Report on the Potential for Renewable and Low Carbon Energy Supply in South Gloucestershire

Final Report
June 2010
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Report on the Potential for Renewable and Low Carbon Energy Supply in South Gloucestershire

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<th>Term</th>
<th>Meaning</th>
</tr>
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<tbody>
<tr>
<td><strong>Anchor Loads</strong></td>
<td>For the purposes of this report the term “Anchor Load” refers to buildings which have a high heat demand, and can be connected to a district heating network. These often have heat demands in business-hours and are large enough to help support the network both technically and financially. Anchor loads are therefore often essential for the success of district heating schemes.</td>
</tr>
<tr>
<td><strong>Combined Heat and Power/Combined Cooling Heat and Power (CHP/ CCHP)</strong></td>
<td>The simultaneous generation of usable heat and power (usually electricity) in a single process, thereby reducing wasted heat and putting to use heat that would normally be wasted to the atmosphere, rivers or seas. CHP is an efficient form of decentralised energy supply providing heating and electricity at the same time. CHP’s overall fuel efficiency can be around 70-90% of the input fuel, depending on heat load; compared to typical fossil fuel power stations which are only up to around 40-50% efficient.</td>
</tr>
<tr>
<td><strong>CRC Energy Efficiency Scheme (CRC), (formerly known as the Carbon Reduction Commitment)</strong></td>
<td>A mandatory carbon trading scheme designed to encourage larger organisations to manage energy consumption and emissions. The scheme, starting in April 2010, is designed to create a shift in awareness, behaviour and infrastructure. It will be administered by the Environment Agency. The scheme will affect approximately 20,000 organisations, with around 5,000 of these required to participate in the scheme. Participating companies will be ranked in a league table for their sector, depending on their performance in reducing carbon emissions. They will also receive either a financial penalty or reward depending on where they are ranked in the table.</td>
</tr>
<tr>
<td><strong>DECC (Department of Energy and Climate Change)</strong></td>
<td>The Department of Energy and Climate Change (DECC) was created in October 2008, to bring together: - energy policy (previously with BERR, which is now BIS - the Department for Business, Innovation and Skills), and - climate change mitigation policy (previously with Defra - the Department for Environment, Food and Rural Affairs)</td>
</tr>
<tr>
<td><strong>Feed in Tariffs (FITs)</strong></td>
<td>A scheme to incentivise renewable electricity installations up to a maximum capacity of 5 MW. The impact of FITs will significantly increase revenue for small-scale generators of renewable electricity, such as photovoltaic systems or small wind turbines. The FITs may also make it easier to obtain finance for such projects as it provides a guaranteed price for the electricity generated.</td>
</tr>
<tr>
<td><strong>Photovoltaics (PV)</strong></td>
<td>Renewable system converting sunlight into electricity, which can be used to power (or partially power) electrical equipment and appliances.</td>
</tr>
<tr>
<td><strong>Planning Policy Statement (PPS)</strong></td>
<td>Issued by central government to replace the existing Planning Policy Guidance notes in order to provide greater clarity and to remove from national policy advice on practical implementation, which is better expressed as guidance rather than policy.</td>
</tr>
<tr>
<td><strong>Renewable Heat Incentive (RHI).</strong></td>
<td>The Energy Act 2008 allows for the setting up of a Renewable Heat Incentive (RHI), which would provide financial assistance to generators of renewable heat and to some producers of renewable heat, such as producers of biomethane. The Government aims to have this in place by April 2011. The incentive payments will be funded by a levy on suppliers of fossil fuels for heat. The proposal is that the RHI will cover a wide range of technologies including biomass, solar hot water, air and ground source heat pumps, biomass CHP, biogas produced from anaerobic digestion and injection of biomethane into the gas grid. As with FITs, the impact of the RHI is that it will make generation of renewable heat more financially viable than it is currently</td>
</tr>
<tr>
<td><strong>Renewable Obligation Certificates (ROCs)</strong></td>
<td>Certificates awarded to renewable electricity generators related to their output. See Renewables Obligation (RO).</td>
</tr>
<tr>
<td><strong>Renewables Obligation (RO)</strong></td>
<td>The Renewables Obligation (RO) is the main current financial support scheme for renewable electricity in the UK, and is administered by Ofgem. It obliges electricity suppliers in the UK to source a proportion of their electricity from renewable supplies. They demonstrate this has been achieved by showing they have the required quantity of Renewable Obligation Certificates (ROCs), which renewable electricity generators are awarded for their output.</td>
</tr>
</tbody>
</table>
1 Introduction

1.1 Background
In October, 2009, South Gloucestershire Council commissioned AECOM to carry out this study to understand the local feasibility and potential for decentralised, renewable and low-carbon energy generation in the area to 2026, to inform the development of the Core Strategy. A key driver for commissioning the study was the Climate Change Supplement to PPS1 (known as the Climate Change PPS). This requires that a Council’s Core Strategy should provide a framework that promotes and encourages renewable and low carbon energy generation.

Although there are six different greenhouse gases (GHG) in total, by far the most significant is carbon dioxide (CO2). This accounted for 85% of man-made GHG emissions in the UK in 2007, after weighting all emissions by their global warming potential. Of these CO2 emissions, 93% came from the burning of fossil fuels to provide energy, either for transport, power stations, industrial processes or to heat and light our homes and other buildings\(^1\). Therefore, promoting sustainable energy, either by reducing fossil fuel energy use, or using energy generated from renewable and low carbon energy sources has a key role to play in mitigating climate change.

1.2 Objectives and scope of study
The objectives of the study were:

- To develop an evidence based understanding of the local feasibility and potential for decentralised, renewable and low-carbon energy generation
- Provide an analysis of policy options to support renewable and low-carbon energy generation, including CHP networks, to inform the drafting of the Core Strategy
- Given the ‘local evidence’ and emerging policy and legislative framework from Central Government and the HCA make a recommendation as to whether or not the Council should pursue a district wide target local requirement of energy to be used in new development to come from decentralised and renewable or low carbon sources.
- Based on the spatial mapping of potential, assess the opportunities for greater use of decentralised and renewable or low carbon energy on strategic new development areas
- Set out what further research and work would be required (if any) to provide an evidence base for setting renewable energy and/or sustainable construction requirements for strategic areas (including likely timescales, costs and risks of preparing this evidence), as well as wider [corporate] action that would be required to develop opportunities on these areas
- To review the latest advice from CLG on monitoring of Renewable & Low Carbon Energy Generation and advise on appropriate definition
- Project potential output for each technology in South Gloucestershire by 2026 and recommend a 3 year target for the Council Plan.
- Set out ideas for how the Council can actively support generation of decentralised, renewable and low-carbon energy other than through the planning system and management of its own buildings. Provide examples of good practice from other Local Authorities as appropriate.

The focus of the study was on renewable and low carbon energy generation and did not consider energy efficiency. However the Council recognise the crucial importance of the latter in reducing carbon emissions and a range of actions to take forward reductions in energy use is set out in the Council’s Climate Change Strategy Revised Action Plan to 2010.

The study considered only the potential for energy generation for electricity or heat production. It does not consider the potential for using renewable energy for transport as this was outside of the brief. In terms of larger scale renewable energy generation, the study only considered on-shore options, and therefore did not assess offshore options, such as offshore wind, tidal or wave power. Similarly, nuclear power is not considered within this report. This is because these technologies fall outside the direct planning jurisdiction of the Council, and, in terms of target setting, are likely to be considered as part of regional targets rather than contributing to an individual local authority target.

\(^1\) See http://www.decc.gov.uk/en/content/cms/statistics/climate_change/co2_meth_n20/co2_meth_n20.aspx
1.3 Report structure
The report begins with a brief overview of the policy context in chapter 2. It then sets out in chapter 3 the current energy baseline for the area, and the projected energy demand to 2020, as well as the current installed renewable energy capacity. In chapter 4 we present the results of the assessment of the area wide potential for renewable energy, focussing on onshore wind, energy from waste, biomass, and building integrated renewable. Chapter 5 presents the results of mapping the opportunities for district heating and CHP for the three major strategic new development areas of North Yate, East of Harry Stoke and Cribbs/ Patchway. Chapter 6 presents an analysis of possible policy options in the Core Strategy and other Development Plan Documents to promote renewable and low carbon energy. Chapter 7 sets out our conclusions and recommendations and chapter 8 sets out more detail on next steps and areas of further work for the Council to take forward relevant policies.
1.4 Defining renewable energy and low carbon energy

1.4.1 Renewable energy

There are many definitions of renewable energy\(^2\). A useful one is:

“Renewable energy is that which makes use of “energy flows” which are replenished at the same rate as they are used\(^3\)”

Most forms of renewable energy stem directly or indirectly from the sun. The direct ones include solar water heating and photovoltaics (PV) which make use of direct solar radiation and ground source and air source heat pumps\(^4\), which make use of solar energy stored in the ground. The indirect forms are: wind power, as wind is caused by differential warming of the earth’s surface by the sun; hydropower, as rainfall is driven by the sun causing evaporation of the oceans; and biomass energy (from burning organic matter), as all plants photosynthesise sunlight in order to fix carbon and grow.

The combustion of biomass fuel is carbon neutral, because although the combustion releases CO\(_2\), the same amount of CO\(_2\) was taken out of the atmosphere when the biomass was growing. The other two forms of renewable energy are tidal power, which relies on the gravitational pull of both the sun and the moon, and geothermal energy, which taps into the heat generated in the Earth’s core.

Of all these perhaps the most complex and multi-faceted is biomass energy, as it can take so many forms. It can include: burning of forestry residues; anaerobic digestion of animal manures and food wastes; combustion of straw and other agricultural residues and products. It also includes the methane produced from the anaerobic digestion of biodegradable matter in landfill sites (i.e. landfill gas), as well as any energy generated from the biodegradable fraction of waste going into an energy from waste (EfW) plant.

1.5 Low carbon energy options

Low carbon energy options cover a range of energy sources that are not renewable, but can still produce less carbon than use of the conventional electricity grid or gas network, and are therefore considered an important part of decarbonising the energy supply. These options include:

- Waste heat, e.g. from power stations, or industrial processes
- Gas engine or gas turbine Combined Heat and Power (CHP), where the heat is usefully used
- Stirling engine or fuel cell CHP, where the heat is usefully used
- The non-biodegradable fraction of the output from energy from waste plants

1.6 Explanation of energy terms: the difference between power and energy and electricity and heat

1.6.1 Power vs. energy output

In the context of this report, power is measured in either kiloWatts (kW), or MegaWatts (MW), which is a thousand kW, or GigaWatts (GW), which is a thousand MW. It is a measure of the electricity or heat output being generated (or used) at any given moment in time. The maximum output of a generator, when it is running at full power, is referred to as its installed capacity or rated power output.

Energy is the product of power and time. It has the units of kWh (the h stands for “hour”), MWh or GWh. As an example, if a 2MW wind turbine ran at full power for 1 hour, it would have generated 2 x 1 = 2MWh of energy. If it ran at full power for one day (24 hours), it would have generated 2 x 24 = 48MWh.

\(^2\) More specifically, the EU Renewable Energy Directive (see chapter 2) gives guidance on which technologies are eligible to qualify for meeting the UK’s renewable energy target for 2020


\(^4\) Strictly speaking, these technologies are only partially renewable, as they also make use of, most commonly, grid electricity to power a compressor. However, if they have a good efficiency, they can provide a form of heating, in the UK, that produces less carbon per unit of output than using a gas condensing boiler.
1.6.2 Electricity vs. heat output
It is often important to distinguish between whether a generator is producing electricity or heat. This is because some renewable energy fuels (i.e. biomass) can be used to produce either heat, power or both simultaneously when used in a Combined Heat & Power (CHP) plant.

It is also important to be able to distinguish between renewable electricity targets and renewable heat targets. To do this, the suffix “e” is added in this report to denote electricity power or energy output, e.g. MWe, or MWhe, whilst for heat, the suffix “t” is used (for “thermal”), to denote heat output, e.g. MWt, or MWht.

1.7 Converting installed capacity into energy output – use of Capacity Factors
A simple and well established way of estimating how much energy per year a certain installed capacity will produce is to use capacity factors. These factors, which vary by fuel and technology, are a measure of how much energy a generating station will typically produce in a year for any given installed capacity. This reflects the fact that the installed capacity is a measure of the maximum amount of power that a generating station can produce at any given moment. However, for reasons to do with either fuel availability, the need for maintenance downtime, or, for heat generating plant, a lack of heat demand at certain times of day or year, the capacity factor is always less than 1.

For any particular technology, the capacity factor (CF) is defined as follows:

\[
CF = \frac{\text{typical annual energy output}}{\text{annual energy output if plant generated at full capacity for the entire year}}
\]

For any given generating station its annual energy output can therefore be calculated by multiplying its installed capacity by its capacity factor and the number of hours in a year.

For example, a biomass power station with an installed capacity of 5MWe, and a CF of 0.9, the annual energy output would be:

\[
5 \times 0.9 \times 365 \times 24 = 39,420 \text{ MWhe}
\]

Those forms of renewable electricity generation that rely on intermittent natural flows of energy (such as wind, photovoltaics and hydropower) inevitably have lower capacity factors than those that are fuelled by waste/biomass as the fuel can be stored to ensure a continuity of supply.

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5 Which, in the case of renewable energy, includes natural energy flows such as the wind, sun and water, as well as solid fuels such as biomass
2 Policy Context

2.1 National Context

2.1.1 The Climate Change PPS
The PPS\(^6\) supplement on climate change (referred to hereafter as the Climate Change PPS) was published in December 2007. It placed climate change at the heart of the planning system, demonstrated by its status as a supplement to PPS1, which sets the principles for the planning system as a whole. The supplement set out how the Government expects planning to help secure enduring progress against UK emission targets, deliver its ambition on zero carbon development and shape sustainable communities resilient to the changes in the climate now accepted as inevitable, through its ability to shape new development and places.

The Climate Change PPS states that, specifically in relation to decentralised renewable and low carbon energy, the key objectives are that local planning authorities prepare, and manage the delivery of, spatial strategies that:

- make a full contribution to delivering the Government’s Climate Change Programme and energy policies, and in doing so contribute to global sustainability;
- in providing for the homes, jobs, services and infrastructure needed by communities, and in renewing and shaping the places where they live and work, secure the highest viable resource and energy efficiency and reduction in emissions.

In line with PPS 12, the PPS requires that any requirements to be set out in Local Development Documents must be evidence based, and in particular, planning authorities should:

- ensure what is proposed is evidence-based and viable, having regard to the overall costs of bringing sites to the market (including the costs of any necessary supporting infrastructure) and the need to avoid any adverse impact on the development needs of communities;
- in the case of housing development and when setting development area or site-specific expectations, demonstrate that the proposed approach is consistent with securing the expected supply and pace of housing development shown in the housing trajectory required by PPS3, and does not inhibit the provision of affordable housing; and
- set out how they intend to advise potential developers on the implementation of the local requirements, and how these will be monitored and enforced.

The Climate Change PPS provided a basis for a range of different policy options and mechanisms for supporting the deployment of renewable and low carbon energy generation. The details of these, and the risks, benefits and relevance to the Council of seeking to use these are set out in chapter 6 of this report.

It is worth noting that since the time of AECOM carrying out this study, the Government has issued a consultation (in March 2010) on a new PPS which updates the Climate Change PPS and combines it with PPS 22: Renewable Energy. This is in recognition of a number of key policy and regulatory developments since the time that the Climate Change PPS was published. Perhaps the key one of these is the confirmation of the trajectory of future Building Regulations towards zero carbon development. It also specifically steers local authorities away from setting area wide targets for carbon reduction or low carbon energy generation in new developments\(^7\), as, after 2013, this has been made superfluous by the proposed future changes in Building Regulations towards zero carbon.

Although only a draft consultation at this stage, the document puts a stronger emphasis on the strategic role of local authorities, through their local spatial strategies and development management, in assisting developers to achieve these future requirements for zero carbon development. It also specifically steers local authorities away from setting area wide targets for carbon reduction or low carbon energy generation in new developments\(^7\), as, after 2013, this has been made superfluous by the proposed future changes in Building Regulations towards zero carbon.

2.1.2 Other national policies and strategies
As well as the Climate Change PPS, there are a number of other policy and regulatory drivers that mean it is important for local authorities to understand the strategic role they can play in taking forward greater deployment of renewable and low carbon energy generation in their areas. These are as follows:

---

\(^6\) Planning Policy Statement

\(^7\) Although it still supports requirements for development areas (such as urban extensions) or strategic sites, where these are viable
EU Renewable Energy Directive. The UK has signed up to the Directive, agreeing to legally binding targets of 15% of energy from renewable sources by 2020. Modelling undertaken on behalf of the Department for Energy and Climate Change (DECC) suggests that by 2020, this could mean:

- More than 30% of our electricity generated from renewable energy sources
- 12% of our heat generated from renewable energy sources
- 10% of transport energy from renewable energy sources

The UK Renewable Energy Strategy (RES) (2009) sets out how the UK will increase the use of renewable electricity, heat and transport to meet this target and address the urgent challenges of climate change and national security of energy supply.

Building Regulations and Zero Carbon: Changes to the Building Regulations in 2010, 2013 and 2016 are expected to bring in challenging dwelling (CO2) emissions rate targets for residential development and for commercial development by 2019. By 2016, new homes will need to achieve a 70% reduction in CO2 emissions on or near site from energy efficiency and the use of Low and Zero Carbon (LZC) energy options. For large sites, district heating (DH) from a low carbon source is likely to be one of the most cost-effective ways of achieving this.

Developers will then have to deal with their residual carbon emissions through the use of Allowable Solutions (AS) (see below).

Allowable Solutions. The range of “allowable solutions,” currently includes:

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

Other allowable solutions remain under consideration. A final Government announcement on the definition of zero carbon for new homes is expected in 2010. The use of allowable solutions provides the potential for a mechanism for delivering Climate Change PPS opportunities. In particular, it could create a mechanism for local authorities to levy payments from developers to help fund the development of local heat networks to supply existing, as well as new developments.

