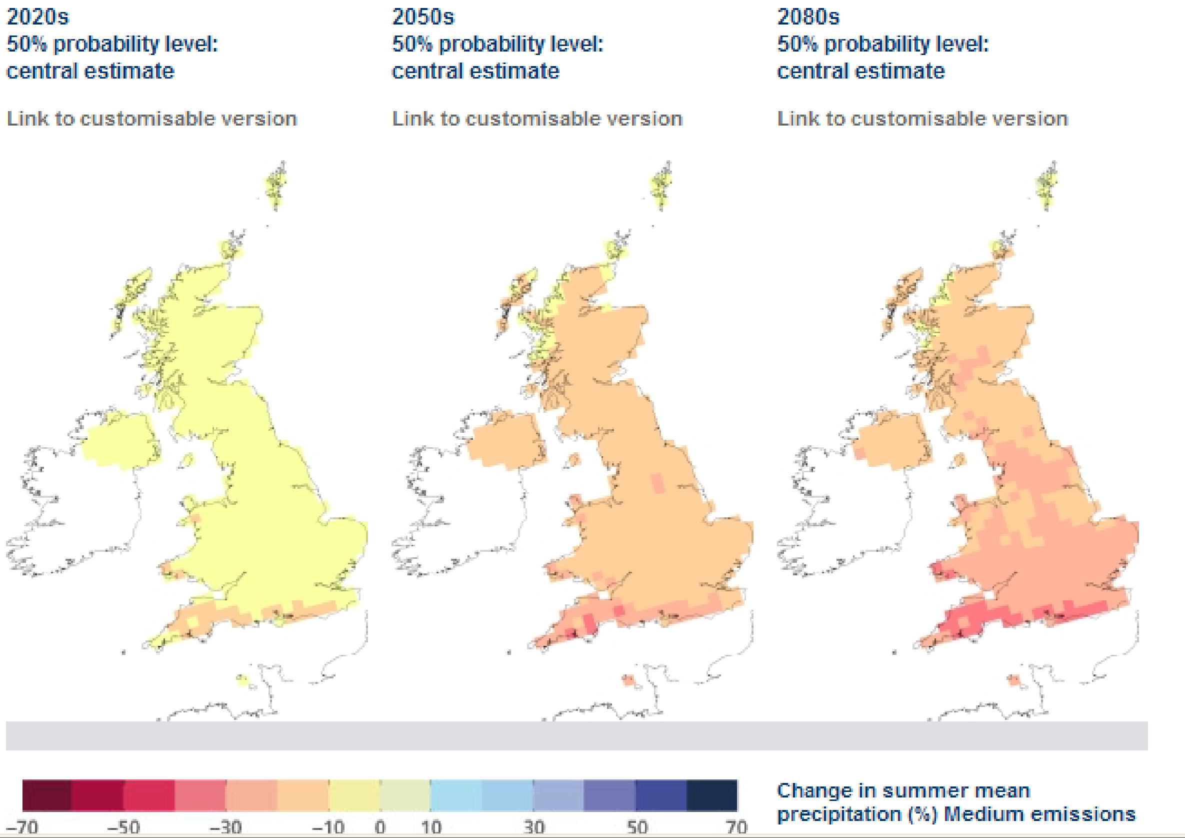


Figure 64: UK Climate Change Projections 2009 for mean summer precipitation at 50% probability

The 2008 **State of the Environment Report for the South East** revealed that although the region is using less water per person than in 2004, the amount used in 2008 increased by 3% per person compared to 2007. Despite the unusually wet summer, average daily water use in the South East during 2008 was 156 litres per person compared to an average water consumption of 149 litres per person per day across England and Wales. Between 2007 and 2008 the number of properties with a water meter in the region increased by 8 per cent, with a total of 28 per cent of all households having a meter. This is significant since the Environment Agency's **Position Statement on Household Water Metering** states that households that are charged by volume (metered) use, consume on average 10-15 per cent less water than households whose water is not metered.

The Environment Agency's publication **Water Resources in England and Wales – current state and future pressures** (December 2008) provides a detailed breakdown of water use across England and Wales, with the maps below illustrating the above average water consumption in the study area.

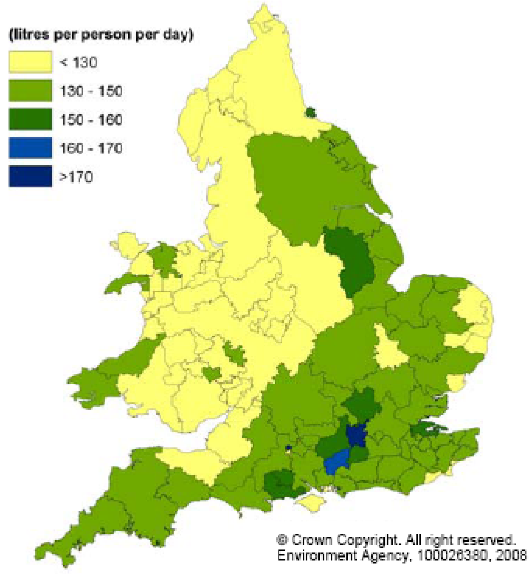


Figure 65: Per Capita Water Consumption of metered households 2007/08

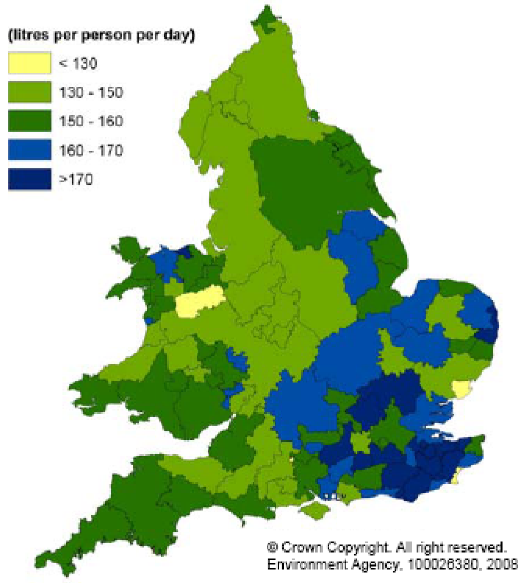


Figure 66: Per Capita Water Consumption of unmetered households 2007/08

The Water Resources in England and Wales publication also provides an indication of different levels of water stress across England and Wales. The Environment Agency measures water stress as 'low', 'moderate' or 'serious'. The study area of North Hampshire lies within an area rated as under 'serious' water stress.

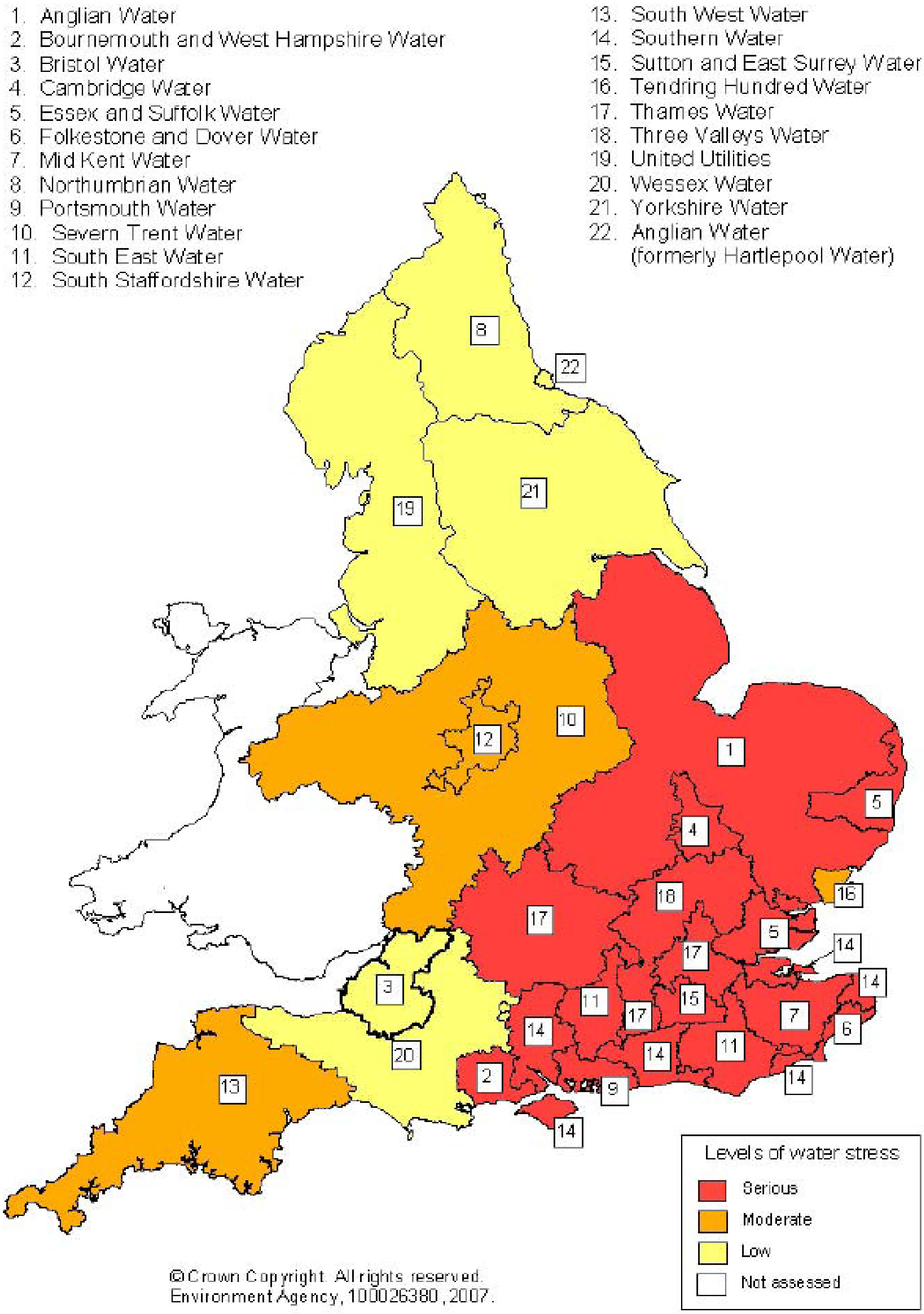


Figure 67: Water Stress levels in England and Wales (Environment Agency, Areas of Water Stress, 2007)

The increased pressure on the county's water resources stemming from new development, domestic consumption and climate change led to the foundation of the 'Water in Hampshire' project in 1999, a multi-agency partnership between public, private and voluntary stakeholders. The Hampshire Water Project prepared the **Hampshire Water Strategy**

(2003) which highlights that average daily household water consumption in Hampshire was 160 litres per person at the time of the report's preparation.

Using the Audit Commission's **Area Profiles** facility, it is possible to obtain average daily household water consumption rates at the local authority level using information derived from 2004 OFWAT data. Basingstoke and Deane, Hart and Rushmoor local authority areas all have average water consumption rates of 175 litres per person per day. This level of consumption is high, and should be considered a priority for reduction.

