2 Technical Summary

2.1 Introduction

This Staffordshire County-wide Renewable / Low Carbon Energy Study has been conducted by Camco on behalf of the authorities of Cannock Chase, East Staffordshire, Lichfield, Newcastle-under-Lyme, South Staffordshire, Stafford, Staffordshire Moorlands, Tamworth and Staffordshire County Council. The aim of the study is to inform the partner authorities about the technical potential, the viability and the deliverability of various renewable and low carbon options through the preparation of a local evidence base. This evidence base has been developed with the project steering group and included analysis of low carbon generation resource potential, investigation of suitable carbon standards for new development and the provision of recommendations for planning policy and delivery of related non-planning policy measures. The study also includes the detailed review of a number of major development sites within the study area to examine the viability and delivery implications for achieving higher carbon standards in practice. During the course of the study, a consultation workshop was held[3] to review and test the principal recommendations with a range of stakeholders.

The intention of this work is for the authorities to draw upon the relevant evidence and recommendations in preparing their Local Development Frameworks in accordance with the requirements of Planning Policy Statements 1 and 22 and the West Midlands Regional Spatial Strategy, which has since been revoked. In simple terms the national policy statements require authorities to develop planning policies to support the implementation low and zero carbon energy generation and for carbon standards in new development.

Urban development within the study area will have an influence on the delivery of low carbon technologies, not least because of increasing carbon standards set at a national level through Building Regulations. Within the study area there is anticipated to be general growth in housing and economic land development as well as numerous points of major development. This study has used development forecast data provided by the participating authorities which, in summary, expects provision of 57,000 dwellings between 2006 and 2026.

The previous Government announced in the policy statement Building a Greener Future[6] that all new homes in England and Wales must meet zero carbon standards by 2016, with interim reductions in CO_2 emissions of 25% below 2006 Building Regulations by 2010 and 44% by 2013. There are similar ambitions to achieve zero carbon standards for new non-domestic buildings by 2019, but the 'road-map' of how to get there is yet to be established. The government also identified that the planning system has a key role to play in supporting the delivery of this timetable for reducing carbon emissions from domestic and non-domestic buildings by providing evidence for, and helping to secure the delivery of, low or zero carbon development. Also at a national level, there is a strong policy drive to reduce carbon emissions (ultimately by 80% by 20250) and to rapidly increase renewable energy generation (to 15% of all energy, including that used for transport, by 2015)

At a West Midlands region level, the 2004 Energy Strategy[7] is somewhat out of step with national policy which has progressed rapidly in recent years. With the new government's drive away from regional to local governance this is unlikely to be addressed. It is understood that a regional low and zero carbon generation study relating to is likely to be undertaken in the near future, but we presume this will focus on assessing resource capacity rather than setting policy direction.

The move away from regional governance has also seen the recent revocation of the West Midlands Regional Spatial Strategy (RSS). Whilst the RSS is no longer in force to provide

[3] *18th March 2010, Cannock*
[6] *http://www.communities.gov.uk/archived/publications/planningandbuilding/buildinggreener*
[7] *http://www.wmro.org/standardTemplate.aspx/Home/OurResearch/Regionalpolicyandstrategy/ EnergyStrategyMonitoringReport2006*

policy direction, the latest documents provide sound supporting evidence for local authority policy, particularly as it has passed through a rigorous assessment process including public consultation.

The last proposed amendments to the RSS where captured in the Phase 2 review report[8] and this included a clear move towards stronger policies around climate change, to support the West Midlands becoming a low carbon region, and to specifically support the aim of achieving a 30% carbon reduction by 2020. The report highlighted action required including implementation of decentralising energy supply, waste reduction and reuse and retrofit of the existing housing stock. It also included obligations on Local Authorities policy and proposals (in their plans, strategies and programmes) with respect to climate change to:

- Ensure development is more sustainable
- Encourage sustainable construction
- Accelerate local development carbon targets ahead of national policy where there is local justification
- Setting renewable energy requirements on new development at a level that can be locally justified, with a suggested interim minimum 10% (of residual energy) for all "significant" development"
- Requiring Design and Access Statements to fully consider sustainability

This report has been structured to provide a logical narrative of the analysis leading to proposed targets and policy recommendations. The key findings from each stage are as follows:

2.2 Current and Future Energy Consumption

The first step to determine future energy consumption was an assessment of current and projected energy consumption and carbon emissions across the study area, broken down by authority and illustrated spatially where appropriate.