Feed in Tariffs (FITs). The 2008 Energy Act contains powers for the introduction of FITs in Great Britain to incentivise renewable electricity installations up to a maximum capacity of 5 MW. The Government intends that FITs should be implemented by April, 2010. The impact of FITs will be significantly increased revenue for small-scale generators of renewable electricity, such as photovoltaic systems or small wind turbines.

Renewable Heat Incentive (RHI). The Energy Act 2008 also allows for the setting up of a Renewable Heat Incentive (RHI), which would provide financial assistance to generators of renewable heat and to some producers of renewable heat, such as producers of biomethane. The Government aims to have this in place by April 2011. The incentive payments will be funded by a levy on suppliers of fossil fuels for heat. The proposal is that the RHI will cover a wide range of technologies including biomass, solar hot water, air and ground source heat pumps, biomass CHP, biogas produced from anaerobic digestion and injection of biomethane into the gas grid. The UK Government issued a consultation on the details of the RHI in early 2010. The impact of the RHI is that it will make generation of renewable heat more financially viable than it is currently.

The Renewables Obligation (RO). The RO is the main current financial support scheme for renewable electricity in the UK, and is administered by Ofgem. It obliges electricity suppliers in the UK to source a proportion of their electricity from renewable supplies. They demonstrate this has been achieved by showing they have the required quantity of Renewable Obligation Certificates (ROCs), which renewable electricity generators are awarded for their output.

If suppliers fail to meet their target, they have to pay a fine and also the value of the fine “pot” is, on an annual basis, split among those suppliers who do meet their targets. This creates a market for the ROCs and means that generators of renewable electricity can sell the ROCs that they receive for significantly more than they receive for their electricity output. The intention is that RO will continue to incentivise electricity generation from larger scale renewable energy installations, whilst the FIT will be aimed at smaller generators.
2.2 Regional Context

The draft Regional Spatial Strategy (RSS), and its supporting technical studies, provide the regional context for the South Gloucestershire LDF, although there is some uncertainty (at the time of writing) about when and if the RSS will be adopted. The key elements in the draft RSS\(^8\) in relation to this study are:

- **Regional and sub-regional renewable electricity and heat targets.** Policies RE1 and RE3 set out, for the former Avon, a renewable energy electricity target range of 35-52MWe by 2010. There is also a regional renewable electricity target of 850MWe by 2020. In terms of renewable heat, there are no sub-regional targets, but a regional target of 100MWt by 2010 and 500MWt by 2020.

  The 2010 electricity targets are based on the Revision 2010 study which developed the evidence base for the study. This was then followed by the Revision 2020 study, which developed the 2020 renewable electricity and heat targets. Both of these evidence base studies are referred to and cross-referenced later in this report.

- **Renewable energy in new development.** In policy RE5, the draft RSS includes a target for the use of decentralised renewable or low-carbon energy as follows:

  “Local planning authorities should set targets in their DPDs for the energy to be used in new development to come from decentralised and renewable or low-carbon energy sources where it is feasible and viable, and the development thresholds to which such targets would apply. In the interim, before targets are set in DPDs, at least 10% of the energy to be used in new development of more than 10 dwellings or 1000m\(^2\) of non-residential floorspace should come 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.”

\(^8\) Taken from the draft revised regional spatial strategy for the South West incorporating the Secretary of State's proposed changes - for public consultation, July 2008
3 Energy Baseline

3.1 Introduction
The UK Renewable Energy Strategy (RES), July, 2009, sets out a target that 15% of all of the UK’s energy should come from renewable sources by 2020. The central scenario set out in that strategy that, nationally, 12% of our heat and 30% of our electricity would need to come from renewable sources by 2020 to meet the target.

With this in mind, it makes sense to identify the contribution that any renewable and low carbon energy generation could make to meeting to energy demand in South Gloucestershire by 2020.

3.2 Current and future heat demand
The table below shows a summary of current heat and electricity demand in South Gloucestershire and predicted demand in 2020. The current demand figures are based on data for the year 2007, which is the most recent year for which data is available. The heat demand is taken to be the consumption of all non-electricity fuels, including natural gas, oil, LPG and solid fuels. It does not include any electricity that may be used for heating (such as economy 7). This is in-line with the approach in the UK RES. The demand in 2020 is based on the UK RES central scenario, which assumes that electricity demand does not increase, and that heat demand falls by 16%.

Table 1: Total energy consumption data for South Gloucestershire for 2007 and 2020

<table>
<thead>
<tr>
<th>Fuel type</th>
<th>Annual energy consumption (GWh)</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Actual in 2007</td>
<td>Predicted in 2020</td>
</tr>
<tr>
<td>Heat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>natural gas</td>
<td>2,113</td>
<td></td>
</tr>
<tr>
<td>oil</td>
<td>460</td>
<td></td>
</tr>
<tr>
<td>manu. solid fuel</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>coal</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Heat total</td>
<td>2,591</td>
<td>2,176</td>
</tr>
<tr>
<td>Electricity</td>
<td>1,553</td>
<td>1,553</td>
</tr>
</tbody>
</table>

Source: Digest of UK Energy Statistics (DUKES)

The table below, for the sake of comparison, shows the energy demand for South Gloucestershire Council (for 2008/9), and the proportion of the 2007 total energy consumption for the South Gloucestershire area that this represents.

Table 2: Council energy consumption data for 2008/09

<table>
<thead>
<tr>
<th>Energy type</th>
<th>2008/09 (GWh)</th>
<th>% of 2007 total</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>39</td>
<td>2.49%</td>
<td>Includes street lighting</td>
</tr>
<tr>
<td>Heat</td>
<td>59</td>
<td>2.27%</td>
<td>Degree day adjusted. This is the total for gas and oil</td>
</tr>
</tbody>
</table>

Source: NI 185 data supplied by the Council.

9 Due to improvements in the thermal performance of existing buildings (e.g. through improved insulation), as well as improvements in boiler and plant efficiencies
10 Our assumptions do not take into account any analysis of how local growth in South Gloucestershire, and hence growth of energy demand, may vary from the national average assumed in the RES
The heat and electricity demand figures in table 1 will be used later in this report when assessing the potential contribution that renewable energy resources in the area could make to energy demand.

### 3.3 Existing Renewable and Low Carbon Energy Capacity in South Gloucestershire

#### 3.3.1 Renewable electricity
The table below shows a summary of the existing installed renewable electricity capacity in the area. This includes Ecotricity’s 6.9MW Alveston wind farm, which is consented but not yet built. The annual energy output for each technology is estimated by applying a capacity factor, as given in appendix 2.

<table>
<thead>
<tr>
<th>Energy technology</th>
<th>Current installed capacity</th>
<th>Notes and sources</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MWe</td>
<td>GWh/yr</td>
</tr>
<tr>
<td>Onshore wind turbines</td>
<td>6.9</td>
<td>16.32</td>
</tr>
<tr>
<td>Biomass CHP - energy crops</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Energy from waste</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Landfill gas</td>
<td>3.33</td>
<td>17.50</td>
</tr>
<tr>
<td>Building integrated renewables:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>small/ micro wind</td>
<td>0.012</td>
<td>0.01</td>
</tr>
<tr>
<td>photovoltaics (PV)</td>
<td>0.023</td>
<td>0.02</td>
</tr>
<tr>
<td>Total</td>
<td>10.3</td>
<td>33.9</td>
</tr>
</tbody>
</table>

#### 3.3.2 Renewable heat
The table below summarises the existing renewable heat installations in South Gloucestershire.

<table>
<thead>
<tr>
<th>Energy technology</th>
<th>Current installed capacity</th>
<th>Notes and sources</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MWt</td>
<td>GWh/yr</td>
</tr>
<tr>
<td>Heat from renewable CHP</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Building integrated renewables:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>solar water heating</td>
<td>0.15</td>
<td>0.09</td>
</tr>
<tr>
<td>heat pumps</td>
<td>0.12</td>
<td>0.20</td>
</tr>
<tr>
<td>Biomass</td>
<td>2.40</td>
<td>6.29</td>
</tr>
<tr>
<td>Total</td>
<td>2.7</td>
<td>6.6</td>
</tr>
</tbody>
</table>

#### 3.3.3 Gas fired Combined Heat and Power (CHP)
The table below shows data on the number of installations of gas engine CHP units installed in the area, taken from the DECC CHP database and information from the Council. As can be seen, the Council leisure centres play a key role in the current level of deployment for this technology.
<table>
<thead>
<tr>
<th>CHP Site Name</th>
<th>Installed electricity capacity (kWe)</th>
<th>Annual electricity output (GWh)</th>
<th>Installed heat capacity (kWt)</th>
<th>Annual heat output (GWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>West of England mail centre, Royal Mail group</td>
<td>300</td>
<td>1.3</td>
<td>420</td>
<td>1.8</td>
</tr>
<tr>
<td>Kingswood leisure centre</td>
<td>48</td>
<td>0.2</td>
<td>67</td>
<td>0.3</td>
</tr>
<tr>
<td>Yate leisure centre</td>
<td>90</td>
<td>0.4</td>
<td>126</td>
<td>0.6</td>
</tr>
<tr>
<td>Bradley stoke leisure centre</td>
<td>112</td>
<td>0.5</td>
<td>157</td>
<td>0.7</td>
</tr>
<tr>
<td>Thornbury leisure centre</td>
<td>167</td>
<td>0.7</td>
<td>234</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>717</strong></td>
<td><strong>3.1</strong></td>
<td><strong>1004</strong></td>
<td><strong>4.4</strong></td>
</tr>
</tbody>
</table>

The above figures, for renewable electricity and heat and gas CHP are summarised in the graph below. The figures for 2020 show only the projected demand for electricity and heat and don’t show any estimate of projected renewable energy output by that date.

*Figure 1: South Gloucestershire energy baseline*

11 This is an estimate only, assuming a load factor of 0.5
12 This is an estimate only, assuming a heat to power ratio of 1.4
13 This is an estimate only, assuming a load factor of 0.5
4 Assessment of Area Wide Renewable Energy Potential

4.1 Large scale wind power
After considering the various constraints set out in appendix 1, we identified a total area of least constraint of 8.46km² for wind farm development. Potentially this could accommodate up to 84MW of wind power, or up to 42 x 2MW wind turbines. This unconstrained land is made up of 59 sites or clusters, which are shown on the map in appendix 3, together with a map showing the constraints layers for wind. These potential areas range in size; one is over 1km² and therefore could accommodate a wind farm of 5 or more 2MW wind turbines. However, the remainder of the sites are all less than 1km² and most could only accommodate a single turbine or a small cluster of 2 or 3 turbines; some of these could be amalgamated into larger wind farms.

However, this potential capacity does not take into account the cumulative impact that could arise from having this number of wind turbines in the area. To take account of this, we applied a further constraint that wind farms would be separated by 7km, with the largest wind sites taking priority, and therefore other smaller sites within 7km of them were excluded. This was the approach used for the REVision 2020 study which developed renewable energy targets for the South West region for 2020. This constraint was also applied to the existing wind turbines at Avonmouth, and the consented Alveston wind farm which therefore excluded any resource within 7km of them. We stress that this 7km buffer was used for the purposes of this high level resource assessment only: there is no recognised standard for this and it should not be applied to individual planning applications. Each application should be considered on its own merits and applicants would need to demonstrate that there was not undue adverse cumulative impact when assessed against standard guidance. It should also be noted that cumulative impact is unlikely to be an issue for small scale turbines.

The total potential resource after applying this cumulative impact constraint was 19.5MW (approximately ten 2MW turbines). The table below summarises the results from these two scenarios for wind power potential:

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Potential installed capacity (MWe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource without cumulative impact buffer</td>
<td>84</td>
</tr>
<tr>
<td>Resource after applying cumulative impact buffer</td>
<td>19.5</td>
</tr>
</tbody>
</table>

4.2 Biomass
Although there are many forms of biomass fuel, the scope of this study only covered the potential for generating energy from “woody” energy crops and from forestry residues.

As part of the study, we assessed the area of agricultural land and woodland available in South Gloucestershire. Woody energy crops can potentially be grown on agricultural land grades 1-4, and the analysis showed that there are 43,000ha of land of this grade in the study area. In practice, however, energy crops are unlikely to be able to compete economically with food crops on land grades 1 and 2, and there are also concerns about the potential impact on food security if energy crops were to displace food crops. Therefore, energy crops are most likely to be grown on land grades 3 and 4. The analysis showed that the agricultural land in the area is predominantly grade 3 (see table below).

Due to competition from other land uses, and other constraints, we have assumed that by 2020 energy crops could only be grown on 10% of land grades 3 and 4, which is just under 4,000ha. This is the same assumption as that used by the Revision

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14 This, for example, is the size of the wind turbines at Avonmouth, see http://www.ecotricity.co.uk/wind-parks/
15 In terms of visual, landscape, noise or other impacts
16 Which are in Bristol rather than South Gloucestershire
17 For example, a 15kW small scale turbine, which might be used for a school, would typically have a hub height of about 15m, and a rotor diameter of 10m.
18 Including the 6.9MW for the Alveston wind park, which has achieved planning consent but is not yet built
19 i.e. short rotation coppice (SRC), or miscanthus/ elephant grass. The study did not cover the potential for growing energy crops for transport fuel, such as rapeseed for biodiesel, or wheat for bioethanol.
2020 study\textsuperscript{20}. Based on the assumptions set out in appendix 1, this could support up to 6MWe of biomass power, or CHP generation.

In terms of forestry residues, there are just over 1,000ha of woodland in South Gloucestershire. Based on the assumptions in appendix 1, this could support 0.8MWt of wood fuel heating.

Table 4: Summary of areas of land use in South Gloucestershire

<table>
<thead>
<tr>
<th>Land Grade</th>
<th>Area (Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 1</td>
<td>311</td>
</tr>
<tr>
<td>Grade 2</td>
<td>2998</td>
</tr>
<tr>
<td>Grade 3</td>
<td>36432</td>
</tr>
<tr>
<td>Grade 4</td>
<td>3333</td>
</tr>
<tr>
<td>Grade 5</td>
<td>35</td>
</tr>
<tr>
<td>Non Agricultural</td>
<td>380</td>
</tr>
<tr>
<td>Urban</td>
<td>4772</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>48261</strong></td>
</tr>
</tbody>
</table>

Source: South Gloucestershire Council, based on data from Natural England

4.3 Energy from Waste

South Gloucestershire Council provided Aecom with a predicted figure for municipal solid waste (MSW) arisings for 2020 of 145,000 tonnes/annum. The West of England Joint Waste Core Strategy (JWCS) gives data on waste arisings for commercial and industrial (C&I) waste for all four unitary authorities in the West of England (for 2005/06). This shows that South Gloucestershire is currently responsible for about 26% of this waste. The strategy also gives predicted waste arisings for 2020. Assuming that South Gloucestershire still has a share of 26% of the waste stream at that time, then the total projected C&I waste for the study area by 2020 is 300,300 tonnes per annum.

We have assumed that 30% of this total waste would be available for energy recovery, which would avoid any conflict with recycling\textsuperscript{21}. The table below shows the potential renewable energy capacity that this residual waste stream could support in 2020, which is 4.7MWe. Only the biodegradable fraction of the waste stream can be classed as renewable and, by 2020, this is projected to be 35%. Other assumptions are given in Appendix 1.

Table 5: Summary of potential energy from waste resource in South Gloucestershire

<table>
<thead>
<tr>
<th>Waste type</th>
<th>Projected total amount by 2020 (tpa)</th>
<th>Amount available for energy generation (tpa)</th>
<th>Potential installed generation capacity (MWe)</th>
<th>Potential renewable capacity by 2020 (MWe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSW</td>
<td>145,000</td>
<td>43,500</td>
<td>4.4</td>
<td>1.5</td>
</tr>
<tr>
<td>Commercial and industrial</td>
<td>300,300</td>
<td>90,090</td>
<td>9.0</td>
<td>3.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>445,300</strong></td>
<td><strong>133,590</strong></td>
<td><strong>13.4</strong></td>
<td><strong>4.7</strong></td>
</tr>
</tbody>
</table>

\textsuperscript{20} Except that the Revision 2020 study assumed that energy crops could be grown on 10% of all land in land grades 1-3, but excluded grade 4.

\textsuperscript{21} This was the figure used for Revision 2010 and 2020. This is also supported by the JWCS, which states (para. 6.8.4) that by 2020, 35% of the MSW and C&I waste stream will be available as residual waste for treatment after allowing for recycling and composting.
4.4 Building Integrated Renewables (BIR)
The potential uptake of building integrated renewable was modelled using AECOM’s in-house uptake model. The full assumptions for this are given in appendix 4. This considers uptake in four discrete sectors, namely:

1. new build residential
2. new build non-residential
3. existing dwellings
4. existing non-residential buildings

The model considers the uptake of low carbon as well as renewable energy technologies as for some sectors they are competing technologies. We present below the results of the predicted uptake of renewable energy technologies only.

BIR uptake in existing buildings is predominantly driven by consumer choice, incentivised by:
- Energy cost savings and maintenance
- Grants
- Revenue incentives – i.e. Feed in Tariff
- Renewable Heat Incentive
- Versus: unfamiliarity, capital costs, inconvenience

A discrete choice model attempts to simulate uptake based on a consumer’s values versus technology attributes. The consumer’s values are represented by coefficients based on extensive survey results. AECOM has developed a discrete choice model for South Gloucestershire, based on the survey coefficients from Element Energy’s 2008 report.

For new buildings, both residential and non-residential, we have assumed that the uptake of BIR is driven by future Building Regulations the trajectory towards zero carbon new buildings.

4.4.1 BIR uptake for electricity by 2020
The results of the uptake model are shown in the table and graph below. The model output shows that PV forms the majority of the uptake. Most of this is predicted to come from new build, but a significant contribution also comes from existing dwellings, due to the support of PV under the Feed-in Tariff.