Water Company Resource Management Plans

All Water Companies across England and Wales are currently undertaking major strategic assessments of water resource needs over a 25 year period through the production of Water Resource Management Plans. As the Figure below illustrates, the study area is covered by three separate water companies –Thames Water, South East Water and Southern Water. Thames Water and Southern Water are both responsible for water treatment and sewerage. South East Water is responsible for providing clean water for domestic use in the east of the study area including Rushmoor, Hart and the eastern portion of Basingstoke and Deane while Southern Water are responsible for water supply in the west of Basingstoke and Deane.

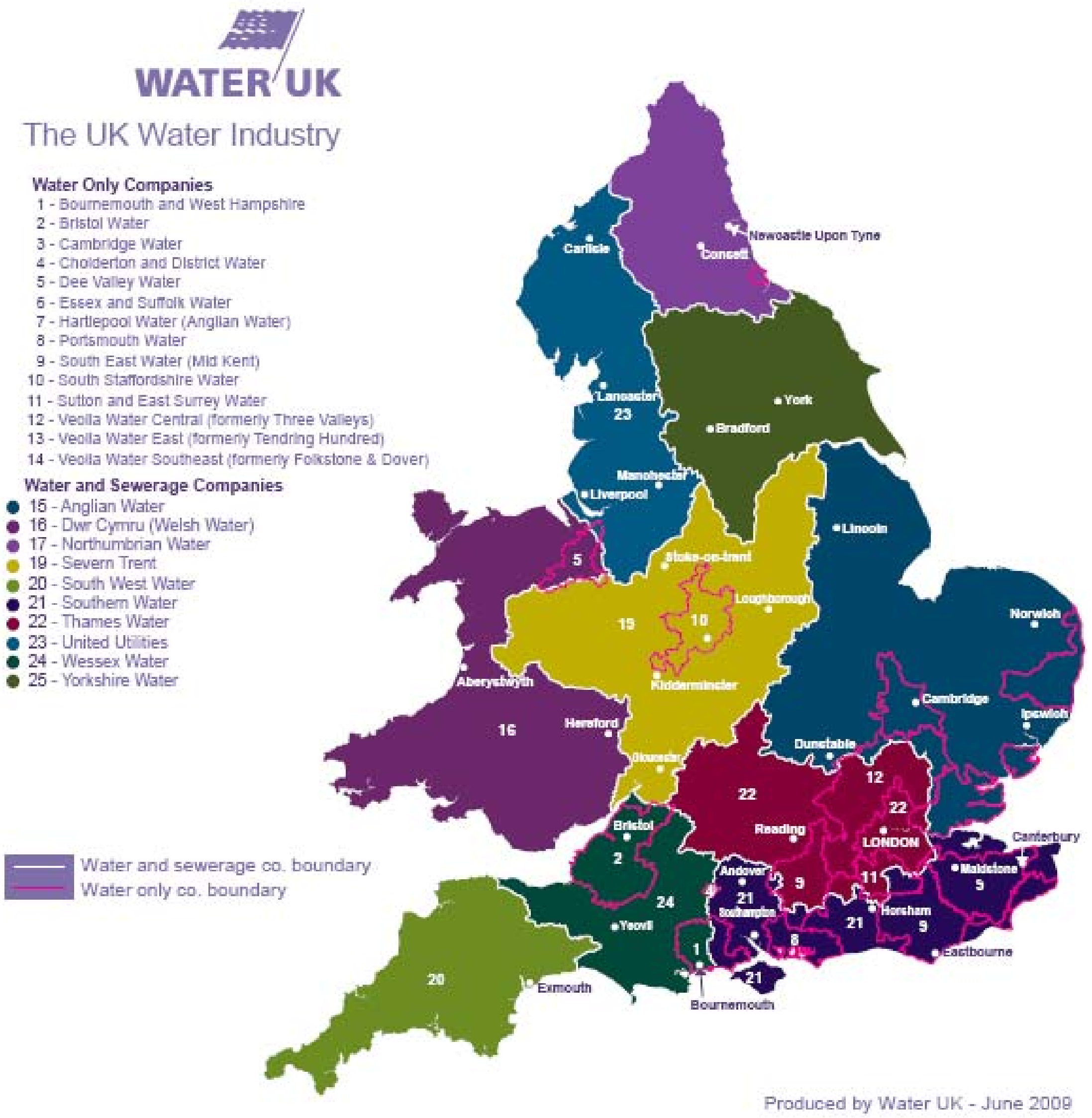


Figure 68: UK Water Companies 2009 (Source: Water UK)

Draft Water Resource Management Plans (WRMPs) for both South East Water and Southern Water provide useful overviews of the current local water resource situation and an assessment of key challenges facing supply in the area as well as a long-term strategy for balancing supply and demand. Key Challenges identified in the study area through a review of the WRMPs are:

- **Increasing demand** for water in the South East, with individual consumption rates already in excess of the national average;
- **Lifestyle changes** driving increasing use of washing machines, dishwashers, power showers and increased use of water in gardens;
- **Population growth** over the next 25 years in the study area;
- **Smaller households** are increasing in number, which are typically associated with higher per person consumption than larger families. Increasing occupancy rate has an inverse relationship with per capita consumption of water;
- **Climate change** affecting the availability as well as patterns of water use;
- **Energy use** – abstraction, treatment and distribution of water is a highly power intensive process and increasing demand is driving increased process and need for assets such as treatment plants, reservoirs and potentially high energy demand desalination plants. Improving water efficiency will therefore help reduce carbon footprint; and
- **Environmental concerns** – growing evidence of adverse impacts of abstractions on the natural environment. This may require modification of abstractions or developing alternatives.

Southeast Water WRMP

Currently, 37% of South East Water's domestic customers are currently metered and charged on a volume of use basis and this is expected to rise to 41% by 2010. In the 10 years from 2010, South East Water proposes to implement a programme of universal metering, with an estimated 90% of customers metered by 2020.

WRMPs provide lower level analysis of smaller scale resource zones. The eastern portion of the study area falls within South East Water's Resource Zone 4 (RZ4).

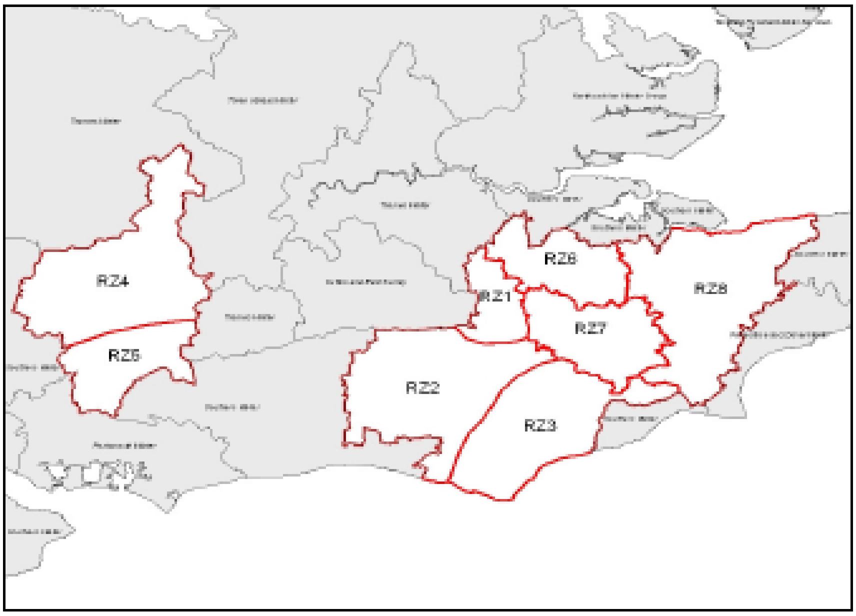


Figure 69: South East Water Resource Zones (South East Water WRMP)

South East Water's WRMP provides a Supply Demand Balance which indicates that RZ4, which includes parts of the study area, has a surplus in supply in the short term. In the medium to long term, however, it is proposed that surplus supply be transferred from RZ5 to the south to supplement dwindling supply in RZ4. This kind of inter-zonal transfer, as highlighted above, is a highly energy intensive process, and should be minimised where possible.

Despite ongoing transfers from RZ5, the WRMP suggests further resource development is necessary in RZ4 in 2021 through a groundwater scheme near Bray in Berkshire, anticipated to deliver 9Ml/d on average, increasing to 18Ml/d during peak summer periods. The resultant impacts of increasing resources on ecology will need to be carefully managed.

Southern Water WRMP

The western portion of the study area falls within Southern Water's 'Western Area' which is subdivided into four Water Resource Zones (WRZs) – Hampshire South, Hampshire Kingsclere, Hampshire Andover and the Isle of Wight. The western section of Basingstoke and Deane straddles Hampshire Andover and Hampshire Kingsclere WRZs.

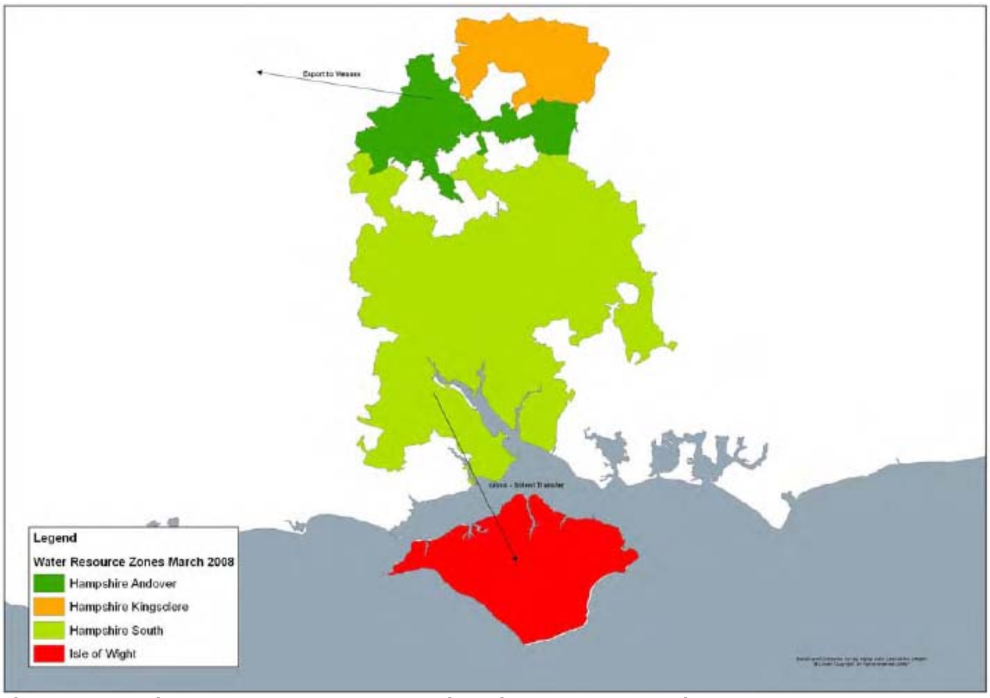


Figure 70: Southern Water Resource Zones (Southern Water WRMP)

Southern Water's Western Area is supplied by a combination of surface and groundwater sources. There are three surface water sources and over 30 groundwater sources. Groundwater sources are from the Chalk aquifer. Many of these sources are constrained by abstraction licensing as opposed to physical constraints. Surface water abstraction from the River Test and River Itchen comprise a significant proportion of supply in the South Hampshire WRZ. The Hampshire Andover and Hampshire Kingsclere WRZs are supplied entirely from Chalk groundwater sources.