This found that overall energy consumption within the study area is approximately 26,000GWh per annum, creating 7.7 million tonnes CO_2 per annum[9] (equivalent to 1.5% of UK emissions and 18% of emissions in the West Midlands).

Energy consumption is dominated by heat and transport, whereas CO_2 emissions show electricity and heat to be broadly equal. Figure 2 shows that South Staffordshire is the highest energy consumer on a per capita basis, with Cannock Chase and Tamworth being significantly lower energy consumers than the other authorities.

Baseline consumption is likely to increase in the absence of policy levers. However, the Low Carbon Transition Plan[11] sets a path for lower consumption as a result of a series of binding and non-binding policy levers leading to the deployment of energy efficiency. We have taken the conclusions of recent studies into account for the implementation of energy efficiency measures in both residential and non-residential buildings within the study area. This forms the projected baseline consumption against which our calculations of renewable energy potential are measured.

[8] *West Midlands Regional Spatial Strategy Phase Two Revision of the Panel: September 2009, R2.1 and R2.7*
[9] *DECC NI186 CO_2 data for 2007*
[11] *The UK Low Carbon Transition Plan - National strategy for climate and energy, DECC, July 2009*

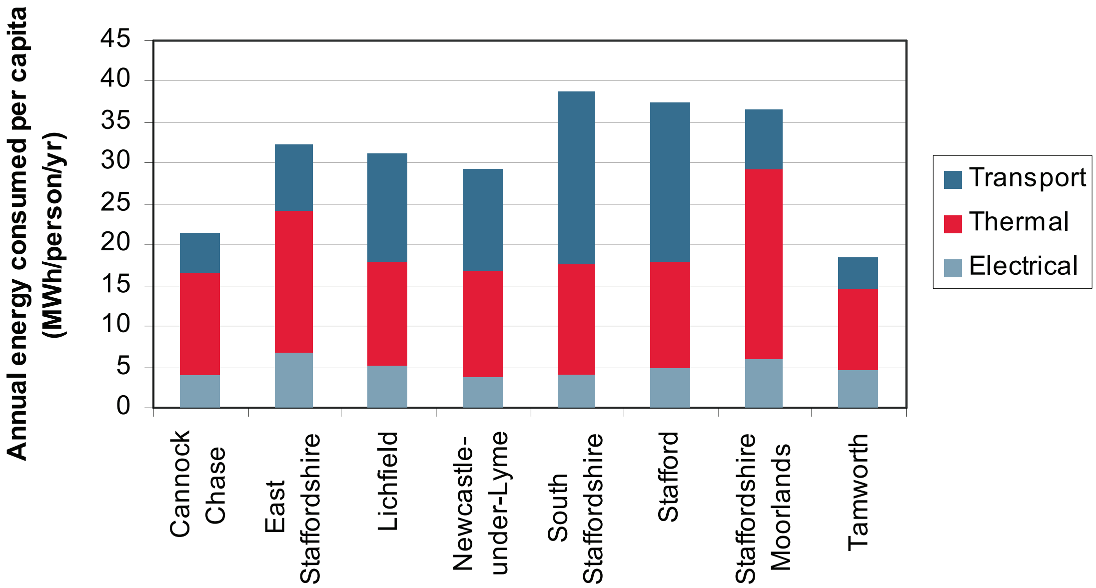

Figure 2 Annual per capita energy consumption in each of the authorities

2.3 Existing and Proposed Renewable Energy Capacity

Existing renewable energy capacity is described on the basis of evidence assembled for this study. It was found that the availability of information about existing or planned installations is patchy; however, the available information has been collated and assessed to provide reasonable estimates. Estimated installed capacity within the study area is around 88 mega-watts (MW), with an energy production equivalent of 400 Gigawatt hours (GWh), equating to 2.5% of energy demand across the study area (excluding transport).

A further 132 MW of capacity has also be identified as proposed, i.e. specific projects that have been indentified and are at some stage of the implementation process. This captures projects that will be at various stages of completion from those that are not fully formed proposals through to those that are constructed but not yet commissioned and operational. Biomass co-firing at Rugeley Power Station represents 72% of the current installed renewable energy capacity of the study area. Excluding Rugeley, existing installed renewable technologies provide 1.1% of the study area’s energy (excluding transport). The remainder is primarily made up from landfill gas within five of the eight authorities, with significant contributions from biomass combined heat and power (CHP) and biomass heating systems. It is important to note that the contribution that landfill gas can make will diminish over time as methane extraction from existing sites will reduce naturally, whilst new organic wastes are actively being diverted from landfill disposal. Investigations have shown that for planned projects, large wind (65 MW) and energy from waste facilities in South Staffordshire (29 MW) and Stafford (20 MW) represent the largest proposed schemes for the future. Wind energy and Energy from Waste dominate the ‘planned’ developments, accounting for 88% of the proposed new generation capacity.