Table 6: Summary of BIR uptake for renewable electricity in South Gloucestershire by 2020

<table>
<thead>
<tr>
<th>Technology</th>
<th>Current installed capacity (kW)</th>
<th>existing resi (kW)</th>
<th>existing non-resi (kW)</th>
<th>new resi (kW)</th>
<th>new non-resi (kW)</th>
<th>total kW</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>no. of bdgs</td>
<td>no. of bdgs</td>
<td>no. of bdgs</td>
<td>no. of bdgs</td>
<td>no. of bdgs</td>
<td></td>
</tr>
<tr>
<td>PV</td>
<td>23</td>
<td>941</td>
<td>1,882</td>
<td>0</td>
<td>0</td>
<td>7,692</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1,213</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1,213</td>
<td>4,853</td>
<td></td>
<td>11,981</td>
</tr>
<tr>
<td>micro-wind</td>
<td>6</td>
<td>65</td>
<td>65</td>
<td>4</td>
<td>4</td>
<td>892</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>892</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>892</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>290</td>
<td></td>
<td></td>
<td></td>
<td>8,584</td>
</tr>
<tr>
<td>small wind</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>19</td>
<td>290</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>296</td>
</tr>
<tr>
<td>Sub total</td>
<td>35</td>
<td>1,006</td>
<td>1,947</td>
<td>24</td>
<td>294</td>
<td>8,584</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,213</td>
<td></td>
<td>4,853</td>
<td></td>
<td>13,244</td>
</tr>
<tr>
<td>Grand total</td>
<td></td>
<td>13,244</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

22 Based on the tariff levels set out in the Government consultation of February, 2010
4.4.2 **BIR uptake for heat by 2020**

The results of the uptake model for heat are shown in the table and graph below. This shows that biomass heating, either in the form of wood pellet or wood chip boilers, forms the majority of the potential installed capacity. Solar water heating and ground/air sourced heat pumps also show significant uptake in existing dwellings, due to the proposed Renewable Heat Incentive. For new build residential developments, the biomass is assumed to serve district heating networks for larger developments of 100 dwellings and above; this does not include individual wood pellet/chip boilers for each dwelling. For existing dwellings the biomass uptake is based on individual boilers in each dwelling, predominantly in rural areas.

**Table 7: Summary of BIR uptake for renewable heat in South Gloucestershire by 2020**

<table>
<thead>
<tr>
<th>Technology</th>
<th>Current installed capacity (kW)</th>
<th>existing resi</th>
<th>existing non-resi</th>
<th>new resi</th>
<th>new non-resi</th>
<th>total kW</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>no. of bdgs</td>
<td>kW</td>
<td>no. of bdgs</td>
<td>kW</td>
<td>no. of bdgs</td>
<td>kW</td>
</tr>
<tr>
<td>solar hot water</td>
<td>150</td>
<td>3,507</td>
<td>7,014</td>
<td>18</td>
<td>222</td>
<td>186</td>
</tr>
<tr>
<td>GSHP</td>
<td>105</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ASHP</td>
<td>10</td>
<td>343</td>
<td>3,430</td>
<td>16</td>
<td>368</td>
<td>0</td>
</tr>
<tr>
<td>biomass</td>
<td>2,395</td>
<td>1,009</td>
<td>13,610</td>
<td>150</td>
<td>10,891</td>
<td>3,932</td>
</tr>
<tr>
<td>Sub total</td>
<td>2,660</td>
<td>4,859</td>
<td>24,054</td>
<td>184</td>
<td>11,482</td>
<td>4,119</td>
</tr>
<tr>
<td>Grand total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 3: Predicted uptake of BIR heat by 2020

- **Biomass**
- **ASHP**
- **GSHP**
- **Solar hot water**

Potential uptake (kW) by 2020
4.5 Summary of renewable energy potential

4.5.1 Renewable electricity
A summary of the potential generation from renewable electricity in the area by 2020 is shown below. This represents the maximum potential resource. The table shows the two scenarios for wind potential as described in section 4.1 above, one without the 7km cumulative impact buffer and one with. The table shows that the potential renewable electricity resource could meet between 11% and 20% of the area’s project electricity demand by 2020 dependant on which wind power scenario is used.

Table 8: Summary of potential for renewable electricity in South Gloucestershire by 2020

<table>
<thead>
<tr>
<th>Energy technology</th>
<th>Current installed capacity</th>
<th>Accessible resource</th>
<th>No. homes equivalent (000's)</th>
<th>Accessible resource (wind with 7km buffer)</th>
<th>No. homes equivalent (000's)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MW</td>
<td>GWh/yr</td>
<td>MW</td>
<td>GWh/yr</td>
<td>MW</td>
</tr>
<tr>
<td>Onshore wind turbines</td>
<td>6.9</td>
<td>16.3</td>
<td>85</td>
<td>200</td>
<td>49</td>
</tr>
<tr>
<td>Biomass CHP - energy crops</td>
<td>0</td>
<td>0.00</td>
<td>6.0</td>
<td>47</td>
<td>12</td>
</tr>
<tr>
<td>Energy from waste</td>
<td>0</td>
<td>0.00</td>
<td>4.7</td>
<td>37</td>
<td>9</td>
</tr>
<tr>
<td>Landfill gas</td>
<td>3.3</td>
<td>17.5</td>
<td>3.3</td>
<td>18</td>
<td>4</td>
</tr>
<tr>
<td>Building integrated</td>
<td>0.035</td>
<td>0.03</td>
<td>13</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>34</td>
<td>112</td>
<td>314</td>
<td>77</td>
</tr>
</tbody>
</table>

Council electrical demand in 2008/9 (GWh) 39
% of Council demand 805%
Total electrical demand for S Glos in 2020 (GWh) 1553

% of S Glos electrical demand in 2020 potentially met by renewable energy 20%
% of S Glos electrical demand in 2020 potentially met by renewable energy 10%

Notes on table:
- The column “No. of homes equivalent” is given for the sake of comparison only. The annual electricity consumption of an average home in the South West is 4,073kWh (taken from Neighbourhood Statistics, and excluding any economy 7 heating). The numbers in this column express the potential annual energy output in terms of the equivalent number of homes this could supply, based on this average figure.
- The annual energy output figure (GWh/yr) is based on using the capacity factors set out in appendix 2.
4.5.2 Renewable heat

A summary of the potential generation from renewable heat in the area by 2020 is shown in the table below. This represents the maximum potential resource. The resource includes the potential heat supply from CHP, set out in the renewable electricity resource table\textsuperscript{24}.

Table 9: Summary of potential for renewable heat in South Gloucestershire by 2020

<table>
<thead>
<tr>
<th>Energy technology</th>
<th>Current installed capacity</th>
<th>Accessible resource/ 2020 uptake</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MW</td>
<td>GWh/yr</td>
<td>MW</td>
</tr>
<tr>
<td>Heat from renewable CHP</td>
<td>0</td>
<td>0</td>
<td>21.4</td>
</tr>
<tr>
<td>Building integrated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>solar water heating</td>
<td>0.15</td>
<td>0.09</td>
<td>7.8</td>
</tr>
<tr>
<td>heat pumps</td>
<td>0.12</td>
<td>0.20</td>
<td>3.9</td>
</tr>
<tr>
<td>biomass</td>
<td>2.40</td>
<td>4.20</td>
<td>36</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2.66</td>
<td>4.49</td>
<td>69</td>
</tr>
<tr>
<td>Council heat demand in 2008/9 (GWh)</td>
<td></td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>% of Council demand</td>
<td></td>
<td>285%</td>
<td></td>
</tr>
<tr>
<td>Total heat demand for S Glos in 2020 (GWh)</td>
<td></td>
<td>2176</td>
<td></td>
</tr>
<tr>
<td>% of S Glos heat demand in 2020 met by renewable energy resources</td>
<td></td>
<td>8%</td>
<td></td>
</tr>
</tbody>
</table>

\textsuperscript{24} The total potential renewable electricity from this resource is 11MWe. We have assumed a typical heat to power ratio of 2:1, which would mean that 22MWt of heat could be available from facilities located close enough to potential heat loads. Some of this heat may also be used for the drying of fuels.
5 Energy Opportunities for Strategic Growth Areas

5.1 Introduction

A key objective of the study was to identify spatial opportunities for the use of renewable and low carbon energy in close proximity to strategic new development sites, or growth areas, in South Gloucestershire. The reason for doing this was twofold, namely:

- To identify whether, and to what extent, these opportunities could provide a justification for setting higher requirements for carbon reduction\(^{25}\) for these areas, as part of the Core Strategy and/or other Development Plan Documents. This is in line with the approach suggested in the Climate Change PPS and Best Practice Guide.

- To help in identifying what further action may be required, both in relation to planning policy as well as wider corporate action, in order to take forward these opportunities.

It was agreed early in the study to focus on the potential for three strategic growth areas which are proposed to be allocated in the Pre-Publication Submission Draft of the Core Strategy, as representing potentially significant opportunities for site wide renewable and low carbon energy supply. These areas are North Yate, East of Harry Stoke and Cribbs/Patchway. The assessment was based on a high level analysis of wind power potential and the existence of existing sources of waste heat and large heat users in the vicinity of the areas, as well as the spatial location of existing public buildings. The study also mapped the location of potential sites or areas of search already identified for energy from waste facilities in relation to the strategic areas. The rationale behind the assessment of heat opportunities was as follows:

- Existing sources of waste heat or CHP may have the potential to supply heat to new (and existing) developments which could reduce carbon emissions by displacing the use of conventional fossil fuelled heating systems. The sale of this heat could also provide the generator with attractive additional financial returns and, in the case of CHP, improving the utilisation of the existing system.

- Existing large heat users in close proximity to new development sites could act as potential “anchor loads” for any new district heating or CHP network. The potential benefits of including such anchor loads are as follows:
  - they would provide an early source of secure income from heat sales for any ESCo\(^{26}\) looking to develop such a network, and therefore improve the economic viability of such a scheme;
  - they can improve the balance and mix of heat loads and hence the utilisation of any energy generation plant, both in terms of the total size of heat demand, but also in terms of the times of day and year that heat is required;
  - the level of carbon savings will be increased, as the heat network would serve existing as well as new buildings.

- Public buildings are particularly attractive as potential anchor loads because:
  - they may face greater drivers and incentives to consider such opportunities for carbon reduction, due to Government sectoral carbon reduction targets and the CRC Energy Efficiency Scheme;
  - they may be able to take a longer term view on investment and energy procurement decisions than private sector organisations. For instance the Council may be able to make use the Well-being Power\(^{27}\) to justify such actions.

\(^{25}\) Or for related polices, such as requirements for district heating and CHP

\(^{26}\) Energy Services Company

\(^{27}\) The Well-being Power, introduced in 2000, enables local authorities in England and Wales to “do anything they consider likely to promote the economic, social and environmental well-being of their area unless explicitly prohibited elsewhere in legislation.”
The assessment of potential heat users and sources of heat was limited to the following:

- Council buildings, including schools and leisure centres
- Hospitals
- Heat users identified on the DEFRA industrial heat map
- Existing power stations, energy from waste (EfW) facilities and landfill gas stations
- Existing CHP installations, as given by the DECC\(^{28}\) CHP database

More detailed analysis which would consider other potential anchor heat loads, as well as the heat demand density of existing residential development, was beyond the scope of this study. However, this could form part of a more detailed future assessment of the feasibility of district heating networks for the three strategic areas.

A map showing an overview of the potential wind power and heat opportunities is given in the Energy Opportunities Plan in Appendix 5. The opportunities that have been identified for each site are presented in more detail in tables below and the maps in Appendix 6.

5.2 Opportunities for strategic areas

Table 10: Energy opportunities for North Yate

<table>
<thead>
<tr>
<th>Name of site:</th>
<th>North Yate New Neighbourhood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of proposed allocation:</td>
<td>3,000 new dwellings and supporting community facilities</td>
</tr>
<tr>
<td>Wind opportunities:</td>
<td>None identified for large scale wind (2MW).</td>
</tr>
<tr>
<td>Heat opportunities:</td>
<td>No existing sources of waste heat close to the site have been identified. The site is immediately adjacent to one of the strategic areas identified in the JWCS as potentially suitable for an EfW facility (see the map in Appendix 6). Such a facility could potentially supply heat to the new development, as well as to adjacent existing buildings and industrial users. The potential area for an EfW facility is located in an industrial area where there may potentially be other users or sources of heat that could provide opportunities. If an EfW facility does not prove viable in future, the industrial area may still represent a suitable location for other forms of energy generation such as gas CHP and biomass energy generation. Brimsham Green secondary school could potentially be an anchor heat load for any renewable heat generation on the new development site. Although some distance from the new development site, Yate leisure centre could also potentially be an anchor load for an EfW facility, although currently this has its own CHP unit.</td>
</tr>
<tr>
<td>Other opportunities or constraints:</td>
<td>There is a railway station at Yate and an existing branch line to Thornbury which now only serves Tyktherington quarry. There may be potential to use the rail network to supply waste and/or biomass fuel to an energy facility if one were to be located in the strategic area. The Council has a depot nearby at Broad Lane, which has potential for redevelopment. It may be possible to locate an energy centre on this site to provide heat &amp; power to new buildings and potentially the adjacent / nearby development site(s). The area of existing housing south of the strategic site appears to be low density detached housing and therefore is unlikely to be suitable for connecting to any future district heating network.</td>
</tr>
</tbody>
</table>

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\(^{28}\) Department for Energy and Climate Change
Table 11: Energy opportunities for East of Harry Stoke

<table>
<thead>
<tr>
<th>Name of site:</th>
<th>East of Harry Stoke New Neighbourhood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of proposed allocation:</td>
<td>2000 new dwellings and supporting community facilities</td>
</tr>
<tr>
<td>Wind opportunities:</td>
<td>None identified for large scale wind (2MW). The site sits within the safeguarding exclusion zone around Filton airfield.</td>
</tr>
<tr>
<td>Heat opportunities:</td>
<td>No existing sources of waste heat close to the site have been identified. The site is in close proximity to Frenchay Hospital and the University of West of England (UWE) Frenchay campus, both of which have significant heat loads and therefore could act as significant anchor heat loads for any potential heat generation. UWE have also proposed significant new development within their site and expressed an interest and intent to have an energy centre and district heating network.</td>
</tr>
<tr>
<td>Other opportunities or constraints:</td>
<td>Immediately adjacent to this site is Harry Stoke, another Local Plan allocated site for 1200 homes plus supporting community facilities, which has yet to commence construction. There is also the land East of Coldharbour Lane, to the immediate south west of the site, allocated in the Local Plan for 500 dwellings and further west there is Cheswick Village (formerly known as Wallscourt Farm) also allocated in the Local Plan, which is currently under construction. Bristol City Council are also promoting the regeneration of the Lockleaze area to the south of Cheswick Village. The Council also owns a significant part of the East of Harry Stoke site, proposed for allocation, north of the railway line, allowing it greater scope to influence the sustainability credentials of development that may come forward. Taken together this represents in the region of 3700 new dwellings, as well as the UWE campus, Lockleaze Regeneration area, Frenchay hospital and potential latter phases of Cheswick Village that could be served by a district heating. This represents a potentially very significant opportunity.</td>
</tr>
</tbody>
</table>
### Table 12: Energy opportunities for Cribbs/ Patchway

<table>
<thead>
<tr>
<th>Name of site:</th>
<th>Cribbs/Patchway New Neighbourhood(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of proposed allocation:</td>
<td>1750 new dwellings and supporting community facilities</td>
</tr>
<tr>
<td>Wind opportunities:</td>
<td>None identified for large scale wind (2MW). The site sits within the safeguarding exclusion zone around Filton airfield.</td>
</tr>
<tr>
<td>Heat opportunities:</td>
<td>In terms of existing sources of potential waste heat/CHP, the site is within about 1km from the Rolls Royce Filton facility, which potentially has its own CHP energy centre consisting of a 50MWe gas turbine. This used to provide process heat but they no longer have a use for the steam. Therefore the unit is now only used intermittently for electricity “peak lopping”. The potential heat output from this unit is likely to be significantly greater than the heat demand from any new development, which may not make it economically viable to run the unit for this purpose. However, the potential to supply the heat to Airbus and other large commercial heat users that may be present in the vicinity, as well as potentially Southmead hospital, may make this more viable. This is worth exploring in more detail with Rolls Royce and other stakeholders. Interestingly, within ~5km to the west of the site is Sea Bank power station. This used to supply heat to the Terra Nitrogen fertiliser factory, but that has now closed. There may be some potential for the power station to supply heat to the development area. The distance may be too great for it to be economically viable, but it is worthy of further investigation. There is also a planning application that has been submitted by SITA for a waste energy recovery facility (Severnside Energy Recovery Centre - ERC) to be located just north of the power station. The application is for a facility to process 400,000 tonnes of waste annually, generating up to 37MWe of electricity. The planning application states that “the plant would be ‘CHP enabled’”; whilst there are no current nearby consumers who could use waste-heat produced by the plant there are planned developments which could link in to the ERC at a future date. The plant will therefore have the capabilities to export heat inbuilt to allow for heat export in the future. It is worth assessing in more detail the cost and viability of supplying the Cribbs/ Patchway site with heat from this potential facility, certainly if granted planning permission. There is also a small landfill gas generator at Berwick Farm in Hallen, approximately 2km west of the site. This may be producing some waste heat, but due to its small scale is unlikely to be a viable source of waste heat for the site. In terms of large potential anchor loads, there is the existing Airbus factory at Filton which appears to have a significant heat load. Filton College and Southmead Hospital are also in close proximity and could be further potential anchor heat loads.</td>
</tr>
<tr>
<td>Other opportunities or constraints:</td>
<td>The site is immediately adjacent to the Charlton Hayes (formerly known as Northfield) development site, which lies immediately to the east and is a Local Plan allocation. This has consent for 2200 homes and a significant quantity of employment development. Therefore there is the potential for a district heating network which links the two development areas as well as supplying heat to Airbus and other nearby commercial customers. With the quantity of waste heat likely to be available from either Sea Bank power station, Severnside ERC or Rolls Royce it is also worth considering the viability of connecting the Cribbs/ Patchway areas (and associated potential anchor loads) with the East of Harry Stoke area (with associated other development and potential anchor loads) via a district heat network. This would create a wider strategic district heating area. Over time, depending on the amount of heat available, this could potentially grow to serve a substantial area of the Filton/ Patchway area of north Bristol with a corresponding significant potential for carbon reduction.</td>
</tr>
</tbody>
</table>
6 Analysis of Policy Options for the Core Strategy and LDF

6.1 Introduction
This section sets out an overview of the different policy options that the Climate Change PPS says local authorities should or can consider as part of developing their local development documents. We have aimed to provide an overview of each option, and a brief assessment of the potential benefits, risks and issues to the local authority involved with each option.