There has been an increase in meter installation over the last 10 years in the Hampshire WRZs from 11% to 42%. Southern Water's Water Resources Strategy for its Western Area supply area aims to achieve universal metering by 2015. Leakage has been reduced over the last 10 years from 33.7 Ml/d to 26.0 Ml/d.

In terms of forecasting future Supply and Demand balances, the WRMP reports that both the Hampshire Andover and Hampshire Kingsclere WRZs will remain in surplus for the duration of the planning period up to 2035. Hampshire South WRZ falls into deficit in 2019/20 due to Sustainability reductions put in place on the River Itchen.

Basingstoke and Deane Borough Water Cycle Study

Under Policy H1 of the South East Plan, Basingstoke and Deane is required to plan for the delivery of 18,900 net new homes between 2006 and 2026 at an annual average rate of 945 net dwellings. To test the Borough's capacity to accommodate this level of development, Basingstoke and Deane Council commissioned the preparation of a **Water Cycle Study** (2007) which forms part the evidence base underpinning the emerging Core Strategy. Since the Study was prepared in advance of the South East Plan's adoption, three growth scenarios are tested – 740 dwellings per annum (Scenario 1), 825 dwellings per annum (Scenario 2) and 990 dwellings per annum (Scenario 3). The adopted RSS target of 945 lies between Scenarios 2 and 3, although is closer to the high growth situation.

The Water Cycle study concludes that planned growth can be supported without extra resource development beyond that which was in water companies' 2004 Water Resource Plans. Any additional resources would not impact on the hydrology of the River Loddon.

In addition to the three population growth scenarios, the Water Cycle Study sets out three water efficiency and demand management scenarios (A, B and C). All three efficiency scenarios assume that new properties coming forward in Basingstoke and Deane have per capita consumption rates of 120 litres per person per day. The Study concludes that although these figures are aspirational, they are an entirely achievable target but may require a change in legislation to implement. The draft Building Regulations (part G AD) sets a requirement for new build residential units to be designed to 120litres/person/day based on a calculation methodology (which is the same as that currently used in the Code for Sustainable Homes).

Outside new development, Scenario A assumes all other developments and existing properties have per capita consumption rates as per the 2004 Water Resource Plans of the relevant water supply companies (Southern Water and South East Water). On the other hand, Scenarios B and C assume that all metered properties other than new developments have per capita consumption rates of 150 litres per person per day while unmetered properties are assumed to have per capita consumption rates as stated in the 2004 water company Resource Plans. In addition Scenario C assumes the introduction of a planned programme to install meters in Basingstoke and Deane by 2018 which could only be achieved through a change in legislation.

Significantly, the study states that scenario testing reveals that demand management measures have a greater impact on water resources than the quantum of development proposed. The assumed water use rates of 120 litres per person in all new development from 2008 within the water efficiency scenarios is equivalent to Code Levels 1 and 2 (with Code Levels 3/4 requiring 105l/person/day and Levels 5/6 requiring 80l/person/day.

Stormwater Management

The Water Cycle study also considers management of stormwater. Basingstoke and Deane Borough Council are currently undertaking a Regional Flood Risk Assessment (RFRA). The reports should form part the evidence base underpinning the emerging Core Strategy and guiding the policy adopted.

The Water Cycle report states that uncontrolled development in the area would lead to an unacceptable adverse impact on flood risk, but that the application of PPS25 and adequate design that incorporates sustainable drainage systems will prevent this. It also confirms that any development that increases hard standing area can impact on river hydrology and groundwater levels therefore increasing risk of flooding.

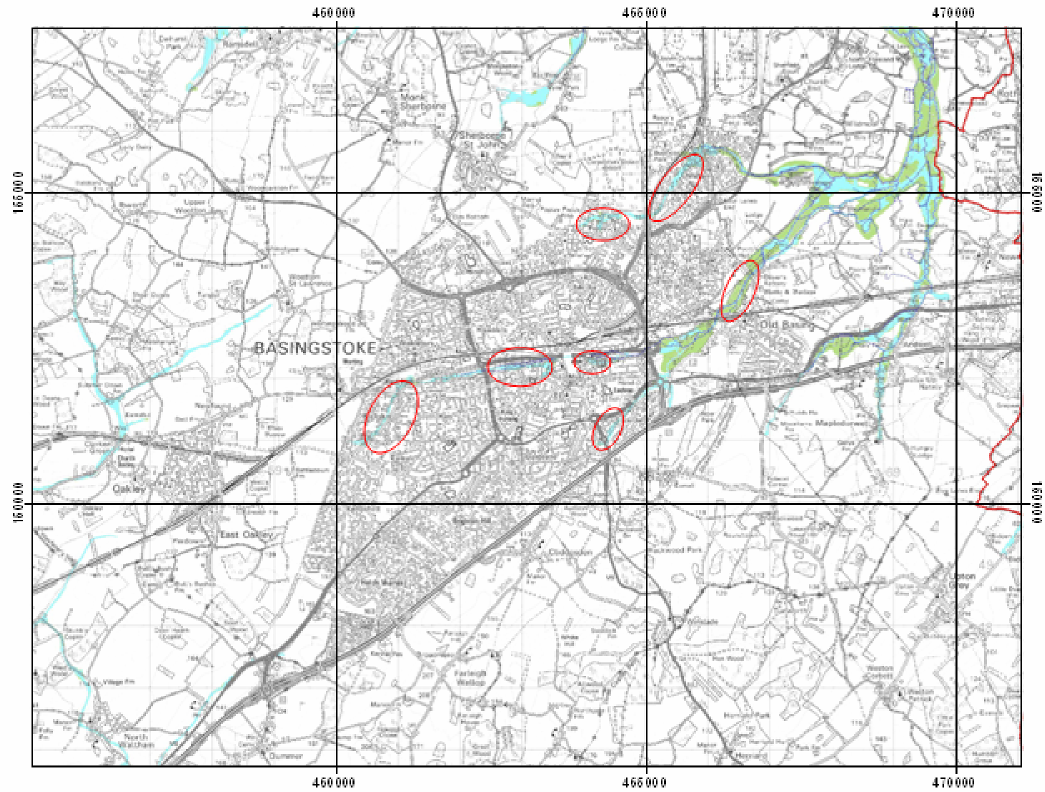


Figure 71: Flood Risk Hot Spots – Basingstoke Water Cycle Study

The study states that "Best practice should be applied to limit development runoff to 'greenfield' rates, using SUDS principles and techniques from a variety of applications and recent innovative solutions." This is already included within the Code and BREEAM requirements for surface water drainage.

The planned RFRA should highlight areas at risk of flooding and discuss mitigation and adaptation measures. The report should direct development away from flood risk areas, where possible, and ensure that any development in high risk areas conforms to the PPS25 exception test.

8.4 TECHNICAL FEASIBILITY CONTEXT

In a similar manner to energy and waste, water should be considered as a hierarchy. Water efficiency should be encouraged before considering water re-use and recycling systems. The high priority measures, such as water demand reduction measures, at the top of the hierarchy are the best – the ones that save the most water at least cost and risk. It follows that measures lower in the hierarchy provide less cost effective savings. The aim is to set targets that promote the best solutions, and follow the sequence of the hierarchy.

A way of ensuring that the hierarchy is followed would be to set a target requiring a minimum level of water demand reduction.

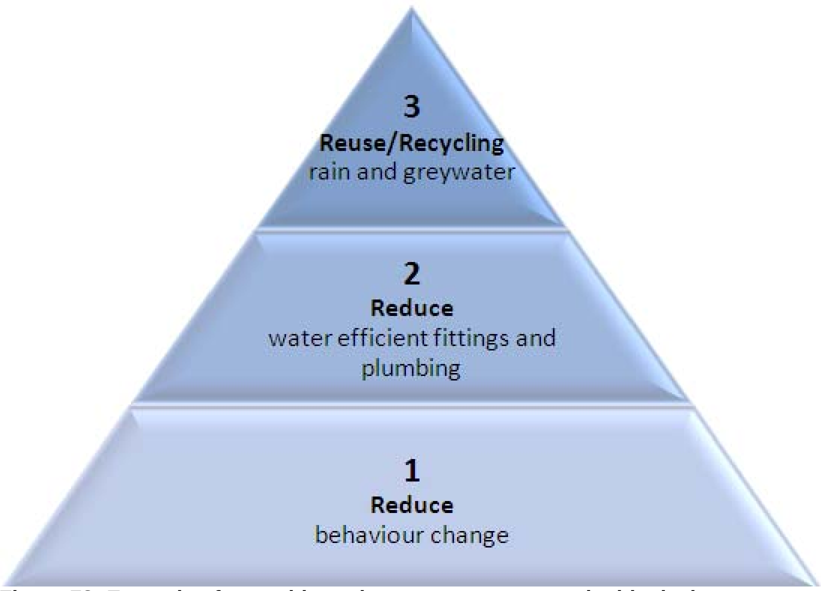


Figure 72: Example of water hierarchy to encourage sustainable design

Applying the Water Hierarchy

A list of measures that are generally included in the water hierarchy are given in the table below.

Table 59: Example of water hierarchy to encourage sustainable design

Type	Description	Examples
Demand Reduction	1) Reduce through change in behaviour	e.g. running basin taps while brushing teeth, using less water undertaking activities;
	2) Reduce through the specification of water efficient sanitary wear and plumbing	e.g. low water use taps and showers, dual flush WCs;
Water supply	3) Water supply displacing mains water	e.g. rain and grey water.

Reducing water use through behaviour

The first level of the hierarchy is difficult to directly influence through sustainable building design and planning as it relates to the actions of building users, however good design and specification has the potential to encourage water efficient behaviour .

Reducing water use through water efficient design and specification

Effective water efficiency measures should be specified to reduce the water consumption of the building users and also, wherever possible, the energy demands through a reduction in hot water use. Good design considerations (through the plumbing design and sanitary ware specification) are essential to retain the functionality of the systems.

Reducing water use through supply

Localised water treatment can potentially lose some of the benefits of economies and efficiency of scale gained by centralised wastewater treatment and water supply.

The figures below compare the water use of a typical UK house and a house built to exemplar sustainable construction standards.

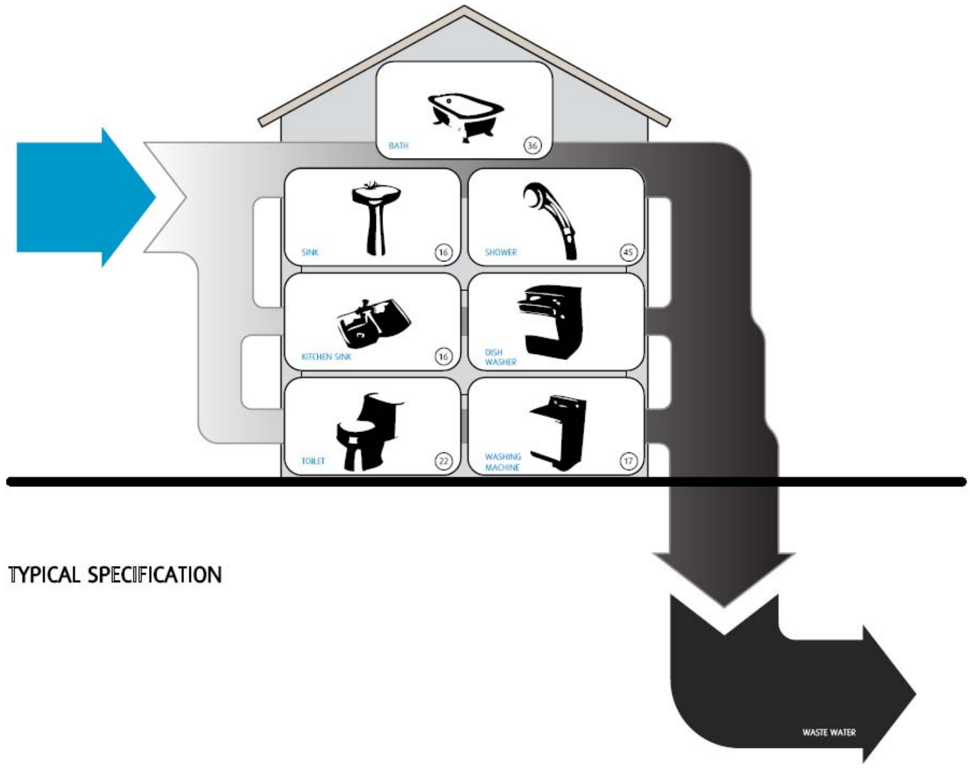


Figure 73: Water balance of a UK home built and operated to typical standards

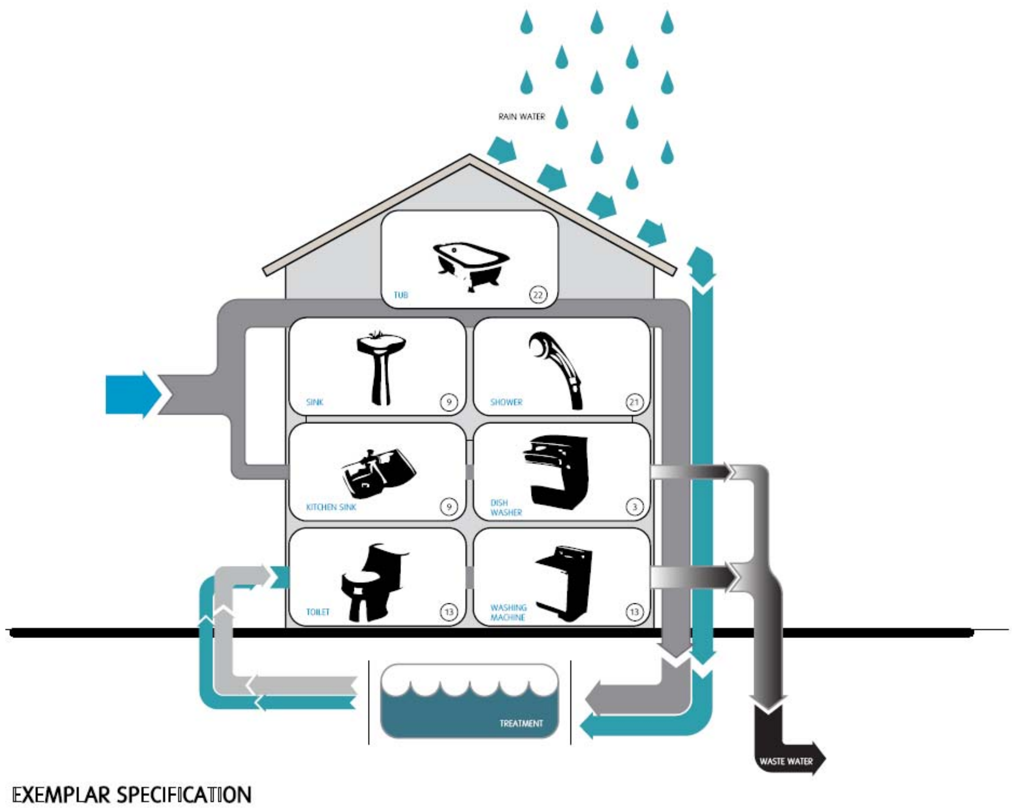


Figure 74: Water balance of a UK home built and operated to typical standards

Water Recycling

Where re-use and recycling systems are fitted, demonstration that they are appropriate and suitably sized is recommended as rainwater and greywater systems are constrained by several factors:

- Greywater systems by the amount to greywater yielded from showers and washroom sinks. In residential applications, the yield typically exceeds the demand for non-potable water in WCs. In non-residential buildings the yield is typically lower than in residential due to the reduced amount of personal washing; however some industrial buildings do yield significant amounts of greywater as a result of the industrial activities.

- Rainwater systems are affected by two constraints: the size of the collection area (e.g. roof area) and the rainfall rates for the area. The wettest parts of the United Kingdom have, on average, ten times as much rain as the driest parts, The drier areas have between 150 and 200 rain days (days with 0.2mm or more of rain) a year, while the wettest areas have slightly more than 200. The figures below demonstrate variance in rainfall both nationally and within the South East.

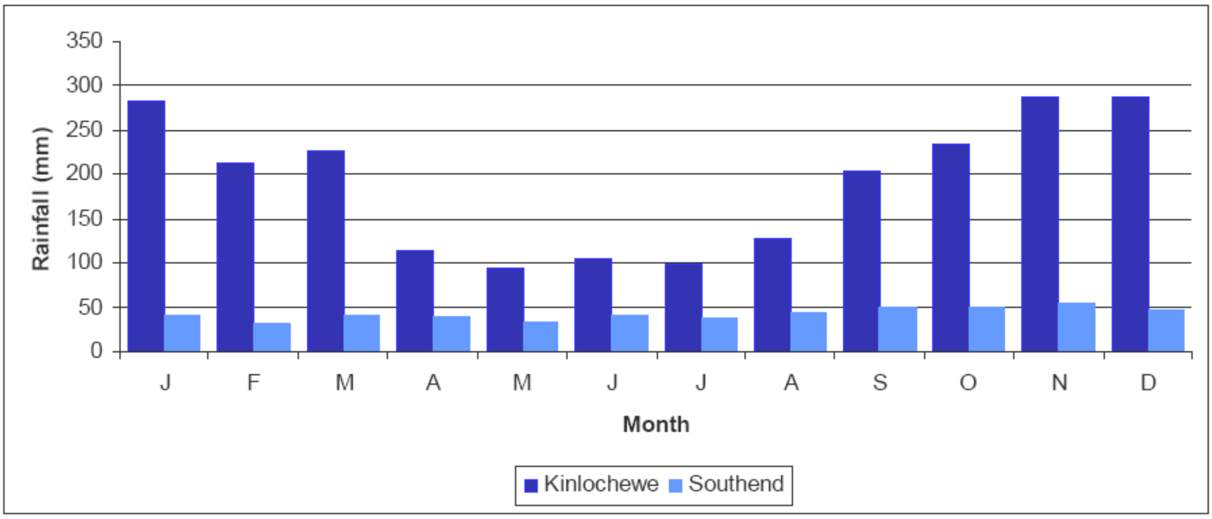


Figure 75: Monthly rainfall averages for Kinlochewe in northwest Scotland and Southend in southeast England[27].

[27] Met Office Fact Sheet 4. Showing the range of monthly rainfall across the UK.

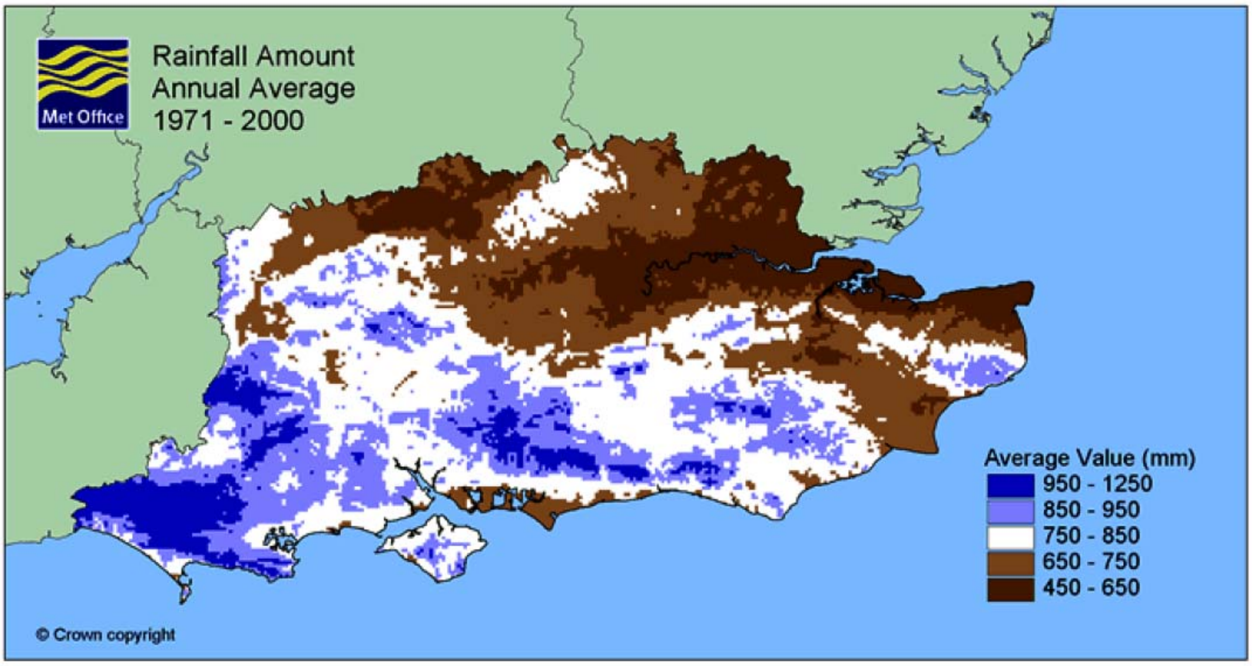


Figure 76: South East 30 year average (1971 – 2000) annual rainfall across UK (Met Office)

The study area has relatively low average rainfall (average annual 750 to 950 mm) when compared to the whole of the UK, but in the South East region its annual rainfall is in the mid to high end.