6.2 Overview of policy options

6.2.1 Policy Option 1: Develop area wide renewable energy targets

| Overview | This will mean setting an installed capacity target (in MW), and/or an energy generation target in GWh, or as a % of energy demand for, e.g. 2020. Targets should be set for both renewable electricity and heat. This is line with policies RE1 and RE3 in the draft Regional Spatial Strategy and the UK Renewable Energy Strategy. The target would be based on the evidence base set out in this report, in section 4. |
| Benefits | The target can act as a stimulus for local action and help develop “ownership” of what needs to happen at a local level if we are to meet the UK Government target of 15% of all our energy to come from renewable by 2015. |
| Risks and Issues | This target would need to be supported by local action and, strictly speaking, the delivery of this target is not within the control of the local authority and will therefore require the Council to play a broader role than just planning. The core strategy could be “home” for such a target; alternatively the target could be placed in a Climate Change Strategy which would have the benefit of providing a platform for the broader partnership action that is required to deliver some of the opportunities for developing low carbon and district heat opportunities. |
| Monitoring | Local authorities are already required to report on the national core output indicator E3: Renewable Energy Capacity and are requested to provide information to DECC on the planning and commissioning status of renewable energy projects as part of the Renewable Energy Planning Database (REPD). This will identify the installed capacity of larger renewable energy schemes that are not permitted development, and therefore will come to the local authority either as a planning application, or as a consultee. Monitoring the installed capacity of renewable energy systems that are permitted development, (e.g. micro-renewables) or do not require a planning application, or form part of a larger planning application for new development, is less straightforward. This data is currently collected by Regen SW, based on data from installers and grant making bodies, and individual local authorities are able to obtain this data from Regen SW to identify the existing installed capacity in their area. In future, it is hoped that with the implementation of the Renewable Heat Incentive (RHI) and the Feed-In Tariff (FIT), central registers from these initiatives could be used as the main source of data on micro-renewables. |

Suggested annual monitoring indicators for this policy option are:
- Installed capacity, in kWe, and kWt, for each technology type
- Annual energy output, in MWhe and MWh for each technology type
6.2.2 Policy Option 2: Develop area wide renewable and low carbon energy/ carbon targets for new development.

Overview

This option is also known as “Merton plus”. It would be a blanket policy that would apply to all developments over certain size thresholds. It could take the form of a certain % carbon dioxide emissions (due to energy consumption) reduction needing to be met from the use of Low and zero carbon energy technologies on or near site, or an expected amount of annual renewable energy generation, in kWh.

There could be different policy requirements for different scales of development. The requirements could also apply only to residential developments, non-residential developments or both. If both, the requirements may need to be different for the two sectors.

As mentioned in chapter 2, policy RE5 in the draft RSS already includes such a policy. The wording of this provides a target that local authorities can use in the interim period before their Development Plan Documents (DPDs) are fully adopted.

Benefits

The use of this sort of requirement can help to stimulate the use of low and zero carbon energy technologies. This is in contrast to Building Regulations (see under risks) which only requires a carbon reduction to be met, and does not distinguish between whether this is met by energy efficiency or the use of low and zero carbon energy options.

This type of requirement can be of benefit where it can be implemented in the near future, in the period before new Building Regulations in 2010 and 2013 start to have an impact on new development.

Risks and Issues

There is a considerable risk that, by the time the Core Strategy is adopted, such a policy will be made redundant by the proposed trajectory of the Building Regulations towards zero carbon. This could contravene the Climate Change PPS which states “controls under the planning, building control and other regulatory regimes should complement and not duplicate each other” (para. 11). In fact, the draft consultation on the update to the Climate Change PPS (released in March 2010), specifically states “The progressively demanding standards for CO2 emissions set through Building Regulations, together with the assessment of local opportunities for renewable and low carbon energy, will help drive greater use of decentralised energy. Targets for application across a whole local authority area which are designed to secure a minimum level of decentralised energy use in new development will be unnecessary when the proposed 2013 revisions to Part L of the Building Regulations (for both domestic and non-domestic buildings) are implemented”.

As set out in chapter 2, the current proposal for future Building Regulations is that these will require new dwellings to achieve a 70% reduction in regulated carbon dioxide emissions by 2016, with intermediate requirements of 25% in 2010 and 44% in 2013. For non-domestic buildings, the proposed trajectory (which is currently being consulted on) is for a 25% average CO2 reduction from 2010.

Applying such a requirement effectively is likely to require considerable input from development management staff at pre-application and determination stage to ensure that the requirements are complied with.

If the aim of such a policy is to stimulate the greater use of low and zero carbon energy options, the introduction of the Feed in Tariff in 2010, and the Renewable Heat Incentive in 2011 are likely to provide a similar, if not greater, level of targeted stimulus for renewable energy.

Monitoring

Some monitoring of the impact of the policy could be achieved by recording the details of proposals for renewable energy generation equipment submitted as part of planning applications. This will require case officers, or building control colleagues, to have sufficient knowledge to be able to assess whether the requirements have been complied with, from, for example, reference to the plans and Design and Access
However, this would not monitor the details of what was actually installed on new development, nor in which year. One way to do this would be to require developers/applicants, as a planning condition, to submit details of the “as-built” part L performance to the local authority for each dwelling or building\textsuperscript{29}, which should include the details of any low carbon or renewable energy technology used. Developers would need to carry out the part L compliance calculations anyway, to satisfy Building Regulations. A local authority officer would then need to discharge the condition and extract the relevant information on renewable energy systems for monitoring purposes. A risk of this approach is that it may place a significant additional workload on development management or building control officers in order to extract this information.

Suggested annual monitoring indicators for this policy option are:

- At the consenting stage, classification of applications receiving consent into whether they have complied fully, partially, or not at all with the policy requirements\textsuperscript{30}
- For built developments, the installed capacity, in kWe, and kWt, and predicted energy output for each technology type, from as-built part L reports

6.2.3 **Policy Option 3: Identify and promote areas for stand alone renewable energy development**

| Overview | This would involve identifying broad/strategic areas for certain types of renewable energy development, similar to the approach used for identifying areas for waste treatment and energy from waste facilities. This approach could be used for identifying wind power and/or biomass power generation opportunity areas. If areas are identified this does not mean that planning applications for other areas should be refused, but rather that applications within such strategic areas would be considered more sympathetically.

There is a basis for this approach set out in the Climate Change PPS. Furthermore, the consultation on a revised Climate Change PPS (March 2010), states, in policy LCF4.2, "Strategic sites which are central to delivering the local planning approach for decentralised energy should be allocated in the core strategy."

| Benefits | The advantage of such an option is that it can encourage a strategic approach to renewable energy development in certain areas, to maximise the resource potential, rather than relying on an ad hoc approach. It would also send a clear signal to renewable energy developers that they would have less risk of planning applications within those areas being refused consent, which may help stimulate developer interest.

| Risks and Issues | A risk with such an approach is that it could create a ransom situation between landowners and developers in such areas that might impede rather than facilitate development.

It would also require more detailed analysis of the impact and constraints of renewable energy development at such areas, as well as extensive consultation with industry and other stakeholders before such areas could be identified with confidence.

A further risk is that there may be significant public opposition to such an approach during consultation on the

\textsuperscript{29} If the local authority were acting as the Building Control Body (BCB) for that development, then they would receive this information anyway. However, in many cases the BCB may be an Approved Inspector, rather than the local authority, hence the need for a suitable planning condition.

\textsuperscript{30} The local authority may choose to still grant consent to schemes not in full compliance as it may give greater weight to delivery of other policy objectives. Alternatively, the applicant may be able to demonstrate that, for a given site, meeting the requirement would not be economically viable in terms of net residual land value, given other development and infrastructure costs and policy requirements for the site.
Core Strategy or on an allocations document due to concerns (which may be unfounded) over potential impact on residential amenity.

Monitoring

Renewable energy projects coming forward in these areas are likely to require planning consent, therefore they could be monitored through the consenting process and the discharge of associated planning conditions. As these schemes are most likely to be electricity generation only, or CHP, the installed capacity and generation from these schemes could be monitored through the DECC renewables database (through projects claiming ROCs), or, for smaller schemes of less than 5MWe, (such as community wind turbines) from any public database on Feed In Tariffs, if those schemes claim FIT rather than ROCs.

Suggested annual monitoring indicators for this policy option are:

- Number of planning applications for renewable energy coming forward in those areas, broken down by technology type and potential installed capacity, in kWe or kWt
- As for the above, but details of which schemes and technologies received planning consent
- Installed capacity and annual renewable energy generation from generators deployed in those areas

6.2.4 Policy Option 4: Develop renewable energy and/or carbon reduction requirements for strategic new development areas

Overview

These targets would either be in excess of any requirements of the Building Regulations in terms of the level of on-site carbon reduction required, or would require zero carbon to be achieved significantly ahead of the proposed timescale for zero carbon (for dwellings by 2016, non dwellings by 2019).

These requirements could be phrased in terms of either a reduction in regulated CO₂ emissions below current (2006) Building Regulations or an expected amount of annual renewable energy generation, in kWh.

Benefits

The use of such an approach can require developers to consider site wide solutions, such as district heating networks, from the outset of a development. This would require them to take a strategic view of how such a solution could be delivered at the masterplanning stage, rather than taking a phase by phase approach tailored to suit the carbon reduction trajectory of the Building Regulations.

Where viable this may create a springboard for involving ESCos to extend the network to also serve existing development which would maximise the potential for carbon savings and help in delivering the Council’s requirements for reducing carbon under NI 185 and 186. This could also improve the utilisation of any network and energy centre, thereby improving the economic viability of its operation.

Risks and Issues

As set out in the Climate Change PPS, any such requirements will need to be supported by a robust evidence which demonstrates the technical and economic viability of a range of site wide renewable and low carbon energy technologies to meet the targets on a development area or site specific basis. The new draft PPS1 Climate Change Supplement also states that, ‘such objectives should focus on opportunities at a scale which developers would not be able to realise on their own in relation to specific developments’. Without this the planning inspector may reject the targets or developers could challenge them during the planning process.

If the aim is to facilitate the development of district heating networks and CHP, there is also a risk that this approach may not be specific enough and developers may choose other technology solutions to meet the target. For more information on the potential content of these studies and associated costs please see Appendix 8.

Monitoring

The monitoring indicators will depend on the intent of the policy, i.e. whether it wanted to secure a CO₂ reduction only, or specifically wanted to secure generation from renewable and low carbon energy sources. Suggested
annual monitoring indicators for this policy option are:

- At the consenting stage, classification of applications receiving consent into whether they have complied fully, partially, or not at all with the policy requirements.

For built development phases:

- For a carbon reduction target, the % reduction in predicted regulated carbon emissions achieved below 2006 TER\(^{31}\) from as-built part L reports, for each dwelling and/or non-domestic building in the area.

- For a renewable energy target, as well as the above, the installed capacity, in kWe, and kWt, and predicted energy output for each technology type, from as-built part L reports.

6.2.5 Policy Option 5: Identify strategic district heating areas and set requirements for connection to district heating networks

Overview

The Climate Change PPS provides a legal basis for these types of requirement and states any requirements must be “fair and reasonable” and “evidence based and viable”. They could include the following requirements on developers:

- demonstrate how opportunities to accommodate a district heating solution have been maximised, taking into account density, mix of uses, layout & phasing, and either:

- include renewable or low carbon heating or CHP generation & distribution infrastructure onsite

- connect to an existing renewable or low carbon heat distribution network

- provide a heat distribution network as part of the development where there are firm proposals for renewable or low carbon heat generation or CHP and distribution in the locality within a reasonable time frame.

An Energy Opportunities Plan, which is a spatial representation of heat opportunities for the strategic areas, can be used in the Core Strategy or other DPDs to underpin such an approach. Any requirement for developments to consider having their own CHP or district heating facilities should only be applied to developments over a certain size. This is because they will need to be large enough to have a sufficient heat load, but also for residential developments there will need to be sufficient revenue for it to be viable for a third party ESCo to operate the network whilst still ensuring that heat prices and tariffs are competitive. There are no hard and fast rules or guidance on this size threshold. However, a minimum size for residential developments is likely to be around 100 dwellings\(^{32}\).

This is also in line with the Government’s draft National Planning Statement for Energy\(^{33}\), which requires energy developers, when developing thermal generation plant of 50MW and above, to consider the potential for CHP.

Benefits

The use of these requirements can provide certainty to an ESCo seeking to invest in a scheme that new developments will connect. This in turn would support the economic viability of the ESCo business model and the heat network.

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\(^{31}\) Target Emission Rate

\(^{32}\) For schemes of less than this size, with the exception of high density flats, the administrative and other fixed costs of maintaining a heat network might mean that the cost of providing heat to dwelling occupants, including an allowance for servicing and replacement costs, could be more than the alternative of each dwelling having its own gas boilers. This may make it difficult for developers to sell properties, but also could be regarded as an unfair burden on future occupants of the properties..

Potentially, as the energy infrastructure for a site develops, this may make the site and neighbouring areas potentially more attractive to developers as the energy infrastructure is developed, due to it providing them with an option to “plug in” to meet their future zero carbon requirements.

As with option 4, this approach can also play a key role in facilitating the development of wider district heating networks, serving existing and new development.

**Risks and Issues**

As with option 4, the use of this option would need a robust evidence base to demonstrate that this approach was technically and economically feasible in the areas identified. It is also likely to require considerable co-operation and partnership between key stakeholders who may be able to act as anchor heat loads and in order to develop the energy infrastructure required. The Council could play a key role in facilitating such an approach, but may not wish to. As well as through planning, some of the facilitating actions the Council could take, depending on the opportunities available within a given area, are as follows:

- Agree to connect to the network and procure heat (and possibly also electricity and cooling) for its existing buildings with large heat loads, such as schools, leisure centres, offices, and so on
- Agree to provide land to host an energy centre, or for strategic heat main routes
- Help fund and carry out upfront feasibility studies and technical and financial assessments
- Become involved in some way with the ownership and management of the network\(^{34}\), either as a purely public entity or as a public-private entity. This could have the benefit of enabling the scheme to access cheaper finance, such as prudential borrowing, as well as opening up eligibility to certain forms of grant funding
- Integrate the laying of heat mains with other infrastructure works that the Council has a degree of control over, such as highways improvements
- Act as an “honest broker” to engage with and secure commitment from other potential customers for a heat network, both public and private sector

The risks, or key issues, of taking such a pro-active approach are that:

- It will require a high level of corporate commitment, at the highest levels, for it to succeed
- It is likely to require significant upfront resources in terms of officer and project management time, as well as, depending on the role taken, consultant support
- Development of such networks is complex and capital intensive, and there is always the risk of project cost overruns, or that the financial performance is less than predicted

**Monitoring**

The implementation of the policy could be monitored at the planning application stage by the applicant providing details in the Design and Access Statement, and on plans, of how they intend to meet the policy requirement. At the design, and then construction stage, implementation could be monitored in a number of ways as follows:

If new developments are connecting to a heat network, or are using CHP on site, then, as for policy option 1, the as-built Part L reports should contain reference to this fact. The Council could set as a planning condition that a copy of the as-built part L compliance report be submitted to the Council for each building after construction.

Suggested annual monitoring indicators for this policy option are:

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\(^{34}\) This ownership could relate either to the energy generator, the distribution network or the supply of energy to end customers, or combinations of these
At the consenting stage, classification of applications receiving consent into whether they have complied fully, partially, or not at all with the policy requirements

For built developments, evidence of how many new dwellings and non-domestic buildings are connected to CHP and/or district heating from as-built part L reports

6.2.6 Policy Option 6: Establish a Carbon Buyout fund.

| Overview | This could support policy options 4 and 5. It would be a fund that developers could pay into if they were unable to meet the requirements in part or full, at a (likely fixed) price per tonne of carbon saved. After 2016 such a fund could be a mechanism that developers could use to meet their requirements for offsetting residual carbon emission to meet zero carbon standards for new dwellings, i.e. an Allowable Solutions fund (see chapter 2). |
| Benefits | The fund could then be used to support low carbon energy infrastructure, such as district heat networks on other sites, or to serve existing development. In particular, this could be used to provide gap funding to enable heat networks to be built that otherwise would not be cost effective. |
| Risks and Issues | The Council would need to administer the fund, and decide what to spend it on. A potential mechanism for this is Section 106, roof tax or CIL\textsuperscript{35}. Care would be needed to ensure that the fund was set at an appropriate level that led to meaningful carbon reduction but did not present an undue burden to developers, given that they will need to meet the additional costs of complying with future Building Regulations carbon reduction requirements. |
| Monitoring | Suggested annual monitoring indicators for this policy option are: |
| | • Total number of new developments each year (broken down into number of new dwellings, and new non-domestic floor area) paying into the fund |
| | • Total amount paid into the fund each year and average amount per new dwelling and per m\textsuperscript{2} of non-domestic building |
| | • Amount spent from the fund each year to support low carbon energy infrastructure, and details of type of infrastructure supported |
| | • Estimate of carbon savings achieved each year from supplying existing buildings from this infrastructure |

6.2.7 Policy Option 7: Area wide Sustainable Buildings Standards for new development

| Overview | This is a variant on option 2 where, instead of or in addition to carbon reduction targets, the Council would require developers to meet certain levels of the Code for Sustainable Homes (CfSH) standards for residential development and/or BREEAM for non-residential development. |
| Benefits | An advantage of this approach is that it can be easier to assess compliance, by attaching conditions that require copies of the CfSH or BREEAM certificates to be submitted to the case officer both prior to (design certificates) and post construction. Both of these schemes have a mandatory requirement for a post construction review before final certificates can be awarded. This approach also encourages delivery of sustainability standards broader than just energy and carbon. |

\textsuperscript{35} Depending on whether the Community Infrastructure Levy (CIL) is implemented
Although these are still likely to be the most significant components.

| Risks and Issues | Although there are examples of other local authorities who have set (or seek to set) area wide requirements of this sort, the Climate Change PPS specifically states (para. 32), that when setting such requirements, “planning authorities should focus on development area or site specific opportunities”. Therefore, given this, we would recommend that the Council should only consider this policy option for development areas or strategic sites, as per policy option 8, below.

Although it may be more straightforward to assess compliance post-consent by relying on the certification process, considerable time investment and some expertise will be required on the part of a case officer during pre-application discussion and when assessing the application to ensure that the requirements are likely to be met. This is because the interim CfSH and BREEAM assessments cannot be carried out until the detailed design stage, which is some time after planning consent is awarded. Time will also be required to discharge any planning conditions relating to the use of CfSH and BREEAM standards.

There is already the South Gloucestershire Design Checklist (August 2007) Supplementary Planning Document (SPD) in place which requires Code for Sustainable Homes Level 3 and BREEAM Very Good for major developments, depending on the nature of development, but it is understood that this is not supported by evidence in accordance with the PPS tests.

For small developments, the cost of carrying out a CfSH or BREEAM assessment can also be relatively significant. This can be mitigated by setting a threshold for the requirement. There is also an issue that meeting certain CfSH and/or BREEAM mandatory requirements may not be possible for all sites, or could present a significant cost. 36

Setting such standards would not improve CO₂ reductions further than the proposed trajectory for Building Regulations, as they will use the Building Regulations’ definition of zero carbon as their basis.

The Council will need to prepare a robust evidence to support any such requirements, to demonstrate that they are technically viable and do not represent an undue burden to developers. This is because although the future Building Regulations will make the carbon reduction elements of different Code and BREEAM levels mandatory, these Regulations, most likely, will not cover many of the broader aspects of Code and BREEAM that would be required to achieve different levels.

Whilst there are some published studies on the costs of meeting Code for Sustainable Homes levels37, these are generic in nature and therefore it is questionable as to whether they would stand up to scrutiny at public inquiry. There is also far less information available on the costs of meeting BREEAM standards. This reflects the far more diverse nature of non-domestic buildings.

| Monitoring | For any development to which the policy applied, the suggested annual monitoring indicators for this policy option are:

- At the consenting stage, classification of applications receiving consent into whether they have complied fully, partially, or not at all with the policy requirements
- Post construction, details of the Code level achieved for each dwelling, and/or the BREEAM standard

36 For example, the entry level requirement for CfSH on surface water runoff may require rainwater harvesting to be used on sites where infiltration and soakaways are not possible. For BREEAM, the mandatory ecology requirement on loss of ecological value may be particularly challenging for greenfield sites.

37 For example, see the Code for Sustainable Homes section of the CLG website http://www.communities.gov.uk/planningandbuilding/theenvironment/codesustainable1
6.2.8 Policy Option 8: Sustainable Buildings Standards for strategic new development areas

Overview
This is a variant on option 4 where, instead of or in addition to carbon reduction targets, the Council would require developers on a strategic site or in a development area to meet certain levels of the Code for Sustainable Homes standards for residential development and BREEAM for non-residential.

Benefits
As for policy option 7.

Risks and Issues
If the main objective is to reduce carbon emissions, or to encourage district heating networks, then this policy may not be specific enough. There is also a risk that if you wish to combine options 8 and 5, the additional costs in meeting the CfSH/ BREEAM standards may undermine the financial viability of any CHP/ district heating network.

As with option 4, a robust evidence would be required to support such requirements tailored to the strategic areas concerned. More detail on this is given in appendix 8.

There is the option of taking a hybrid approach which may overcome the above issue, whereby the overall standard to be met is set at a lower level, but a higher standard is set specifically for the carbon reduction element. For example, developments could be required to meet BREEAM Very Good overall, but to deliver the BREEAM Excellent mandatory carbon reduction target38, or to achieve Code for Sustainable Home level 4 overall, but to achieve the mandatory carbon reduction target for Code level 5. This would have the advantage of putting focus on the carbon reduction element of the standards, but retaining the benefit of using the Code/ BREEAM certification process to assist in assessing compliance. A disadvantage of this is the Code and BREEAM certificates don’t currently carry information on the level of carbon reduction achieved (or rather the number of credits achieved for the carbon reduction topic), therefore developers would need to submit additional information from their assessors to provide this evidence of compliance.

Monitoring
For any development areas to which the policy applied, the suggested annual monitoring indicators for this policy option are:

- At the consenting stage, classification of applications receiving consent into whether they have complied fully, partially, or not at all with the policy requirements
- Post construction, details of the Code level achieved for each dwelling, and/or the BREEAM standard achieved for each non-domestic building, based on the Code/ BREEAM certificates

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38 Strictly speaking, under BREEAM 2008, this is not a carbon reduction target per se, but an EPC rating, which can be equated to a carbon reduction when compared to a benchmark new building
7 Conclusions and Recommendations

7.1 Area wide renewable energy potential and targets
Based on the assessment set out in section 4, the potential for renewable electricity generation depends significantly on whether the currently consented Alveston wind park is built, and whether the South Gloucestershire area is chosen as a site for an energy from waste facility to treat the residual waste for the West of England sub-region (such as the Severnside ERC). Assuming that both of these are the case, then the evidence base supports an installed capacity target of 47MWe by 2020, equating to about 10% of South Gloucestershire’s projected electricity demand by 2020. The currently installed renewable electricity capacity, including the Alveston wind park, is just over 2% of the projected 2020 demand. If South Gloucestershire were not to host any energy from waste facilities, then a more appropriate target would be 42MWe or about 8% of the area’s projected electricity demand by 2020.

In terms of renewable heat, the evidence base suggests that a challenging but achievable target would be 69MWt of installed capacity by 2020, equating to about 8% of the area’s projected heat demand by 2020. This compares to a current level of installed renewable heat capacity of about 0.2% of the projected 2020 heat demand. Achieving this target will depend on the level of energy from waste and biomass CHP deployment in the area, and, crucially, the extent to which those facilities operate in CHP mode, supplying heat to buildings and industry. It will also depend on the Renewable Heat Incentive coming into force in 2011, at the tariff levels suggested in the UK Government consultation of February 2010. If, as described above, no energy from waste facilities were developed in the area, then a more appropriate target for renewable heat would be 59MWt by 2020, or about 6% of projected heat demand.

7.1.1 Onshore Wind
There is the potential for 84MW (forty two 2MW turbines) of onshore wind within South Gloucestershire, although the accessible resource may be substantially less (~20MW) due mainly to cumulative impacts. The council can encourage the uptake of wind in the following ways:

- Promote the identified wind opportunity areas included in Appendix 3
- Follow guidance within the PPS on Climate Change by encouraging appropriate wind development
- Investigate the feasibility and, if viable, develop wind power schemes on SGC owned/controlled land

7.1.2 Biomass
Assuming 10% of land graded 3 or 4 was to be utilised for growing biomass crops, there is potential fuel for up to 6MWe, and an additional 12MWt if operated as a CHP facility. There is also the potential for 0.8MWth wood fuel heating, based on improved woodland management of the existing 1000ha of woodland in South Gloucestershire. The council can encourage the uptake of biomass in the following ways:

- Encourage facilitate and develop biomass supply chains and their associated organisations
- Encourage facilitate and develop woodland management schemes which maximise the harvest of forest residues whilst minimising any ecological impacts for use on Council owned/managed woodland and other woodland in the area
- Follow guidance within the PPS on climate change by encouraging appropriate biomass developments
- Maximise the use of heat generated – see Section 7.4 for details of this
- Use biomass heating systems within Council buildings

39 The decrease in the % of electricity demand does not fall linearly with the reduction in installed MW of capacity, as the annual output per MW for energy from waste is higher than for some other technologies included in the resource assessment, (see appendix 2).
7.1.3 Energy from Waste
Assuming South Gloucestershire has a waste resource of 445,300tpa by 2020, of which 133,590tpa could be available for energy generation, there is the potential for 13.4MWe. Due to the anticipated biodegradable fraction of the waste by 2020, only about 35% of this would be considered renewable resulting in a potential renewable generation capacity of 4.7MWe. The council can maximise the potential for this in the following ways:

- Encourage facilitate and develop waste management plans which follow the waste hierarchy whilst maximising the waste utilised in energy generation schemes
- Follow guidance within the PPS on climate change by encouraging appropriate energy from waste schemes
- Maximise the use of heat generated – see Section 7.4 for details on the role and importance of wider corporate action in enabling district heating

7.1.4 Building Integrated Renewables (BIR)
The potential for BIR was estimated using a BIR uptake model which considered the costs, savings and financial incentives available. This estimated the potential for BIR electrical generation to be 13.2MWe, with the majority (90%) from solar PV. The thermal generation was estimated to be 47.2MW, with the majority (75%) from BIR biomass systems. The council can maximise this potential by:

- Encouraging, facilitating and developing BIR supply chains and their associated organisations
- Follow guidance within the PPS on climate change by encouraging appropriate BIR installations which fall outside the areas of permitted development (i.e. installations not requiring planning permission)
- Utilise BIR on council buildings
- Ensure sites & buildings are designed so as to maximise the potential output of micro renewables

7.2 Energy opportunities for strategic new development areas

7.2.1 Severnside & Rolls Royce Heat Potential
As covered in section 4, perhaps the greatest strategic opportunity for carbon reduction is the potential for a district heat network to supply heat from Severnside ERC and/or Rolls Royce to significant new development in the UWE / Harry Stoke and Cribbs/Patchway areas and potentially serving a wider catchment of existing buildings. We recommend that a more detailed assessment of the feasibility and economic viability of this should be fast tracked. This feasibility work could potentially be funded by the Carbon Trust under their strategic design advice programme, or the Department of Communities and Local Government (DCLG) Area Based Grant to assist in delivering the PPS1 Supplement. There may be additional sources of funding to support this that the Council will be aware of.

7.2.2 Cribbs / Patchway Locality
Should a Severnside ERC / Rolls Royce strategic heat network not be feasible, proposed development at Charlton Hayes & the Cribbs / Patchway New Neighbourhood would likely be large enough to support an energy centre and district heating network. The rich mix of industrial, commercial and community uses in the locality may also present further offsite heat customers. Therefore, we would recommend the Council work with local developers to facilitate a more detailed study to assess the viability of such a scheme.

7.2.3 North Fringe South Area
This area comprises proposed development at the East of Harry Stoke New Neighbourhood (2000 dwellings), Harry Stoke (1200 dwellings), Land East of Coldharbour Lane (500 dwellings), remaining tranches of Cheswick Village, the University of Western England and the Abbeywood Retail Park. The Lockleaze Regeneration Area should also be considered in any further investigation of the potential of this area. Hence similarly, should a Severnside ERC / Rolls Royce strategic heat network not be feasible, proposed development in the area represents a significant opportunity to support an energy centre and district heating network. The rich mix of commercial and community uses in the locality may also present further offsite heat customers.
AECOM

Therefore, we would recommend the Council work with local developers to facilitate a more detailed study to assess the viability of such a scheme.

7.2.4 North Yate New Neighbourhood
This strategic growth area is likely to be too far from Severnside ERC, North Fringe South Area or Cribbs/Patchway to consider including it as part of the same network. However, the site would likely be large enough to support its own energy centre and district heating network. Therefore, we would recommend the Council requests the developer produces a more detailed study to assess the viability of such a scheme.

7.3 Analysis of policy options to promote renewable and low carbon energy supply
As set out above, the South Gloucestershire area presents some significant opportunities for developing low carbon district heating networks to serve both new and existing buildings and industrial heat users. These opportunities exist because of:

- The proximity of the dense urban areas of North Bristol and varied land-use mix
- The industrial area of Avonmouth, with its existing and proposed sources of power generation and associated waste heat
- The potentially significant level of new development on strategic sites

The challenge is how to use policy and corporate action to shape the delivery of these opportunities. To do this, we conclude that the Council’s focus for policy making in the core strategy, and other local development documents, should be as set out below.

7.3.1 Policies for new development

- To develop policies and requirements for strategic new development areas that will encourage or require developers to connect to existing or proposed heat networks, or be designed to be able to connect in the future, if in the vicinity, or to develop their own energy centres and heat networks, where the scale of development, and the proximity of other heat loads, justifies this.
- We understand that the Council intend to set out some high level policies for these types of requirements in the core strategy. However the Council may also wish to set out more specific requirements for the strategic growth areas and guidance on how to comply with the policies in a site allocation DPD and/or in supplementary planning documents (SPDs) /framework masterplans.
- There are a number of policy options for setting a carbon reduction or renewable energy targets for strategic new development areas or sites, which can serve as a mechanism for delivering the above. One option is to require the sites to meet Code for Sustainable Homes or BREEAM standards, which have mandatory carbon reduction requirements within them. The advantage of requiring these standards is that they can be more straightforward for the local authority to monitor and assess compliance, making use of the Code and BREEAM certification process at design and post construction stage. However, if the main objective of the policy is to deliver carbon reduction and/or renewable energy deployment, rather than meeting wider sustainability standards, then a stand-alone carbon reduction or energy generation target can be as effective, without requiring a Code or BREEAM assessment to be carried out or a particular level to be met. This also reduces the associated costs for the developer in having these assessments completed.
- To use the Energy Opportunities Plan set out in appendix 5, as part of the core strategy or other LDDs, to identify spatial strategic district heating areas where policies of the sort described above would apply
- To develop policies that encourage or require the co-location and/or the supply of heat from any proposed thermal power generation (i.e. energy from waste or biomass) to serve existing and new buildings, developments and process heat use.
- We recommend that the Council should also consider developing a Carbon Buyout Fund and setting a requirement that developers should pay into this if they are unable to meet policy requirements in full for strategic sites. This fund could act as
the forerunner for Allowable Solutions payments from developers once the 2016 requirements for zero carbon homes come into force. The fund would be spent on supporting the delivery or expansion of local district heating infrastructure to reduce carbon emissions from existing homes and buildings.

- In terms of developing area wide "Merton" type targets for renewable and low carbon energy in new developments, we do not believe this will add much, if any, value to the proposed change to the Building Regulations in 2013, and therefore we do not recommend that the Council consider this type of policy

- In relation to district wide targets for Code for Sustainable Homes or BREEAM standards for new development, the current Climate Change PPS specifically steers away from this, and states that the focus of such requirements, if they are to be used, should be on development areas or site specific opportunities. This would need site-specific evidence-base studies to be completed and potentially defended at Core Strategy or other Local Development Framework Public Inquiries. For further information on what these would include and their costs, see Appendix 8.

These conclusions are in line with the consultation on draft replacement to the Climate Change PPS, which states (para. LCF7.1):

"Local requirements for decentralised energy should:

- relate to identified development areas or specific sites;
- be consistent with giving priority to energy efficiency measures; and,
- focus on opportunities at a scale which developers would not be able to realise on their own in relation to specific developments."

Some examples of good practice in relation to these types of policies are as follows:

**Barking and Dagenham town centre Area Action Plan (AAP).**

The Council has adopted in Policy BR1 of the Borough wide Development Policies a target of reducing the carbon emissions of new developments in the AAP area by 32% more than would be achieved by only following the Building Regulations requirements. The 32% reduction target is derived from a 10% reduction from requiring new developments to provide some on-site energy generation such as solar panels and wind turbines, and a further 22% savings that can be achieved using waste heat from Barking Power Station to fuel a combined heat and power system for the AAP area. Because this is a vital element of achieving the low carbon targets for the AAP area, policy BR2 of the Borough wide Development Policies requires all major developments in the AAP area to be compatible with the community heating network.


**Plymouth City Centre and University Area Action Plan (adopted April 2010)**

Policy CC5 in the AAP encourages larger developments to connect to any existing CHP or district heating networks, or to make an offsite contribution to such networks, as well as using heating and cooling systems that are compatible with any heating or cooling network. See [http://www.plymouth.gov.uk/mgInternet/Published/C00000254/M00004009/Al00042503/LocalDevelopmentFrameworkAdoptionoftheCityCentreandUniversityAreaActionPlanfullversion.pdf](http://www.plymouth.gov.uk/mgInternet/Published/C00000254/M00004009/Al00042503/LocalDevelopmentFrameworkAdoptionoftheCityCentreandUniversityAreaActionPlanfullversion.pdf)

The Planning Advisory Service also provides a useful guide to “Setting council-wide and site-specific or development area requirements”, on its web site, see: [http://www.pas.gov.uk/pas/core/page.do?pageld=94412](http://www.pas.gov.uk/pas/core/page.do?pageld=94412)
7.3.2 Development management
In the interim period before the core strategy is adopted it will be critical for the local authority to try to use what influence it has with developers on sites in the vicinity of the strategic growth areas to aid in the development of district heating networks. The Climate Change PPS can be used as a material consideration in this respect, as set out in paragraph 39, as follows:

“In the interim period before the development plan is updated to reflect the policies in this PPS, planning authorities should ensure proposed development is consistent with the policies in this PPS and avoid placing requirements on applicants that are inconsistent. Where proposals are inconsistent with the Key Planning Objectives set out in this PPS, consideration should be given to how proposals could be amended to make them acceptable or, where this is not practicable, to whether planning permission should be refused.”

7.3.3 Developing area wide renewable energy targets
This report has set out the potential accessible renewable energy resource in the South Gloucestershire area by 2020, for heat and electricity. If the Council wish to set area-wide renewable energy targets then this will require further discussion with stakeholders, both internal and external, to agree on the level of targets to be set. A “home” also needs to be found for these targets. Perhaps the most logical place for this is the Climate Change Strategy, rather than the Core Strategy or LDF, as this would provide broader corporate “ownership” of these targets, which is in keeping with the broader strategic action and partnership working that will be required to help meet such targets.