Rainwater yield is also dependent on the collection area and the run-off coefficient of the roof surface (dependent on the material and the pitch of the roof). In densely built areas with large number of water uses and disproportionally small roof collection areas, rainwater harvesting may not meet a significant proportion of the non-potable water demand.

8.4.1 MEETING CODE AND BREEAM CREDITS FOR NEW DEVELOPMENT

Code for Sustainable Homes

The two credits relating to building water use in the Code for Sustainable Homes are: WAT1 Indoor water use and WAT2 External water use. WAT1 includes mandatory requirements for each of the Levels as defined in Chapter 2 above.

The internal water use is calculated according to a National Calculation Methodology[28] developed by Communities and Local Government. This methodology has been developed to determine compliance with both the Code for Sustainable Homes and proposed Building Regulations Part G. It assesses the total internal water consumption by combining separate calculations for individual components (sanitary ware fittings, appliances and reuse or recycling systems) allowing a level of flexibility within the specification. The calculation methodology is not "capable of calculating the actual water consumption of a new dwelling"[27] but rather the litre/person/day result can be used as a comparative tool.

[28] The Water Efficiency Calculator for new dwellings. The Government's national calculation methodology for assessing water efficiency in new dwellings in support of:
The Code for Sustainable Homes, May 2009 and subsequent versions The Building Regulations 2000 (as amended), May 2009. Department for Communities and Local Government.

The table below lists the different Code Level mandatory requirements for internal water use, likely specifications for the levels and the cost of these specifications above a base case new home. The cost data is taken from the CLG cost analysis of the Code[29].

Table 60: Code costs for Water efficiency – taken from the Cost Analysis of The Code for Sustainable Homes[30]

Code Level	Litre/person/day requirement	Specification	Cost
1 & 2 Equivalent to the Part G Building Regulation water efficiency requirement	120	6/4 litre flush toilets taps with flow regulators (2.5 l/m) shower 6 litres/min standard bath standard washing machine standard dishwasher	£0
3 & 4	105	As above, except: 4/2.5 litre flush toilets smaller bath	£125
5 & 6	80	Houses As level 3 and 4, except: Rainwater harvesting 6/4 litre flush toilets	£2,650
		Flats As level 3 and 4, except: Rainwater harvesting 6/4 litre flush toilets	£800

The Code for Sustainable Homes also includes mandatory requirements for surface water run-off to ensure that the peak rate of runoff into watercourses is no greater for the developed site than it was for the pre-development site. The additional run-off predicted for a 1 in 100 year event of 6 hour duration including an allowance for climate change (PPS25, 2006), must be entirely reduced through the use of SUDS techniques wherever possible (infiltration, green roofs or rainwater harvesting) or attenuation systems where SUDS are not technically feasible. Where the ground conditions are suitable, infiltration techniques such as holding ponds and swales should be adopted. Where this is not feasible, other SUDS techniques can also be applied, including green roofs for their surface water retention and additional benefits (i.e. ecology and in urban environments mitigation against the Urban Heat Island effect). Rainwater harvesting systems can also be introduced as part of a SUDS scheme as long as additional storage allowance is provided to capture the run-off from large storm events. The additional storage is also likely to require attenuation such as an outlet throttle located to discharge the excess stormwater.

The capital costs for the mandatory surface water requirement in the Code, as listed in the **Cost Analysis of the Code for Sustainable Homes**, are £450 (based on one infiltration swale for every 2 units). If standard infiltration techniques cannot be used due to ground conditions, additional costs may be incurred for attenuation measures such as permeable surfaces and/or rainwater harvesting.

[29] Cost Analysis of The Code for Sustainable Homes, July 2008. Department for Communities and Local Government
[30] Cost Analysis of The Code for Sustainable Homes, July 2008. Department for Communities and Local Government

Other Code credits relating to water management include SUR2 Flood risk, which can be achieved for building in a low flood risk area or where flood resilience measures are incorporated into the building design in a medium or high flood risk area. Targeting these credits is not mandatory but would be recommended when considering long term vulnerability of buildings to the effects of climate change in a flood risk area. Flood Risk Assessments for the region should highlight areas at risk of flooding and discuss mitigation and adaptation measures. The report should direct development away from flood risk areas where possible. The costs of flood resilience materials on the ground floor of a 2 bed mid terraced house are quoted as £16,635 in the **Cost Analysis of the Code for Sustainable Homes.**

BREEAM

The BREEAM 2008 schemes have different credits depending on the building and scheme type (e.g. Offices, Retail, etc.). The water credits included in full, or in part, by the schemes are:

- **Internal water consumption**: This is either based on a calculation or fitting standards methodology. Credits are achieved depending on the water consumption of the WCs, urinals, taps (excluding kitchen, cleaning sinks and external taps) and showers. Additional credits can also be achieved through the specification of rain and greywater systems for WC flushing. In some schemes the credit for rain and greywater systems supplying internally used non-potable water is included as a separate heading.
- **Water meters**: This credit requires the specification of a water meter with a pulsed output on the mains water supply to enable connection to a Building Management System and the water consumption of the building to be monitored.
- **Major leak detection**: This credit is awarded for the provision of a leak detection system for the building's water supply (between the building and site boundaries). A large proportion of the water lost through leaks is from the pipework between the site boundary and building.
- **Sanitary supply shut-off**: This credit requires proximity detection shut-off systems to the water supply in the toilet areas. Proximity detection shut–off systems reduce water use by minimising leakage when the wash areas are not in use.
- **Irrigation systems**: Credit is given for a low water using irrigation such as low level irrigation landscaping, a manual watering schemes or low water using irrigation.
- **Vehicle wash**: This credit aims to minimise the volume of potable water used by vehicle washing facilities. This is achieved by using a fully automatic water reclaim system that reclaims and recycles the water that falls on and drains off the vehicle pad.
- **Flood risk**: This credit aims to encourage development in low flood risk areas or to take measures to reduce the impact of flooding on buildings in areas with a medium or high risk of flooding. A site specific Flood Risk Assessment must show the development to be appropriately flood resilient and, if the area has a medium or high risk of flooding, an additional credit is awarded where attenuation measures are specified to ensure that the peak run-off rate for a 1 in 100 year storm event of 6 hour duration complies with the CIRIA Interim Code of Practice for Sustainable Drainage.
- **Minimising watercourse pollution**: The aim of this credit is to reduce the potential for silt, heavy metals, chemicals or oil pollution to natural watercourses from surface water run-off from buildings and hard surfaces. Compliance is demonstrated by the specification of SUDS or other source control systems.

Of these credits the only mandatory requirements are for water efficiency measures and water meters. Unlike the Code for Sustainable Homes, 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.

Table 61: BREEAM Matrix for water management credits

Credit	**BREEAM 2008 Scheme**							
	Industrial	Healthcare	Prisons	Courts	Education	Retail	Offices	Bespoke
Wat 1: Water Consumption	✓	✓	✓	✓	✓	✓	✓	✓
Wat 2: Water Meter	✓	✓	✓	✓	✓	✓	✓	✓
Wat 3 Major Leak Detection	✓	✓	✓	✓	✓	✓	✓	✓
Wat 4: Sanitary Supply Shut Off	✓	✓	✓	✓	✓	✓	✓	✓
Wat 5: Water Recycling		✓	✓	✓	✓	✓		✓
Wat 6: Irrigation Systems		✓		✓	✓	✓		✓
Wat 7: Vehicle Wash						✓		✓
Pol 5: Flood Risk	✓	✓	✓	✓	✓	✓	✓	✓
Pol 6: Minimising Watercourse Pollution	✓	✓	✓	✓	✓	✓	✓	✓

Design & Impacts on masterplan

The table below lists the key masterplanning implications for the mandatory and non-mandatory water management credits in the Code and BREEAM schemes.

Table 62: Masterplanning implications

Requirement	Design and masterplanning implications
Mandatory requirements for Code Level 5 & 6 - Rain or greywater systems assumed	Allow space in the masterplan for storage tanks (ideally underground) and additional plant room for pumping and/or treatment. Communal water recycling systems should be considered for larger sites. These can utilise rainwater, greywater and/or stormwater. Riser space for double (potable and non-potable) supply pipe work and drainage.
Mandatory (Code) requirements for the reduction of surface water run-off and the application of Sustainable Drainage Systems (SUDS)	Drainage solutions should be properly considered at the beginning of masterplanning. Measures should be taken to reduce impermeable surface area and provide source control including green roofs, soakage areas and rainwater harvesting. Within the masterplan, areas should be provided to provide water treatment and attenuation. These areas should be integrated into the design of public realm and open space, providing ecological benefit where possible.
Water Recycling or Vehicle Wash	See rainwater / greywater system requirements above.
Minimising Watercourse Pollution	Allow space in the masterplan for treatment – petrol interceptors, permeable paving or SUDS systems.
Simple rainwater collection	Space for rainwater collection for external use (water butts or central water tanks)

Economic Viability

Although a significant proportion of the additional costs of delivering Code targets are typically associated with delivering the energy targets, the costs to meet the water efficiency criteria should not be overlooked. **The Cost Analysis of the Code for Sustainable Homes** provided cost estimates for the various levels of the code. The credit calculation methodology allows flexibility in meeting the requirements, but it can be safely assumed that Code levels 1 to 4 would generally be achieved with low water use sanitary ware, which can be specified to incur only slight additional costs above a base case. For higher Code Levels, 5 and 6, rain or greywater recycling systems are likely to be specified. Costs of these are dependent on the scale of systems with individual house costs quoted at £2,650 reducing to £800 for communal systems in flats. These costs result in significant increase in unit cost between Level 4 and 5, as shown in the figures below.

The cost for the provision of water butts as indicated in the CLG report is £200. There are lower cost products on the market and very often water butts are subsidised by utility companies and local authorities.