An example of district level renewable energy targets for heat and electricity is set out in the Core Strategy spatial options consultation, October 2009, for Bath and North East Somerset. See: 

7.4 The role and importance of wider corporate action in enabling district heating
As described in section 6, as well as planning, wider corporate action by the Council can have a key role to play in facilitating the delivery of low carbon district heating networks, including:

• Where possible, procure energy for its existing buildings with large heat loads, such as schools, leisure centres, offices, and so on from district heating networks so as to provide “anchor loads”

• Provision of land to host an energy centre, or for strategic heat main routes

• Assisting to fund and carry out upfront feasibility studies and technical and financial assessments

• Become involved in some way with the ownership and management of the network40, either as a purely public entity or as a public-private entity. Integrate the laying of heat mains with other infrastructure works that the Council has a degree of control over, such as highways improvements

• Act as an “honest broker” to engage with and secure commitment from other potential customers for a heat network, both public and private sector

• Procurement of waste treatment solutions

Appendix 7 sets out some examples and case studies of what other local authorities are doing to take forward the development of low carbon energy networks, including Coventry City, Nottinghamshire and Islington Councils.

Five critical success factors for these examples seem to be:

40 This ownership could relate either to the energy generator, the distribution network or the supply of energy to end customers, or combinations of these
1. A strong lead from one department in a local authority to provide a co-ordinating role and impetus for action with either in-house, or the ability to buy-in, technical and management capacity for project development

2. Strong local authority leverage and influence on the sites to be connected, either through land ownership, energy procurement, planning policy, or funding, or combinations of these

3. A strong partnership of stakeholders across the local authority with senior officer and member support, enabling the authority to use the full range of its corporate powers and responsibilities (covering finance, planning, housing, waste, energy procurement, highways, etc) to aid the development of the project

4. Partnerships with external stakeholders, such as Housing Associations, and other public bodies who may act as potential anchor heat loads, or play other key roles, such as funders or landowners

5. Secure capital grant funding (e.g. from HCA, regional development agencies or other sources) to cover the cost of enabling infrastructure, such as strategic heat mains. The process of pulling together bids for this funding also seems to have played a role as a catalyst to enable the project concept and necessary partnerships to form
8 Further Work and Next Steps to Enable District Heating

8.1 Further evidence base work and feasibility assessment
As mentioned in section 7, we recommend that a more detailed assessment of the feasibility and economic viability of district heating for the East of Harry Stoke and Cribbs/ Patchway strategic growth areas should be fast tracked. This study would have a number of aims, namely:

- To inform and support any planning policy requirements or development management discussions for the new development areas, in terms of the level of carbon reduction and/or requirements for connection that could be set
- To inform Council waste procurement strategy and the ongoing discussions with Severnside ERC

And, if any of the options appear viable, to provide a basis for:

- More detailed technical analysis and engagement with key stakeholders
- Securing capital funding
- Procuring further design services as well as, potentially, contracting services to begin construction of the district heating network.

A potential source of capital grant funding is the Home and Communities Agency (HCA) Low Carbon Infrastructure Fund. The study should consider the following aspects:

- The potential route and ballpark cost for any heat main backbone from Severnside ERC and Rolls Royce to the strategic areas, as well as for connection between the two growth areas. This should include a consideration of the location of public land ownership.
- Engage with key stakeholders in relation to the areas (e.g. Rolls Royce, UWE, Frenchay hospital, Airbus, Sea Bank power station, SITA, Filton College), who may be able to supply waste heat or to act as potential anchor heat load customers. The aim of engagement would be to establish the extent of stakeholder interest in being involved in a district heating network and their perspective on key barriers and incentives to their involvement
- The proposed build out rate and floor area schedule for each of the strategic growth areas, and adjoining development areas
- The heating (and cooling) demand and peak load of existing potential anchor loads, both public sector and private
- The existence of other potential anchor heat loads that could be identified from local knowledge and review of Local Land and Property Gazetteer (LLPG) and Valuation Office Agency (VOA) data
- The location of concentrations of social housing adjacent to the areas, by obtaining data from the key housing associations/ Registered Social Landlords (RSLs) in the area
- The potential for connection into adjoining areas of existing high density development. This should make use of the regional heat map to be developed by Regen SW by the end of March, 2010.
- The potential carbon savings that could be achieved from different district heating options both for the strategic growth areas as well as from connection into existing potential anchor heat loads and residential developments
- The financial performance of the different district heating options, (in terms of internal rate of return and net present value) considering:
  - Each growth area served by its own energy centre
  - Stand alone energy centre to serve both growth areas
  - One or both growth areas served by a heat main from Severnside ERC or Rolls Royce
• The financial assessment should include including consideration of:
  o Revenues from heat (and electricity if using CHP) sales
  o The potential benefit from the Renewable Heat Incentive and ROCs
  o The potential value from any Allowable Solutions and the contribution that this could make to funding the district heating infrastructure
  o The potential loss of revenue for the Severnside ERC plant from any reduced electricity output\textsuperscript{41}
  o Potential sites for locating any stand alone energy centres East of Harry Stoke and Cribbs/ Patchway

8.2 Wider corporate action to support district heating
We recommend that the first steps for the Council in this area, over the next 6-12 months, should be to:
• Nominate a department/ team to lead this activity
• Form a cross-departmental strategic district heating group to act as a steering group for taking this concept forward, with the appropriate senior level officer and member support
• Using the steering group, develop a Consultant’s brief for the technical / evidence base work described above, and to oversee the delivery of that work
• Assuming the outcomes of further study identify district heating as feasible, develop a bid for capital grant funding for enabling infrastructure if required

\textsuperscript{41} Assuming that the technology at this plant would be a steam turbine, there would be a small loss in electricity output from tapping off steam before it passes through the steam turbine, to feed into the heat network. For low pressure steam (1.5bar), feeding a low temperature heating network, the ratio of heat output to lost electricity output would be in the region of 8:1, i.e. 8 units of heat for every lost unit of electricity output (the so-called Z ratio).
Appendices

Appendix 1: Detailed assumptions for resource assessments for wind, biomass and energy from waste
Appendix 2: Capacity factors
Appendix 3: Outputs from wind power assessment
Appendix 4: Detailed assumptions for BIR uptake assessment
Appendix 5: Energy Opportunities Plan
Appendix 6: Energy opportunities for strategic growth areas
Appendix 7: Examples of other local authorities’ approaches to developing District Heat Networks
Appendix 8: Scope of work to prepare an evidence base for setting Sustainable Buildings Standards for strategic areas
Appendix 1: Detailed Assumptions for Resource Assessments for Wind, Biomass and Energy from Waste

Wind Power

The constraints that were used for assessing the potential wind power resource were as follows:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values used for assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind turbine size</td>
<td>2MW wind turbine, 80m hub height, blade diameter 80m, giving a tip height of 120m</td>
</tr>
<tr>
<td>Wind farm density</td>
<td>Assume maximum of 5 turbines per km², or 10MW per km²</td>
</tr>
<tr>
<td>Wind speed</td>
<td>Viable resource only in areas with annual average wind speed ≥ 6.0 m/s at 45m above ground level. Wind data taken from the BERR/NOABL database.</td>
</tr>
<tr>
<td>Exclusion areas</td>
<td>• 500m buffer from all residential dwellings (as identified on South Gloucestershire Council’s Local Land and Property Gazetteer)</td>
</tr>
<tr>
<td></td>
<td>• Topple distance + 10% (i.e. 132m) separation from all roads (as identified on OS MasterMap)</td>
</tr>
<tr>
<td></td>
<td>• For airports, used exclusion zones given by Civil Aviation Visual Flight Rules (VFR) maps, to avoid any potential interference with landing and takeoff flight paths</td>
</tr>
<tr>
<td></td>
<td>• Buffer of 3 x rotor diameter (240m) from National Grid overhead power lines</td>
</tr>
<tr>
<td></td>
<td>• Sites of historic interest (but no buffer applied)</td>
</tr>
<tr>
<td></td>
<td>• Woodland (but no buffer applied)</td>
</tr>
<tr>
<td></td>
<td>• As we only have the OS data layer for South Gloucestershire, we have excluded any wind potential within 500m of the area boundary</td>
</tr>
<tr>
<td>Landscape and conservation designations</td>
<td>Assumed no wind development in international or nationally designated areas, namely: National Parks, AONB, SSSI, SPAs, RAMSAR</td>
</tr>
</tbody>
</table>

In addition to the above constraints, we have also mapped the potential impact on the National Air Traffic Service (NATS) en route radar. NATS provide a data set which identifies whether there may be low, moderate or high impact on en route radar. We have mapped those areas with potential moderate and low impact, and we have assumed that those areas with potential high impact are unsuitable for wind power.

We have also mapped the location of existing, or consented wind farms, as these may have a bearing on potential resource when it comes to assessing the potential for cumulative impacts

Biomass

Key assumptions are as follows:

- Average yield for energy crops 12 oven dry tonnes (odt) per ha per annum. This is an average across SRC and miscanthus.
- 8000odt/ annum of fuel required per MWe of installed capacity. This is taken from the REVision 2010 study and assumes the use of a steam turbine
- Sustainable yield of wood fuel from woodland management 2odt/ha. Assume that only 25% of this can be harvested in practice, giving a combined yield of 0.5odt/ha of woodland. This is based on the REVision 2010 assumptions.
- 660odt/annum are required to support 1MWt of wood fuel heating. This is based on a capacity factor of 30% and an energy content for wood of 5,000kWh/odt.

- For 1MWe of electrical output, there is assumed to be 2MWt of heat output available, on the basis that the facility would be CHP enabled.

**Energy from Waste**

- 10,000 tonnes of waste required per MWe of installed capacity. This is taken from Revision 2010

- For 1MWe of electrical output, there is assumed to be 2MWt of heat output available, on the basis that the facility would be CHP enabled.
Appendix 2: Capacity Factors

Table 1: Renewable electricity capacity factors

<table>
<thead>
<tr>
<th>Technology</th>
<th>Capacity factor</th>
<th>Comments and source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onshore wind</td>
<td>0.27</td>
<td>DUKES 2009, figure for 2008¹</td>
</tr>
<tr>
<td>Biomass CHP from energy crops</td>
<td>0.9</td>
<td>typical for gas and coal fired power stations²</td>
</tr>
<tr>
<td>Energy from Waste</td>
<td>0.9</td>
<td>typical for gas and coal fired power stations</td>
</tr>
<tr>
<td>Landfill gas</td>
<td>0.60</td>
<td>DUKES 2009, figure for 2008</td>
</tr>
<tr>
<td>BIR electricity</td>
<td>0.1</td>
<td>this is an average for PV and micro and small wind</td>
</tr>
</tbody>
</table>

BIR = Building Integrated renewable energy generation, and covers PV and small wind

Table 2: Renewable heat generation capacity factors

<table>
<thead>
<tr>
<th>Technology</th>
<th>Capacity factor</th>
<th>Comments and source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat from CHP (from biomass or energy from waste, or from large scale heat only biomass or energy from waste)</td>
<td>0.5</td>
<td>This allows for the fact that not all of the waste heat can be usefully used 100% of the time</td>
</tr>
<tr>
<td>Solar water heating</td>
<td>0.07</td>
<td>From REVision 2020</td>
</tr>
<tr>
<td>Heat pumps and biomass boilers</td>
<td>0.2</td>
<td>This is a typical figure assuming the use of some thermal storage, and is an average across new build and existing buildings</td>
</tr>
</tbody>
</table>


The Markal energy model was used for the projections in the 2007 UK Energy White Paper
Appendix 3: Outputs from Wind Power Assessment

Mapping wind constraints

The map on the next page shows the wind power constraints map.
Identifying wind clusters

After mapping the constraints described in appendix 2, we grouped areas of least constraint into clusters, within which no polygon was more than 4 rotor diameters (320m) away from at least one other. Based on this, we identified 59 different clusters. These are shown in the table and figure below.

Once the clusters had been identified, we then applied a cull algorithm for cumulative impact as follows:

- Firstly, all existing or consented wind farms were assumed to exclude any other wind resource within 7km (which was the distance used for the REVision 2010 study).
- The cull routine then picked the largest remaining cluster and applied a 7km exclusion around that
- The routine then picked the next largest remaining cluster and applied the 7km exclusion, and continued to repeat this until no clusters were left

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Area (km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.29</td>
</tr>
<tr>
<td>2</td>
<td>0.77</td>
</tr>
<tr>
<td>3</td>
<td>0.60</td>
</tr>
<tr>
<td>4</td>
<td>0.50</td>
</tr>
<tr>
<td>5</td>
<td>0.47</td>
</tr>
<tr>
<td>6</td>
<td>0.44</td>
</tr>
<tr>
<td>7</td>
<td>0.43</td>
</tr>
<tr>
<td>8</td>
<td>0.42</td>
</tr>
<tr>
<td>9</td>
<td>0.34</td>
</tr>
<tr>
<td>10</td>
<td>0.30</td>
</tr>
<tr>
<td>11</td>
<td>0.28</td>
</tr>
<tr>
<td>12</td>
<td>0.25</td>
</tr>
<tr>
<td>13</td>
<td>0.21</td>
</tr>
<tr>
<td>14</td>
<td>0.16</td>
</tr>
<tr>
<td>15</td>
<td>0.16</td>
</tr>
<tr>
<td>16</td>
<td>0.15</td>
</tr>
<tr>
<td>17</td>
<td>0.15</td>
</tr>
<tr>
<td>18</td>
<td>0.15</td>
</tr>
<tr>
<td>19</td>
<td>0.14</td>
</tr>
<tr>
<td>20</td>
<td>0.12</td>
</tr>
<tr>
<td>21</td>
<td>0.11</td>
</tr>
<tr>
<td>22</td>
<td>0.10</td>
</tr>
<tr>
<td>23</td>
<td>0.09</td>
</tr>
<tr>
<td>24</td>
<td>0.08</td>
</tr>
<tr>
<td>25</td>
<td>0.07</td>
</tr>
<tr>
<td>26</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-----</td>
</tr>
<tr>
<td>27</td>
<td>0.07</td>
</tr>
<tr>
<td>28</td>
<td>0.07</td>
</tr>
<tr>
<td>29</td>
<td>0.07</td>
</tr>
<tr>
<td>30</td>
<td>0.06</td>
</tr>
<tr>
<td>31</td>
<td>0.05</td>
</tr>
<tr>
<td>32</td>
<td>0.04</td>
</tr>
<tr>
<td>33</td>
<td>0.04</td>
</tr>
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</tr>
<tr>
<td>35</td>
<td>0.03</td>
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<tr>
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<td>0.02</td>
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<td>37</td>
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<tr>
<td>39</td>
<td>0.01</td>
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<td>40</td>
<td>0.01</td>
</tr>
<tr>
<td>41</td>
<td>0.01</td>
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<tr>
<td>42</td>
<td>0.01</td>
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<tr>
<td>43</td>
<td>0.01</td>
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<tr>
<td>44</td>
<td>0.01</td>
</tr>
<tr>
<td>45</td>
<td>0.01</td>
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<tr>
<td>46</td>
<td>0.01</td>
</tr>
<tr>
<td>47</td>
<td>0.01</td>
</tr>
<tr>
<td>48</td>
<td>0.01</td>
</tr>
<tr>
<td>49</td>
<td>0.01</td>
</tr>
<tr>
<td>50</td>
<td>0.00</td>
</tr>
<tr>
<td>51</td>
<td>0.00</td>
</tr>
<tr>
<td>52</td>
<td>0.00</td>
</tr>
<tr>
<td>53</td>
<td>0.00</td>
</tr>
<tr>
<td>54</td>
<td>0.00</td>
</tr>
<tr>
<td>55</td>
<td>0.00</td>
</tr>
<tr>
<td>56</td>
<td>0.00</td>
</tr>
<tr>
<td>57</td>
<td>0.00</td>
</tr>
<tr>
<td>58</td>
<td>0.00</td>
</tr>
<tr>
<td>59</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8.46</strong></td>
</tr>
</tbody>
</table>

The map on the next page shows the location of each of the clusters.
Appendix 4: Detailed Assumptions for BIR Uptake Assessment

Existing residential and non-residential

**Existing dwellings**

Existing dwellings were split into a number of market subsectors, based on the splits shown in the table below.

<table>
<thead>
<tr>
<th></th>
<th>Existing Dwellings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tenure</strong></td>
<td></td>
</tr>
<tr>
<td>LA/ RSL</td>
<td>10%</td>
</tr>
<tr>
<td>Owner Occupier</td>
<td>80%</td>
</tr>
<tr>
<td>Private Landlord</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td></td>
</tr>
<tr>
<td>suburban</td>
<td>60%</td>
</tr>
<tr>
<td>rural</td>
<td>20%</td>
</tr>
<tr>
<td>urban</td>
<td>20%</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td></td>
</tr>
<tr>
<td>house</td>
<td>91%</td>
</tr>
<tr>
<td>flat</td>
<td>9%</td>
</tr>
<tr>
<td><strong>Gas Supply</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>89%</td>
</tr>
<tr>
<td>No</td>
<td>11%</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>Pre-1980</td>
<td>63%</td>
</tr>
<tr>
<td>Post-1980</td>
<td>37%</td>
</tr>
</tbody>
</table>

Total number of existing dwellings: 108,000

Unless otherwise stated, the number and split of existing dwellings was taken from the Stock survey final report (supplied by the Council) and the West of England Strategic Housing Market Assessment.