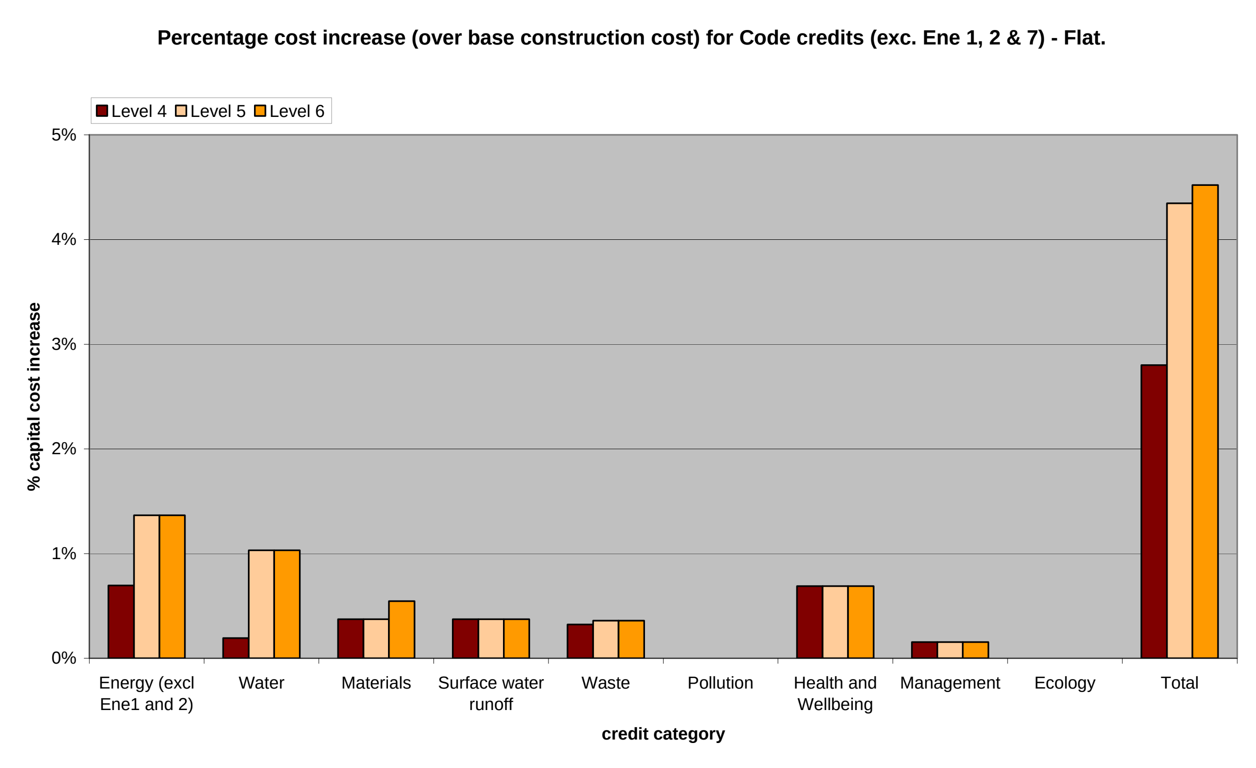


Figure 77: Costs (over base construction cost) for delivering Code credits as required to levels 4, 5 & 6 for a flat

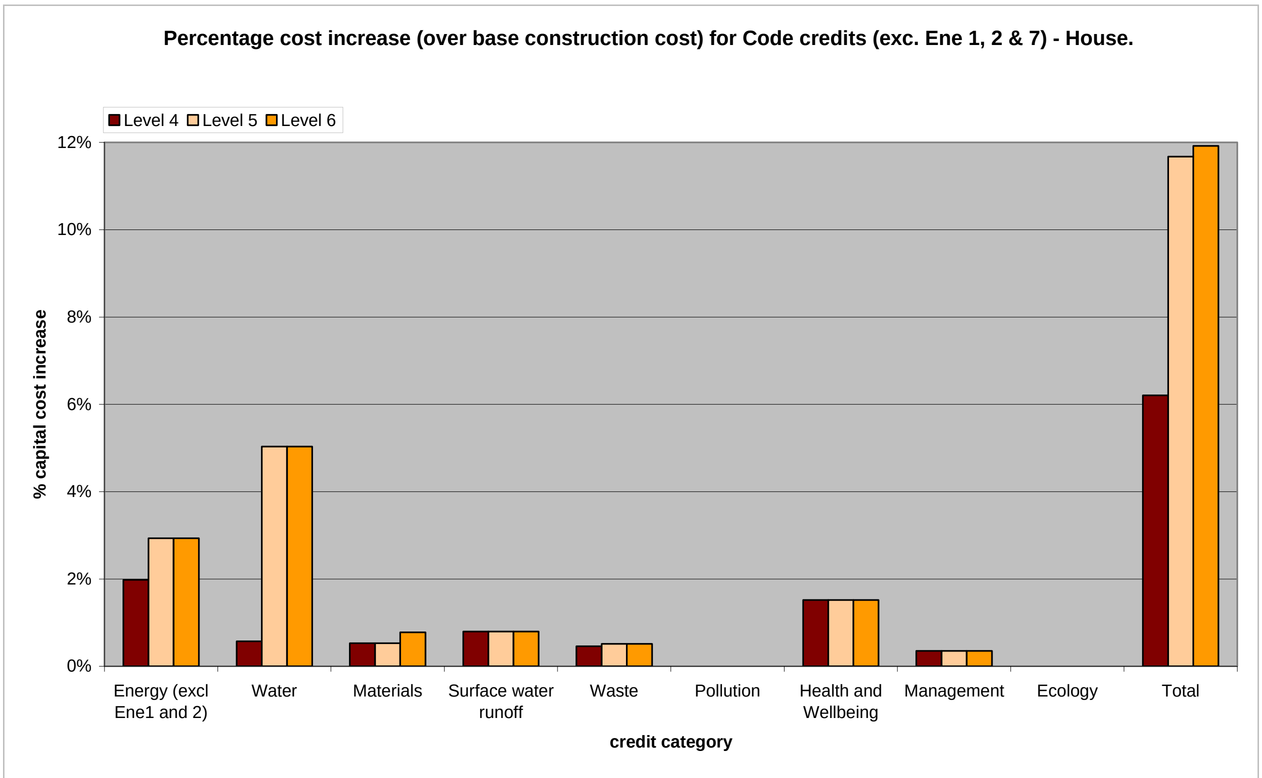


Figure 78: Costs (over base construction cost) for delivering Code credits as required to levels 4, 5 & 6 for a house

These costs were predicted, and are not yet fully supported by the industry. Due to the recent slowdown of development completions there has not been a sizeable number of completed Code assessments (either at design stage or post construction review); there is therefore not yet sufficient final cost data to establish robust cost benchmarks.

The BREEAM mandatory requirements are not deemed to be very onerous, however no formal cost assessment is available to confirm this. To meet higher ratings for the BREEAM assessments it is likely that several of the non-mandatory credits would need to be targeted. To assist with the capital costs Enhanced Capital Allowances can be sought by the building user.

8.4.2 RETROFITTING EXISTING PROPERTIES

Retrofitting homes with energy efficiency measures, such as the Local Authority lead schemes to meet HECA targets, provides an additional opportunity to help reduce the water consumption of the existing stock through the retrofitting of water saving devices (WC flush volume reducers and aerating showers). Access to properties to fit measures is one of the key barriers to retrofitting efficiency measures, so combining the fitting of both water and energy measures would appear to be a sensible approach.

8.5 POLICY RECOMMENDATIONS

The sections above describe the evidence base for the establishment of policy and targets regarding water in North Hampshire. It is clear that the area suffers from a high level of water stress, and that improvements need to be made to both existing and new buildings to ensure a sustainable future. We recommend the following actions are taken through policy development:

- **Overarching Core Strategy Policy**: We suggest the introduction of a water hierarchy within the policy wording to encourage implementation of the most effective water efficiency measures, from those that save the most water at least cost and risk to those that only need to be adopted where targets cannot be achieved otherwise. The Core Strategy should strongly support the reduction of water use and application of SUDS in new development along with the sustainable management of water resources generally. The draft LDFs of Basingstoke and Deane include policy relating to water use and SUDS. Rushmoor should include requirements in its emerging Core Strategy.
- **Policy for New Development**: The chapters above forward recommendations for the use of the Code for Sustainable Homes and BREEAM targets for new development – Code for Sustainable Homes Level 3 increasing to Level 4 and BREEAM 'Very Good'. These recommendations are supported by this water evidence base, and should be included to ensure new development has a reduced impact on water resources and helps to reduce water consumption of the LPA areas.
- **Policy for Existing Buildings**: Planning cannot directly affect water use in existing buildings, though LPAs should support initiatives to that effect. Planning policy can influence water use in existing buildings where there is significant redevelopment or refurbishment. Requirements to demonstrate improvement of water efficiency in both the extension/redevelopment and within the remaining building should be required alongside planning applications.
- **Review of Policy Going Forward**: It is expected that the level of knowledge surrounding water management will increase significantly in the coming years, and key questions such as the effect of local water recycling on CO_2 emissions will be answered. Currently, there is no evidence base to require water targets above those recommended, primarily due to technical and cost constraints. However, as these are both likely to change in the coming years, we recommend review of the policies in a few years time to determine if further gains can be made.

Justifications

The South East of England will be disproportionately affected by climate change, particularly with regards to water scarcity. Climate change is already destabilising the economy and food production and will continue to cause death directly both at a local level through heat exhaustion and at a global level through increasing numbers of extreme weather events. North Hampshire has both a global responsibility and a local vulnerability. As demonstrated by the evidence base, future restraints on water supply pose danger to both local communities and the environment. This means actions must be taken to prevent and adapt to climate change by reducing carbon dioxide emissions, and requiring the inclusion of water efficiency measures to reduce water consumption.

Setting requirements for Code Level 3 and 4 and BREEAM 'Very Good' will encourage water efficient developments. These standards should be able to be met without significantly burdensome capital costs.

Requirement of Code for Sustainable Homes levels will also ensure Sustainable Urban Drainage Systems are installed in new development, helping to manage water locally and prevent downstream flooding in the area. The Draft Flood and Water Management Bill also proposes the inclusion of SUDS as a mandatory requirement for all new development.

Water use in the study area is very high, and water supply is highly constrained. While new development can ensure water demand growth doesn't increase more than necessary, serious change is required in existing buildings to reduce water consumption. Planning should support all policy and other initiatives to facilitate water reduction in existing buildings.

There is ongoing research within the industry looking at localised water demand management and sustainable water supply. Such research may impact government policy. The BREEAM and Code schemes are updated annually to reflect any changes in the industry and understanding of the issues. Relating planning policies to managed building codes (such as the Code and BREEAM) provides benefit from their reviews and updates. The resulting policies should reflect developments in the sector, through increased performance requirements and/or changes to reflect research and learning.

Appendix A: Testing of Recommended Policy on Carbon Compliance for New Development in North Hampshire

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 CO2 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 section. The analysis completed here gives an indication of the expected cost uplift for a typical site. These costs should be used to examine viability in the round, but analysing these additional costs in the context of the local market and other obligations under the proposed Local Development Frameworks. We recommend that the LPAs consider these costs using a wider viability model such as the ‘three dragons model’, the Homes and Communities Agency viability model or another similar model.

The analysis below has been conducted based on several assumptions:

- It relies on the most up-to-date cost data that is available in a public forum (*Cost analysis of the Code for Sustainable Homes, November 2007, DCLG), and therefore* the cost data is generic at a national level, as are the assumed unit and land value costs *; and*
- The modelling assumes a range of low and zero carbon technologies are available for selection by a developer. This selection assumes an urban context, as will be typical for most development sites and urban extensions in the area.

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. Site specific attributes will also determine which technologies and strategies are suitable to reduce on-site carbon. Site by site viability should be considered through an examination of carbon reduction options and an ‘open-book’ viability consideration.

TESTING COST VIABILITY OF THE ACCELERATED CARBON COMPLIANCE POLICY

The following scenarios were modelled using our AECOM Stock Energy Model to compare the financial implications of a range of policy options. The highlighted policy below represents our proposed policy for the LPA areas. '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 capital costs and associated CO_2 savings with each policy type over time are presented the figures below. 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 micro-generation technologies. 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.