---

3. Taken from South Gloucestershire Council Rural Affordable Housing Strategy 2006/7-2009/10
4. Taken from fuel poverty data at district level
5. Taken from Private Sector House Condition Survey 2007
### Existing non-residential buildings

<table>
<thead>
<tr>
<th></th>
<th>On/off gas</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>On gas</td>
</tr>
<tr>
<td>Retail_Medium</td>
<td>250</td>
<td>80%</td>
</tr>
<tr>
<td>Office_Medium</td>
<td>127</td>
<td>80%</td>
</tr>
<tr>
<td>Warehouse_Medium</td>
<td>1900</td>
<td>80%</td>
</tr>
<tr>
<td>Factory_Medium</td>
<td>129</td>
<td>80%</td>
</tr>
<tr>
<td>Hospitality_Small</td>
<td>50</td>
<td>80%</td>
</tr>
<tr>
<td>Hospitality_Medium</td>
<td>50</td>
<td>80%</td>
</tr>
<tr>
<td>Hospitality_Large</td>
<td>10</td>
<td>0%</td>
</tr>
<tr>
<td>Health_Medium</td>
<td>27</td>
<td>80%</td>
</tr>
<tr>
<td>Health_Large</td>
<td>2</td>
<td>100%</td>
</tr>
<tr>
<td>School_Small</td>
<td>65</td>
<td>100%</td>
</tr>
<tr>
<td>School_Medium</td>
<td>65</td>
<td>80%</td>
</tr>
<tr>
<td>School_Large</td>
<td>66</td>
<td>80%</td>
</tr>
<tr>
<td>Leisure centre_Large</td>
<td>4</td>
<td>100%</td>
</tr>
<tr>
<td>Leisure centre pool_Large</td>
<td>8</td>
<td>100%</td>
</tr>
</tbody>
</table>

The estimates of typical floor areas for existing non-residential buildings, and the number of buildings in each class, were taken from ERIC data (public), and approximated from LLPG data (private).

### New build residential and non-residential

#### New build residential

It was assumed that for each new dwelling, developers would install the lowest capital cost technology which would enable them to meet the CO₂ reduction requirements for that given year. The current Part L proposed trajectory to zero carbon was assumed, although there is a high level of uncertainty around this relating to the 2010 Part L consultation.

A build out rate of 1,362 new dwellings per annum has been assumed, a figure supplied by the South Gloucestershire Council Principal Planning Officer (Dan Jones). Extra care homes are also included in this section.

Assumptions regarding costing, learning rates and development of various technologies were taken from the Element Energy Report and previous AECOM work for CLG, which fed into the consultation on a definition of zero carbon homes and non-domestic buildings. The new dwellings were split into the following categories:

---

6 As supplied by the Council
7 See “The UK Government consultation on a definition for Zero Carbon New Homes and Non-Domestic buildings”. The consultation document issued in December 2008 includes, in Annex E, a useful summary of the additional build cost of different technology options to achieve different levels of carbon reduction.
### New Dwellings

<table>
<thead>
<tr>
<th>Tenure</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA/ RSL</td>
<td>33%</td>
</tr>
<tr>
<td>Privately rented / owned</td>
<td>67%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Location</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>rural</td>
<td>30%</td>
</tr>
<tr>
<td>urban</td>
<td>70%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>house</td>
<td>52%</td>
</tr>
<tr>
<td>flat</td>
<td>48%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scale of development</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>31%</td>
</tr>
<tr>
<td>Large (100 dwellings or more)</td>
<td>69%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gas Supply</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>On gas</td>
<td>89%</td>
</tr>
<tr>
<td>Off gas</td>
<td>11%</td>
</tr>
</tbody>
</table>

| Total number of new dwellings per year | 1362 |

### New build non-residential

Unlike residential, there is no clear build-out rate or target growth per year in terms of non-residential buildings. Building rates and timings for public buildings (schools etc), were provided by the Council, although the information beyond 2012 was somewhat less certain. Refurbishments have not been included, as they are very small and are therefore unlikely to affect the overall findings. Based on the Council information for 2010 onwards, biomass has been assumed for all new/rebuilt schools regardless of Building Regulations. The Council has confirmed a couple of new libraries are to be built, but these have not been included due to their small size.

For employment sites, the development in recent years (2006-2009) has been projected forwards to 2020 (in terms of m² floorspace per annum of B1, B2 and B8 employment space). Where Building Regulations require carbon savings beyond that which is normally achievable by energy efficiency measures, it has been assumed that PV would be installed to provide renewable electricity. It was not possible to obtain any information regarding healthcare developments from the South Gloucestershire NHS Trust. A summary of the projected completed floor area each year is given in the table below:

---

8 Information provided directly by Council
9 Taken from South Gloucestershire Council Rural Affordable Housing Strategy 2006/7 – 2009/10
10 CLG completions data
11 Based on email on historical completions from Robert Wiley, South Gloucestershire council 28/01/10
12 Rural fuel poverty data - CSE
13 Information provided directly by Council
<table>
<thead>
<tr>
<th>Floor area of new non-residential build each year (m²)</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1 (offices)</td>
<td>12,436</td>
<td>12,436</td>
<td>12,436</td>
<td>12,436</td>
<td>12,436</td>
<td>12,436</td>
<td>12,436</td>
<td>12,436</td>
<td>12,436</td>
<td>12,436</td>
<td>12,436</td>
</tr>
<tr>
<td>B2 (light industry)</td>
<td>15,074</td>
<td>15,074</td>
<td>15,074</td>
<td>15,074</td>
<td>15,074</td>
<td>15,074</td>
<td>15,074</td>
<td>15,074</td>
<td>15,074</td>
<td>15,074</td>
<td>15,074</td>
</tr>
<tr>
<td>B8 (storage &amp; distribution)</td>
<td>5,851</td>
<td>5,851</td>
<td>5,851</td>
<td>5,851</td>
<td>5,851</td>
<td>5,851</td>
<td>5,851</td>
<td>5,851</td>
<td>5,851</td>
<td>5,851</td>
<td>5,851</td>
</tr>
<tr>
<td>Schools</td>
<td>14,949</td>
<td>3,000</td>
<td>1,700</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5,000</td>
<td>10,000</td>
<td>10,000</td>
<td>0</td>
<td>22,000</td>
</tr>
</tbody>
</table>
Appendix 5: Energy Opportunities
Plan
Appendix 6: Energy Opportunities for Strategic Growth Areas
<table>
<thead>
<tr>
<th>Reference</th>
<th>Strategic Growth Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>East of Taunton</td>
</tr>
<tr>
<td>B</td>
<td>North Yate</td>
</tr>
<tr>
<td>C</td>
<td>Cribbs / Patchway</td>
</tr>
</tbody>
</table>

**Legend**

- **Existing and Proposed Renewables**
  - Landfill Gas
  - Municipal and Industrial Waste
  - Wind Onshore [>0.5MW]
  - Potential Anchor Heat Loads / Sources
- **Council Properties [>300MWh/yr]**
  - Care Home
  - Community/Day Centre
  - Depot
  - Leisure Centre
  - Office
  - School [Primary]
  - School [Secondary]
  - Vinney Green Secure Unit
- **Strategic Growth Areas**
  - Local Plan
  - Mixed Use
  - Housing
  - Strategic Waste Areas of Search
  - Wind Resource [AAWS >6/s at 45m]

**Reference**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Anchor Heat Load Source</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Terrington Villes Ltd</td>
<td>DECC Ind, heat map</td>
</tr>
<tr>
<td>2</td>
<td>Towns Crofton Ltd</td>
<td>DECC Ind, heat map</td>
</tr>
<tr>
<td>3</td>
<td>University of the West England</td>
<td>DECC Ind, heat map</td>
</tr>
<tr>
<td>4</td>
<td>Cadbury Trebor Bassett</td>
<td>DECC Ind, heat map</td>
</tr>
<tr>
<td>5</td>
<td>Rolls-Royce PLC</td>
<td>DECC Ind, heat map</td>
</tr>
<tr>
<td>6</td>
<td>Aishai UK Ltd</td>
<td>DECC Ind, heat map</td>
</tr>
<tr>
<td>7</td>
<td>Southmead Hospital</td>
<td>ERIC data, DECC CHP register</td>
</tr>
<tr>
<td>8</td>
<td>Thornbury Hospital</td>
<td>ERIC data</td>
</tr>
<tr>
<td>9</td>
<td>Frenchay Hospital</td>
<td>ERIC data</td>
</tr>
<tr>
<td>10</td>
<td>Sea Bank Power Station</td>
<td>Google</td>
</tr>
<tr>
<td>11</td>
<td>Oldbury Power Station</td>
<td>Google</td>
</tr>
</tbody>
</table>

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Scale: 1:25,000 @ A3

GIS: Mark Morant

QA: Stephen Ward

Version: 3

Date: 04-03-2010

South Gloucestershire Council

AECOM
Appendix 7: Local Authority approaches to driving forwards renewable energy & district heating opportunities

(This document was prepared by South Gloucestershire Council and not by AECOM).

Introduction
To successfully deliver renewable energy and district heating, a range of measures are required from local authorities. These can be split into:

- Council policies: included within Core Strategies or within their own dedicated climate change/renewable energy/district heating strategy documents.
- Internal groups set-up within the council to drive forwards renewable energy and district heating initiatives plus ensuring relevant policies are understood within the council and externally plus ensuring they are monitored and adhered to.
- External groups: typically these are formed through the Local Strategic Partnership, these form a bridge between councils and other public/private organisations in their area to work together in strategy/policy formation and on specific projects.
- District heating groups: due to district heating schemes being fairly localised, the groups which are set up are quite specific and can sometimes include multiple councils.

The following research was carried out on what activities other local authorities have used, split into these four areas. The purpose of this was to learn from these other local authorities and provide evidence for developing South Gloucestershire Council’s own policies, strategies and groups/partnerships. The local authorities investigated were those suggested by members of South Gloucestershire Council, AECOM and those who attended a Councillor Briefing Session held on 2nd February, 2010.

Internal Groups
Local authorities have set up internal groups of council officers to ensure renewable energy and district heating issues are considered and opportunities realized in all local authority operations. These groups typically contain the following functions:

- Technical knowledge; often sourced from existing Sustainability/Energy teams, or potentially employed as new officers; these are members of the team who have the technical knowledge on renewable energy, waste and district heating. This should include understanding of the resource, technology and local issues.
- Planning: internal groups require strong links with planning, preferably with members of the various planning teams (such as Major Sites, Development Control, etc.) sitting within the team. This allows for an understanding of what developments are occurring in the area and the easy transfer of knowledge from technical staff to planning departments.
- Senior/Director Support: strategies/policies formed by internal groups also need support from senior members of staff/director(s) within the Council.
- Councillors?

Coventry City Council
Coventry City Council (CC) is in the process of setting up a carbon management board, which will contain a variety of different officers. This board will be assessing carbon footprints and measures to reduce these both directly for the service and also that of the wider community i.e. does the service have an effect on the public/business’s footprints and could it be run differently to reduce this. This has been made possible via the Carbon Trust’s Local Authority Carbon Management program14.

Islington Borough Council

---

Islington Borough Council (BC) has set up a Sustainability Team to drive forwards sustainable energy and district heating objectives. This group together with other members within the council set-out a 3 year action plan to tackle sustainable energy issues and aid them towards their Carbon Reduction Commitment (CRC) goals.

A monitoring group containing officers from the Sustainability Team and members of other departments will be given the task of ensuring these actions are successful. Some of the funding for these actions will come from Islington’s own £4million Climate Change Fund, which they have collected themselves to use on measures to mitigate/adapt to climate change. Other funding will likely be from the Mayor of London (GLA).

Southampton City Council
Southampton CC has set up an Energy Group which contains officers from housing, asset management, planning & sustainability. This group meets regularly and has a presence at most of the Policy Coordinators Group meetings, a strategic advisory group to chief officers.

This group forms many of the plans and strategies needed for implementing sustainable energy measures and are currently working on/releasing their Carbon Reduction Commitment (CRC) Action Plan which provides many of the actions and timescales the council is hoping to make in order to achieve high carbon savings.

Woking Borough Council
Woking BC have set up a Climate Change Working Group which contains officers and members from across the Council to monitor and drive forwards the actions listed above within the Climate Change Strategy. Their planning policy team is currently developing their evidence base together with Woking BC’s ESCo, who run their gas CHP plant and district heating network.

Local Strategic Partnerships
Local Strategic Partnerships (LSPs) allow for the formation of partnerships between local authorities and other businesses/organisations active in their area to drive forwards renewable energy and district heating. This will often involve reforming groups within the LSP to create dedicated groups for forming strategies and taking forwards specific tasks within the area.

Coventry City Council
The Coventry LSP brings together senior representatives from the community, private, public and voluntary sectors to work together to help improve the city as a place to live, work and play. They have included SCS 10 (“Making a Positive Environmental Contribution and Tackling Climate Change”) within their Coventry Partnership’s Community Cohesion Strategy. Many of the aims of this policy are being driven forwards by the Environment Them Group, a group within the LSP relaunched in September 2008 to tackle environmental matters.

The executive Environment Theme Group is adopting a citywide strategic overview of environmental matters. It will consist of leaders from across the City from all sectors, recognizing the strategic importance of effective environmental management to the city’s long term prosperity. The Environment Theme Group was given the following five key activities to progress:

- Innovative network of decentralised energy production + distribution: Funding of £1.6 million has recently been announced for district heat and power schemes for 154 homes in the WEHM area. The heat line from the existing (CHP?) plant at Whitley to the city centre is still awaiting further news on funding.
- Coventry to become a world leader in the development and deployment of low carbon vehicles: Funding for a trial of 110 low carbon vehicles has been made available.
- Coventry Bishopsgate – gateway to a low carbon future: Empty retail space in the City Centre is being investigated for a climate change centre; to date all agencies that have been visited are extremely supportive of the proposal, however no funding has been made available.
- Detailed aerial thermal survey of the City: The survey took place at the end of March in conditions outside the climatic and time limits set in the tender.

The group meets every quarter to discuss progress on these key activities plus other environmental issues which arise within Coventry. Their last meeting was in December 2009 however the above progress was given in their (publicly available) September 09 meeting\textsuperscript{15}. The council plays a supportive and advisory role, facilitating their meetings (via LSP funding) and helping to achieve their objectives; however they do not provide funding for the groups projects. They also enlisted the help of the Carbon Trust in funding the heat mapping project of the city.

\textit{Islington Borough Council}

Islington BC has set up a Climate Change Partnership as part of their LSP, where members who have signed up to it agree to reduce their CO\textsubscript{2} emissions by 15\% within three years. The council\'s Sustainability Team acts as a supporting role in this, providing them with advice and organising meetings to help them meet their carbon reduction goal.

\textit{Nottinghamshire County Council}

Nottinghamshire CC has worked closely with the Nottinghamshire (strategic) Partnership, comprising of key partner organisations covering district councils, the voluntary sector, the business community, primary care trusts, schools and further education colleges, police, fire, Connexions, Jobcentre Plus and many others. They have recently released Nottinghamshire\'s Sustainable Community Strategy\textsuperscript{16} which outlines how all local partners will work together to create a more sustainable community.

Within this strategy there are six key themes, the first of which is “A Greener Nottinghamshire”; this includes environmental quality, recycling, transport, housing, countryside and green space and CO\textsubscript{2} emissions. This sets the following RE and carbon reduction short term aims:

- Reduce per capita CO\textsubscript{2} emissions to 6.53 tonnes per head by 2010 –11 (NI 186)
- Implementing a Climate Change Strategy and Action Plan
- Target on fuel poverty for those on incomes based benefits living in homes with high energy efficiency rating to 34\% by 2010-11 (NI 187)
- Regional emissions of the 6 greenhouse gases contributing to climate change should be reduced by 12.5\% below the 1990 level by 2012.

The overall direction of this work is being driven by the Nottinghamshire Climate Change Partnership, whose steering group includes members from Nottinghamshire CC, Borough Councils, BT, Climate Action Networks Notts, EST Advice Centre, Environment Agency, Natural England and many more\textsuperscript{17}.

\textit{Southampton City Council}

Southampton CC has strong links with their LSP, which will shortly be merging their environmental and sustainability groups to form an energy partnership, which will form a key part of the LSP. This will include businesses and organisations from outside the Council as well as members from the Council\'s internal Energy Group.

\textsuperscript{15} - Coventry LSP\'s Environment Theme Group meeting notes and details -\url{http://www.coventrypartnership.com/Environment}

\textsuperscript{16} - Nottinghamshire\'s Sustainable Community Strategy 2010-2020 - \url{http://www.nottinghamshirepartnership.org.uk/index/sustainable-community-strategy/}

\textsuperscript{17} - List of those involved in Nottinghamshire\’s Climate Change Steering Group - see here for full list - \url{http://www.nottinghamshirepartnership.org.uk/index/meetings/climatechangepartnershipgroup/}
District Heating Partnerships
Some Local Authorities, or in some circumstances groups of, have formed District Heating groups and/or partnerships to specifically drive forwards district heating schemes. This has often involved organisations outside the council or, due to the nature of district heating schemes crossing local authority boundaries as part of an urban expansion or large new development, a collective of neighbouring councils and other associated organisations to ensure cohesive strategy and to combine resources.

Cranbrook - Exeter & East Devon Growth Point
Exeter and East Devon Growth Point is a partnership between East Devon District Council, Devon County Council, Exeter City Council and the Government. They are supported by the South West Regional Development Agency (RDA) and the Homes and Communities Agency (HCA) and work very closely with Teignbridge District Council.

The East Devon New Community Developers [Hallam Land Management, Persimmon Homes, Redrow Homes and Taylor Wimpey Homes] seek a cost neutral package to secure the objective of a CHP scheme. Simon Perks of Persimmon Homes, on behalf of the Consortium, noted: "Working towards the objective of incorporating CHP into the scheme is challenging, particularly in the current very difficult economic climate. Without the support of full grant monies to bridge the additional cost burden that we face it will simply not be achievable at this time. The partners remain hopeful that with the recent announcements we are now very close indeed to achieving this crucial objective and being able to launch Cranbrook".

The Growth Point and New Community Partners are exploring the possibility of providing a Combined Heat and Power (CHP), District Heating Scheme. A single energy centre will provide heat and power to the whole of Cranbrook and would be powered from locally-sourced, sustainable wood fuel. A planning application for this proposal was registered by East Devon District Council in December 2009.