Note that in the following graphs, it shows the total cost and carbon saving associated with the technologies that are likely to be selected. In some cases the policy prediction and the baseline case have the same results as the same technology is selected to meet either target (in this case the baseline requirement is exceeds building regulations due to the performance of the technology). For example a common method to meet building regulation requirements in 2010 will be the use of ground source heat pumps, however the installation of this technology will result in carbon savings in excess of the requirements.

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. Figures A1-A4 shows the capital costs and associated CO2 savings of meeting each type of policy, based on a representative selection of building types.

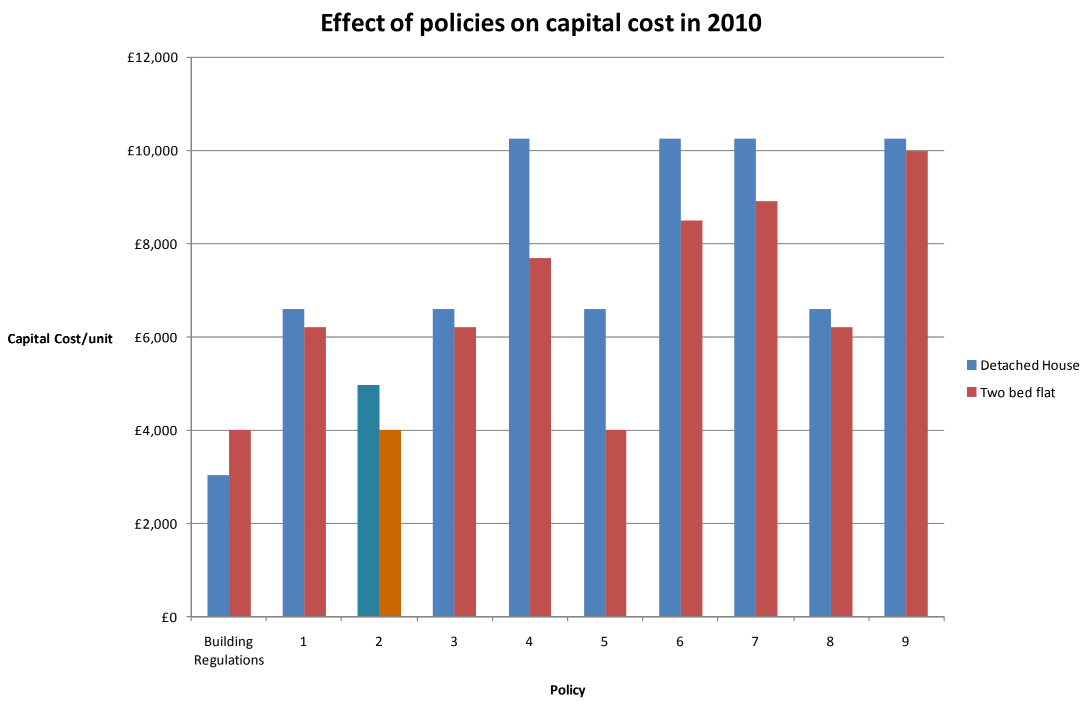


Figure A1: Cost per dwelling of meeting 2010 targets, for a detached house and a two bed flat under different policy scenarios (Source: AECOM Stock Energy Model)

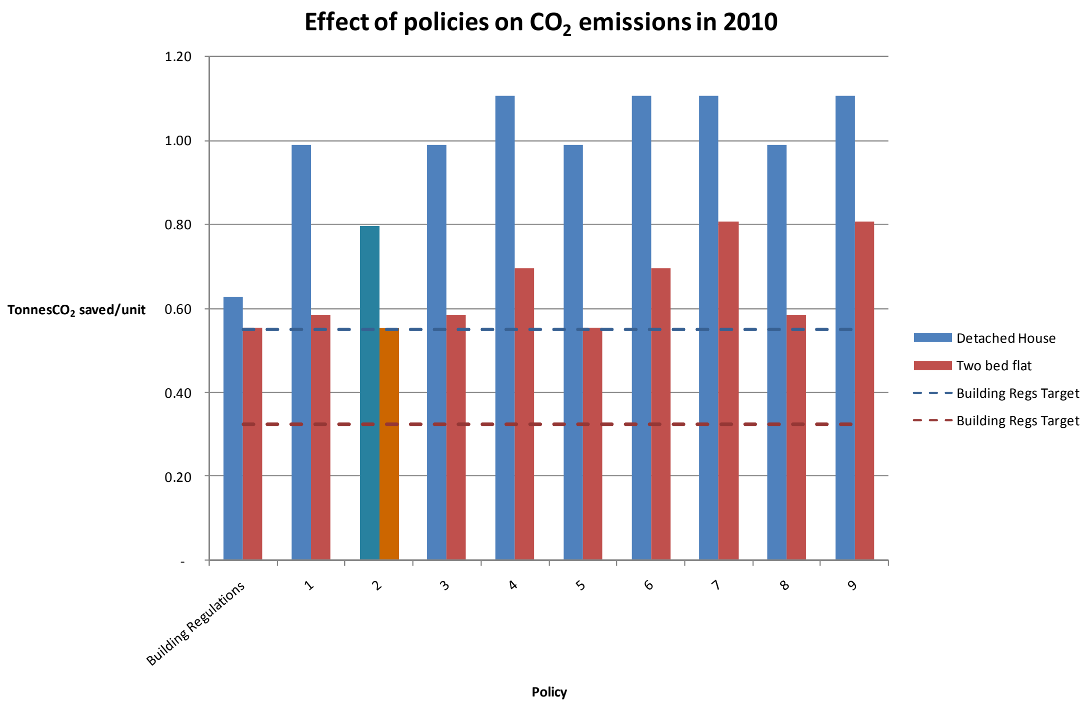


Figure A2: CO_2 savings per unit per year of meeting 2010 targets for a detached house and a two bed flat under different policy scenarios. (Source: AECOM Stock Energy Model)

Policy option 2 (the proposed policy) 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.

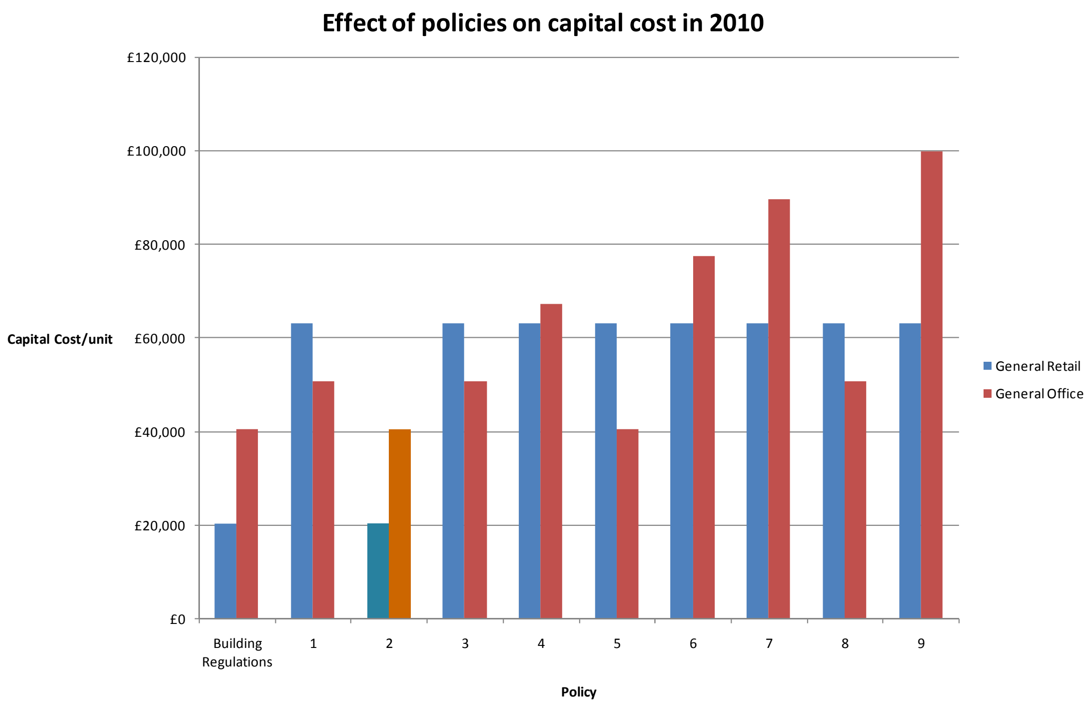


Figure A3: Cost per building type of meeting 2010 targets for an office and a retail unit under different policy scenarios (Source: AECOM Stock Energy Model)

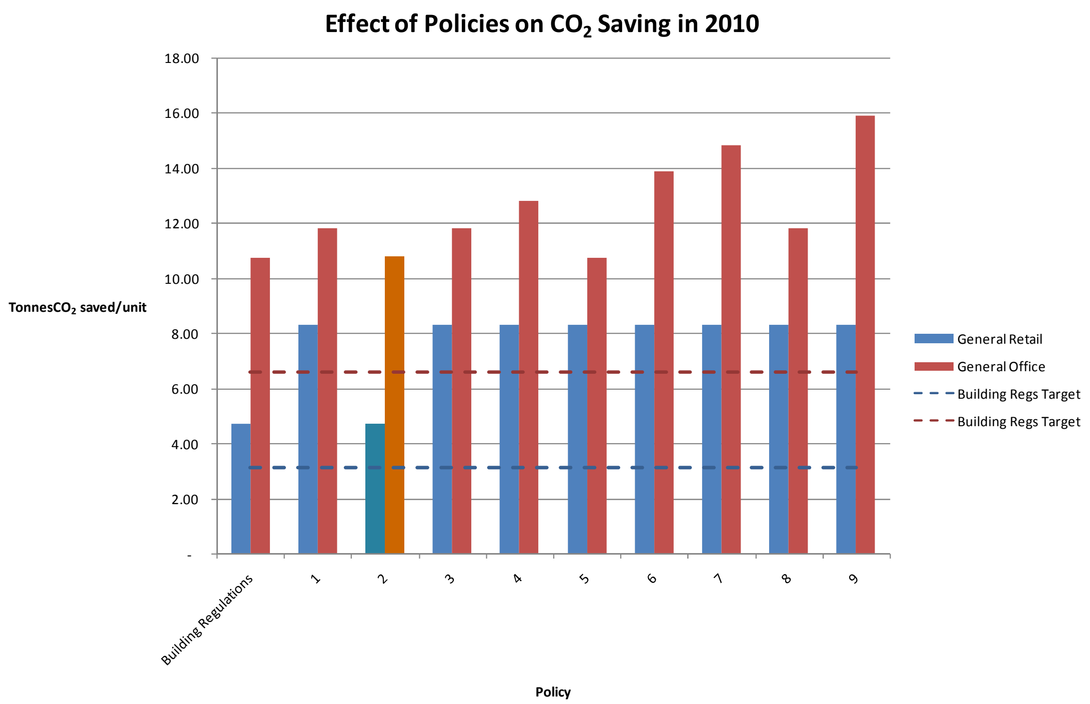


Figure A4: CO_2 savings per unit per year from meeting 2010 targets for an office and a retail unit under different policy scenarios (Source: AECOM Stock Energy Model)

Period from 2013 to 2016

From 2013, the Building Regulations are expected to require an improvement of 44% in the regulated CO2 emissions of residential buildings compared to 2006 levels. There are currently no proposals for changes to the standards for non-residential buildings in the period 2013 to 2016. The costs and CO_2 savings associated with a range of policy types are shown below in Figures A5-6. Whilst there is not much difference in capital cost between the policy options for a detached house, the policy option 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 policy option 2 for a two bed flat in 2013.

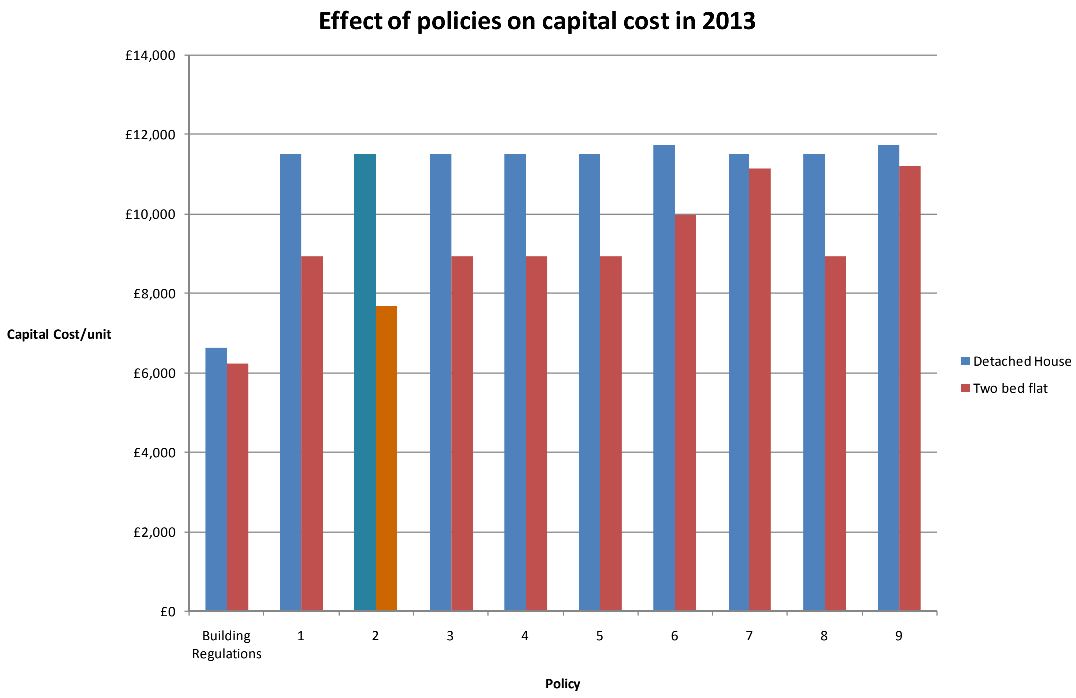


Figure A5: Cost per building of meeting 2013 targets for a detached house and a two bed flat under different policy scenarios. (Source: AECOM Stock Energy Model)

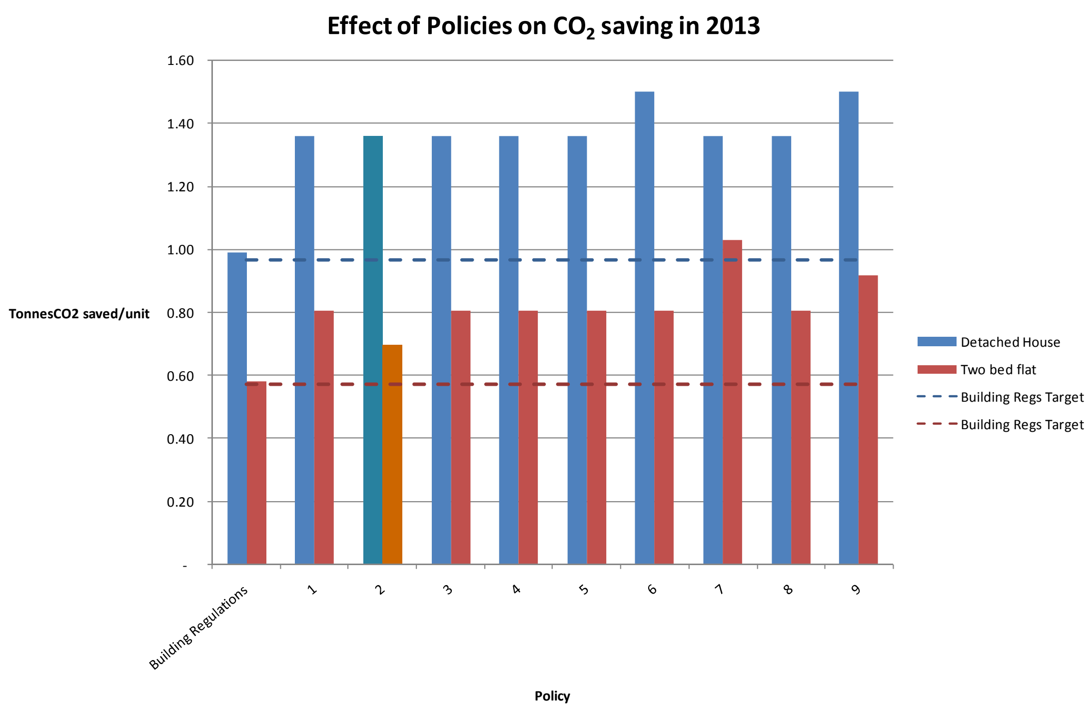


Figure A6: CO_2 savings per unit per year of meeting 2013 targets for a detached house and a two bed flat under different policy scenarios. (Source: AECOM Stock Energy Model)

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.

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 CO2 per square metre over the building lifetime of 30 years; this equates to a lump sum of £3,000 per tonne of CO2 per square metre and is in accordance with the central option costs for allowable solutions in the Zero Carbon consultation, reflecting the cost of off-site renewable electricity. Table A1 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 A2.

Building Type	Building Regulations 2006 TER (annual tonnesCO_2)	Building Regulations 2010 TER (annual tonnesCO_2)	Policy Required 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 A1: Building Regulations 2006 Baseline TER, Building Regulations 2010 updated TER and 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)	Policy Required 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 A2: Building Regulations 2006 Baseline TER, Building Regulations 2013 updated TER and required TER, and the maximum levy chargeable for some standard dwelling types.

Appendix B: Study Workshops

Two workshops were held as part of this study to engage with key stakeholders, gather local information and share the results of the study. The content and attendees of the workshop were as follows.

Workshop 1: Exploring the Challenge and the Opportunities
3 August 2009

The first workshop was held during the initial phases of the study to scope information available and to outline the key issues that the study would consider. The workshop included discussion of the following topics:

1. National and Regional Policy Context
2. Scope of the Study
3. Key Stakeholders
4. Workshop Session: Exploring Opportunities and Constraints. Participants discussed the key challenges for the local region and highlighted information sources.
5. Existing Buildings: Discussed the state of existing buildings and energy uses in the three LPA areas.
6. New Development and the Market: Discussed the local development markets, issues for developers and likely low carbon solutions to come forward.
7. Community Opportunities: Highlighted possibilities for development of district heating and wind power at a community scale.
8. Stand-Alone Opportunities: Considered wider regional opportunities for use of biomass, energy from waste and anaerobic digestion.
9. Strategic Sites: The specific opportunities and constraints for strategic sites in the area were discussed.

Attendees:

Richard Ford	Planner, Basingstoke and Deane Borough Council
Joanne Bettany	Planner, Hart District Council
Chris Butler	Councillor, Hart District Council
Viv Evans	Corporate Director, Hart District Council
Stephen Parker	Hart District Council
Fraser Fleming	Rushmoor Borough Council
Malcolm Peters	RAF
Roger Booth	Newnham Parish Council
Campbell Williams	Hampshire County Council
Mark Wilson	Hampshire County Council
Lucy Martins	Climate Change Officer, Basingstoke and Deane Borough Council
Carolyn Whistlecraft	Climate Change Officer, Hart District Council
Katie Bailey	Planning Policy Manager, Rushmoor Borough Council
Daniel Hawes	Planning Policy Manager, Hart District Council
Matthew Melville	Senior Planning Officer, Rushmoor Borough Council
Les Murrell	Climate Changer Officer, Rushmoor Borough Council
Greg Pitt	SEEPB
Terence Genis	Rushmoor Borough Council
Victoria Pinnick	Environment Agency
Paula Baker	Councillor, Basingstoke and Deane Borough Council
Martin Biermann	Councillor, Basingstoke and Deane Borough Council

Mark Lambert	LDF Team Leader, Basingstoke and Deane Borough Council
Michelle Paine	Basingstoke and Deane Borough Council
R Dibbs	Deputy Leader, Rushmoor Borough Council

Workshop 2: Sharing the Results and Enabling Delivery
14th September 2009

The second workshop was held following the completion of the bulk of the study to share results and to identify next steps. The workshop included discussion of the following topics:

1. Policy Context: A refresh of key policy drivers
2. Physical Context Results: Discussion of analysis of existing buildings, new development projections and potential for strategic renewables installations. Discussion included the three strategic sites examined; Queen Elizabeth II Barracks, Aldershot Urban Extension and Basing View.
3. Delivery Context Results: Discussion of potential delivery options and key stakeholders
4. Policy Options: Discussion of potential policy options for the LPA areas

Attendees:

Richard Ford	Planner, Basingstoke and Deane Borough Council
Joanne Bettany	Planner, Hart District Council
Stephen Parker	Member, Hart District Council
Susan Band	Member, Hart District Council
Ken Crooks	Member, Hart District Council
Malcolm Peters	RAF
Lucy Martins	Climate Change Officer, Basingstoke and Deane Borough Council
Carolyn Whistlecraft	Climate Change Officer, Hart District Council
Daniel Hawes	Planning Policy Manager, Hart District Council
Matthew Melville	Senior Planning Officer, Rushmoor Borough Council
Les Murrell	Climate Changer Officer, Rushmoor Borough Council
Terence Genis	Rushmoor Borough Council
Victoria Pinnick	Environment Agency
Martin Biermann	Councillor, Basingstoke and Deane Borough Council
R Dibbs	Deputy Leader, Rushmoor Borough Council
Rachel Scott	Senior Planning Policy Officer, Hart District Council
Amanda Bassett	Hampshire and Isle of Wight Wildlife Trust
Rebecca Fenn-Tripp	Principal Planning Officer, Basingstoke and Deane Borough Council
Paul Johnston	Principal Landscape Architect, Basingstoke and Deane Borough Council
Chris Griffin	LSP Climate Change
Steven Lyons	Senior Ranger, Hart District Council
Matthew Shailer	Go Green Energy Limited