This scheme would serve the whole community at Cranbrook and would mean reduced energy bills and hot water always available. It is estimated that the installation of biomass district heating and a CHP plant in the Growth Area to generate electricity and heat for the first 2900 homes at Cranbrook could provide an estimated 10,000 tonnes of CO2 saving a year.

A study by Element Energy identified there was a shortfall of approximately £8million required to set-up the district heating network. £2.5million of funding has come from Homes and Communities Agency's Low Carbon Infrastructure Fund18. Other funding has been secured from a range of private and public bodies, including the SW regional government and minor contributions from associated local authorities. The successful securing of funding will hopefully be announced in ~2 months.

An East Devon Delivery Team was set up to be a dedicated group of specialists who help to coordinate the delivery of the strategic developments. The team plays a key role in removing obstacles to delivery and acting as a central point of information for all projects; this includes facilitating meetings and enabling partnership working. Working with the local authority partners, the Delivery Team are running a studies programmes to provide an evidence base which will help to inform development across the whole of Exeter and East Devon. The group includes officers of East Devon DC as well as members of the development partners.

The team report directly to the Exeter and East Devon Growth Point Steering Board, which comprises of key representatives from all the partner organisations and a mixture of public and private organisations; this includes officers from all involved councils, the Environment Agency, the Highways Agency, Exeter Airport and a range of other private industries.

18 - Homes and Communities Agency's Low Carbon Infrastructure Fund: http://www.homesandcommunities.co.uk/low-carbon-infrastructure
The Delivery Team investigate and propose key steps in the delivery process and how funding is spent to ensure the schemes’ success, which is then presented to the steering group for advice. Once the steering group have agreed to the proposals, they are taking to the relevant local council (typically this will be East Devon DC) who are responsible for where Growth Point Funding is used. The council members will then agree with the proposals, or may have recommendations for change.

Since being awarded Growth Point Status in 2006, the Delivery Team have produced a Programme of Development (POD) to assist in identifying areas where additional funding could help unlock developments and accelerate delivery.

**Islington Borough Council**

Islington Borough Council (BC) will work together with Homes for Islington, Eaga, Roundwork London, Better Archway Forum, Archway Town Centre Management Group, and the Whittington Hospital to create the Archway Low Carbon Zone. Islington Council’s new Low Carbon Zone aims to cut carbon emissions in Archway by 20 per cent by 2012 – a doubling of current borough-wide targets. It will also cut local energy bills. The Archway Low Carbon Zone is 0.69km² and includes 700 buildings ranging from large emitters like the Whittington Hospital, and the council’s own estates, through to over 100 smaller businesses and over 500 private houses.

The Archway project forms one of ten low carbon neighbourhoods identified by Boris Johnson, the Mayor of London. Islington BC and awarded at least £200,000 to turn the Archway project into reality. As part of the winning project for Archway, Islington will be setting up a green ‘energy doctor’ programme which will offer residents an audit of how they can make their homes more energy efficient, do some of the easy to do measures such as installing energy efficient light bulbs and radiator panels and support the households to make the bigger changes they may wish to do.

As part of the archway project, the council is hoping to set up a gas-CHP district heating network. The feasibility studies for this are in the process of completion with funding for the generation plant and distribution network coming from the Mayor of London.

**Southampton City Council**

Southampton CC’s Energy Group together with Utilicom and other private and public organisations form the District Heating Steering Group. Utilicom act as a (commercial) ESCo and run the existing city centre district heating network. This was set-up via a cooperative agreement where Southampton CC didn’t have to take any financial risk or input.

Southampton CC have however recently agreed to invest a small amount of funding into the city centre district heating network to achieve something which Utilicom would not; precise details of this will shortly be announced on Southampton CC’s website.

**Renewable Energy and District Heating Strategies**

The following represents examples of what other supporting Strategies local authorities are using to drive forwards renewable energy and district heating in their areas.

**Southampton City Council**

Southampton CC’s “Energising Southampton” document sets out the sustainable energy vision for the city up to 2026. This sets out five key areas of focus:

- **Combined Heat and Power (CHP) based local energy network**: Expand the existing city centre scheme to include a larger city centre area. Utilising the opportunities presented by regeneration and development

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and by influencing the planning system a network of CHP district heating plants will be developed. These
will be centred around major new developments throughout the city which will be the catalysts for a network
of community energy schemes. This has the potential to lead to massive cuts in the city’s CO2 emissions.
Southampton City Council is already the UK leader for CHP district heating schemes. Its aim is to stay at the
forefront of this agenda and to use its considerable expertise in the subject to secure this programme of
work.

- **Establishment of a city energy services company:** The establishment of a Southampton city Energy
  Services Company (ESCO) will be investigated. This type of initiative would enable a proportion of the
  annual revenues resulting from renewable energy and energy efficiency measures to be reinvested in the
  city to benefit the local community. It will also stimulate the development of energy efficiency and renewable
  energy projects in the future by close working with other major energy users and suppliers in the city.

- **The development of renewable energy schemes:** A range of renewable energy technologies are
  available but not all are suited to the urban environment. The feasibility of the various options will be
  considered and the council will seek to promote and develop the most appropriate technology. The intention
  will be to integrate these to provide a locally based renewable energy network which could work in
  conjunction with CHP, and make best use of local conditions and markets.
  - Biomass boilers in schools: helping schools to manage their energy.
  - Exploring the development of a local biofuels supply chain to support these initiatives, for example,
    through use of crops for biofuels and managed coppice woodlands for wood fuels.
  - Installation of solar PV (photovoltaic) panels, solar thermal panels (that heat water rather than
    generate electricity) and microwind turbines targeted at those homes identified as being in areas of
    deprivation and fuel poverty.

- **Energy efficiency programmes:** There will be a programme of energy efficiency measures promoted to
  homes and businesses in Southampton. Building on the Carbon Trust carbon management programme the
  council will set an example to others in the reduction of emissions and the improvement of energy efficiency
  in the provision of its services.

- **Green infrastructure:** Green infrastructure plays an important role in adapting to and mitigating the effects
  of climate change through the enhancement of existing green areas and the creation of new ones. The council
  will promote the establishment of a network of ‘green roofs’ which will help to reduce the ‘heat island’
  effect and promote biodiversity whilst also bringing more green areas into the city centre.

**Birmingham City Council**

Birmingham CC, via their Climate Change and Sustainability team, together with interested organisations from
Birmingham’s LSP, has included the following actions within their emerging Sustainability Strategic Framework:

- Map skills needs and gaps to support behavioural change and drive delivery of a low carbon economy and
develop a plan to respond to identified gaps
- Identify, train and support climate change champions who will lead organisational change
- Develop local centres of excellence for climate change education and training.
- Improve the availability of advice and support to help businesses adapt and respond to climate change,
  including on new regulatory requirements and risk assessments and management
- Develop a new 10 year strategy to radically accelerate improvements to the thermal efficiency of the city’s
  homes
- Develop the Birmingham “Smart Home” through the Cisco Connected Urban Development programme to
  accelerate the creation of carbon neutral “eco-centre” neighbourhoods in the city
- Build on the outcome of pilot projects, to promote adoption of smart metering in the city’s homes, including
  private sector homes
- Accelerate improvements to the thermal efficiency of public sector homes beyond the current Decent
  Homes standard after 2010
• Work with local private finance institutions to develop financial packages and incentives for property owners and student/HMO landlords to invest in energy efficiency and renewable energy solutions
• Explore the scope to offer a subsidised energy rating to targeted homeowners and initiatives to help low income owners to improve energy efficiency.
• Set carbon emissions targets through revised planning guidance for all new developments including the Schools for the Future programme.
• Establish a Better Building Partnership, led by the private sector, to develop a support programme for the low carbon upgrading of non-domestic buildings and consider how climate change adaptation can be built into refurbishment plans.
• Encourage public sector agencies to set targets for improving the energy efficiency of their buildings and extending energy performance certificates to smaller buildings.
• Create opportunities for local distribution energy networks and decentralised energy infrastructure capacity and advice
• Secure provision of renewable energy into new developments and encourage renewable micro-generation in both new and existing buildings through revised planning guidance
• Improve the co-ordination of advice and information on funding for renewable energy installations
• Ensure there are appropriate institutional arrangements to help finance further opportunities for distribution energy, particularly community schemes that can help tackle fuel poverty
• Work with local universities to develop innovative approaches to energy production.

**Woking Borough Council**

Woking BC released their Climate Change Strategy in 2008 (see), which sets out their strategy of adaptation and mitigation to climate change up to 2013. This sets out actions and their respective actions and progress, which include:

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<th>Action</th>
<th>Timescale</th>
<th>Progress</th>
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<tr>
<td>Encourage the widespread adoption of higher standards promoting development that is more sustainable.</td>
<td>1-3 yrs</td>
<td>SCC has adopted C Plan software to assist with ensuring that new development has incorporated renewable energy technologies.</td>
</tr>
<tr>
<td>Incorporate planning policies which will ensure that new development in the Borough contributes to a reduction in CO2 equivalent emissions of greenhouse gases through the Local Development framework. The Core Strategy of the LDF is due for adoption in December 2010.</td>
<td>1-3 yrs</td>
<td>The Council seeks to achieve the Code for Sustainable Homes Level 3 for new residential developments from 2008; Code Level 4 from 2010; and seeks BREEAM “excellent” ratings for non residential developments.</td>
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<tr>
<td>Consider options for expansion of the decentralised energy system in Woking including CHP within the town centre and elsewhere within the Borough.</td>
<td>1-3 yrs</td>
<td></td>
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<tr>
<td>Continue to share information and carry out ‘peer support’ work with other local planning authorities as initiated through Beacon Status programmes.</td>
<td>1-5 yrs</td>
<td></td>
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<tr>
<td>Generate 20% of the Council’s electrical energy requirements from renewable sources by 2011</td>
<td>3-5 yrs</td>
<td>In 2007 the Council generated 11% of the Council’s electrical energy requirements from renewable energy sources.</td>
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<tr>
<td>Generate 100% of the Council’s</td>
<td>1-3 yrs</td>
<td>In 2006, the Council generated 94% of its</td>
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<th>Requirement</th>
<th>Duration</th>
<th>Notes</th>
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<tr>
<td>Achieve a year on year improvement of 3% per annum in energy efficiency of both Council owned and privately owned residential property using the Home Energy Conservation Act (HECA) methodology.</td>
<td>1-3 yrs</td>
<td>HECA requires every UK local authority with housing responsibilities to submit an energy conservation report to Government identifying measures that significantly improve the energy efficiency of all residential accommodation in their area; and to report on progress made in implementing the measures.</td>
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<tr>
<td>Reduce the carbon emissions of existing council owned housing through energy efficiency and renewable energy improvements above and beyond minimum requirements as set out in the Decent Homes Standard and by achieving an average SAP rating of 4 across all properties by 2012.</td>
<td>1-3 yrs</td>
<td>Using the findings from Oak Tree Road refurbishment project, assess current refurbishment specifications for Council owned housing to identify cost effective carbon reduction measures and develop suitable procurement channels for their implementation.</td>
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<tr>
<td>Adopt a low carbon homes programme based on the findings from the Oak Tree Road project. The aim will be for 1,000 homes in the borough to be classified as low carbon by 2012.</td>
<td>3-5 yrs</td>
<td>Consideration will be given to identifying a variety of measures to increase the installation of energy efficiency measures and microgeneration technologies in private homes including signposting to accredited installers and available funding.</td>
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| The Council will collaborate with four other Councils on an enhanced grants programme which will aim to:  
  - Bring 1000 'non-decent' properties up to a 'decent' standard through appropriate energy efficiency measures.  
  - Help 800 vulnerable residents to escape fuel poverty through income maximisation and better thermal efficiency, resulting in reduced bills.  
  - Bring 20% of non-decent Houses of Multiple Occupation up to a decent standard through energy measures. | 1-3 yrs  |                                                                                                                                 |
| Create a local carbon reduction fund to enable members of the community to offset their carbon emissions by contributing to local climate change projects. | 1-3 yrs  |                                                                                                                                 |
Appendix 8: Scope of Work to Prepare an Evidence Base for Setting Sustainable Buildings Standards for Strategic Areas

Introduction

The introduction of Sustainable Building Standards may assist local authorities with ensuring that new developments and refurbishments are designed so that their environmental impacts will be reduced. Aspects of sustainability other than purely carbon emissions are taken into consideration in such assessments so they may be useful across a number of policy areas.

The dominant assessment frameworks in the UK are currently the Code for Sustainable Homes (dwellings only) and BREEAM (non-domestic buildings). Both of these assessment methods assign a rating based on the performance scored in the following categories: Management, Health and Wellbeing, Energy, Surface Water Runoff (Code only), Transport (BREEAM only), Water, Materials, Waste, Ecology, and Pollution.

In general, the dominant cost in achieving higher Code standards (and to a lesser extent BREEAM) is the carbon reduction requirements. However, there are additional costs in achieving BREEAM and Code targets over and above the carbon reduction element. Therefore the scope of work below is split into two parts. Task A covers the work to assess the viability of achieving the mandatory carbon reduction requirements of the different levels of Code and BREEAM, covering both energy efficiency, and the use of renewable and low carbon energy technologies. Task B covers the work required to assess the wider viability of achieving a given Code or BREEAM level in full.

The scope of work set out below assumes that an Energy Opportunities Plan has been prepared that identifies the energy opportunities that may be present for any given strategic site, in particular the potential for low carbon district heating, given the proximity of suitable heat loads and/or heat sources. The intention is that the scope of work set out below would provide the Council with a basis for commissioning consultants to carry out this evidence base work.

Task A: assessing the viability, costs and benefits of meeting the carbon reduction requirements of the standards

A1. Quantify the nature of new development in each strategic site

The consultant should quantify, as far as is possible:

- The type of development to go on a site (i.e. residential, offices, retail, and so on), broken down by use class for non-dwellings (e.g. B1, B2, B8, etc.). For residential development, the consultant should also identify the typical density of development, or an estimate of the split of house types (e.g. between flats, terraced, semi-detached and detached)
- The quantities of each, in terms of total number of dwellings, or m² or ha of non-residential development, broken down by use class
- The estimated start date for construction on the site and build out rate

All of the above factors will affect the energy demand and hence potential carbon emissions from the site.

A2. Estimate the future energy demands for each site

This will be affected by the type and quantity of development, given by the above, and will include taking into account future energy efficiency standards. The consultant should provide year-on-year estimates of heat and electricity demand and carbon emissions over the period of interest for each strategic site, given as a total and broken down by building category.

A3. Test the feasibility and viability of targets for carbon reduction

The consultant should assess the level of carbon reduction that could be achieved for developments on the site by considering a range of carbon reduction levels together with the energy supply opportunities for the site. The targets should be expressed in line with Building Regulations methodology i.e. they should be expressed in terms of a percentage reduction in regulated carbon emissions below 2006 part L standards and incorporate ‘allowable solutions’ for reductions over and above the ‘carbon compliance’ level as proposed in the definition of zero carbon for future Building Regulations. In particular, the assessment should consider which technology combinations could deliver:
For the Code, a carbon reduction of 44% or 100%, to achieve the Code level 4 and 5 carbon reduction requirements\(^{21}\)

For BREEAM, an EPC rating of 40 (the requirement for BREEAM Excellent)

The costs and benefits of achieving the targets should be evaluated, primarily in terms of additional costs and benefits to developers and/or occupiers (if any). The consultant should also assess the technical and institutional feasibility of realising the energy opportunities, for example in terms of delivery timescales, planning constraints, technology risks, requirements for partnership working, the extent of interest or involvement from ESCOs, and any other areas that may positively or negatively affect feasibility.

**Indicative Cost: £3-5,000 per strategic site (excluding any costs to defend evidence at Examination in Public)**

**Task B: assess viability of meeting sustainability standards**

**B1. Assess opportunities and constraints for sustainability standards**

The consultant should carry out a review, specific to the local area, to determine the BREEAM and Code opportunities and constraints which may be presented by the locality, i.e. a high level pre-assessment. Some of the aspects which should be taken into consideration include:

- Are there large areas which are at high risk of flooding?
- Are the proposed development areas on greenfield or brownfield land?
- Is there a smoke control zone?
- Local recycling and composting collection services
- Suitability of soils for soakaways and other SUDs solutions
- Proportion of rural / urban areas (for BREEAM: rural are less likely to achieve transport credits)
- Public transport frequency & coverage (for BREEAM)

If it is thought that the local area provides significant benefits or constraints towards achieving BREEAM or Code, then this should be taken into consideration when setting any targets for each specific strategic site.

**B2. Assess feasibility and viability of different sustainability standards**

Referring to the output of the previous task, examine the remaining list of issues not specific to the site, and identify those which require the least effort or / and are the least complex to achieve. This activity should identify whether or not any particular performance level under the Standard(s) is not reasonably achievable for technical or practical reasons. As part of this exercise, consideration should be given to whether a particular issue would require the inclusion of building techniques, systems or equipment which would be particularly unusual for a building of the type being considered.

An important consideration is that the exercise needs to think carefully about examining a performance which only marginally achieves any particular performance as this will often not necessarily take into account the design flexibility required to deliver a development.

Once the technical feasibility of a standard (or range of standards) has been assessed, a financial analysis should be undertaken to identify the likely additional build cost associated with reaching a range of performance levels under the Standard(s). This should also draw on the information obtained from Task A, with regard to meeting the mandatory carbon reduction or EPC requirements of different levels of the standards. This exercise should identify the likely most cost effective route to achieving each performance level.

**Indicative Cost: £3-5,000 per strategic site (excluding any costs to defend evidence at Examination in Public)**

\(^{21}\) Note that the current proposal from CLG (as of March 2010) for updating the Code in the light of the definition of zero carbon homes is that the Code level 5 target of 100% reduction in regulated emissions will consist of a 70% reduction on or near site, (as per the UK Government definition for zero carbon new homes), with the other 30% reduction coming from Allowable Solutions.