2.4 Low carbon policies and targets

The study goes on to explore the relevant low carbon policies and targets at national, regional and local levels. These include both those related to renewable energy generally and low carbon development more specifically. Of particular relevance are the previous government’s

Low Carbon Transition Plan, the UK Renewable Energy Strategy, the proposed changes to building regulations setting out a path to zero carbon development, and local low carbon policies in place to date. Clearly, government policy will need to be kept under review to take account of the new administration's priorities.

The Low Carbon Transition Plan and the Renewable Energy Strategy[12] present significant policy intentions relevant to this study. However, there are a number of issues that remain unresolved or are likely to change in the near future, for example, the definition of zero carbon homes and the roadmap for zero carbon non-residential buildings.

A range of policy and market mechanisms are designed to provide much greater support for building integrated and other decentralised energy projects. These reduce the burden on developers of delivering low and zero carbon buildings as well as support stand-alone wind and biomass projects. These include new market mechanisms for renewable energy generation: the Feed-in Tariffs (FITs) for small scale renewable electricity generation (available from April 2010) and potentially the Renewable Heat Initiative (RHI) intended to commence April 2011. The Renewable Energy Strategy announced the establishment of the Office for Renewable Energy Deployment (ORED) which will drive delivery of the UK's targets.

It is worth noting that zero carbon homes (which are due to become a mainstream requirement from 2016) are predicted to make a relatively minor contribution to the UK's overall carbon reduction targets over the LDF plan period up to 2026. This highlights the importance of supporting low carbon decentralised renewable energy projects as these are expected to deliver greater gains than zero carbon development policies for new build development. Clearly, over a longer time period zero carbon development has a much greater impact as it continues to displace existing housing.

The approach to developing planning policy for renewable energy generation and low carbon development standards is going to continue to change. The new government has suggested it wishes to introduce significant change to the planning system with strong drive to towards locally developed policy. Regional Spatial Strategies have been revoked, removing the regional link to directing policy at a local level, which in most instances was simply reinforcing national requirements. Following earlier consultation Government is also considering options to creating a new single Climate Change Planning Policy Statement, intended to bring together Planning Policy Statements 1 and 22 (Climate Change and Renewable Energy). The published consultation document proposes moving away from locally specific carbon standards in recognition that these become obsolete as significantly higher standards post-2013 become enshrined in the Building Regulations. It also places a greater focus on developing local authority policy (supported by suitable evidence) that seeks to support the delivery of low carbon development solutions (and stand-alone low carbon energy generation), with spatial mapping having an important role, where it is relevant. The Planning Advisory Service intends to develop guidance to support implementation of the final planning statement, for which there is not yet a published timetable.

2.5 Zero Carbon definition

One key area of policy development for the built environment relates to the changing building regulations that are planned to deliver zero carbon homes from 2016.

The Government has set out its aspirations for improving the carbon performance of new developments into the future with its announcement of the tightening of Building Regulations for new homes along the following lines:

- 2010 – a 25% carbon reduction beyond current (2006) requirements;
- 2013 – a 44% carbon reduction beyond current (2006) requirements; and,

[12] *The UK Renewable Energy Strategy, DECC, July 2009*

- 2016 – zero carbon.

In the March 2008 budget the Government also announced its intention for all non-domestic buildings to be zero carbon by 2019.

The aspiration for zero carbon development by 2016 (or 2019) is very challenging. It will require innovative approaches from all quarters of development industry and the public sector. The latter will have an important role in establishing and delivering effective policy and providing the conditions and infrastructure to enable the standards to be delivered.

The government is proposing to introduce a more flexible definition of 'zero carbon' to guide building policy, but this has yet to be fully agreed. On going consultation on remaining elements of the definition are due to be resolved in 2010. In simple terms it will require the mitigation of all carbon (regulated and unregulated[13]) from a mixture of 'on-site' energy efficiency and renewable energy measures, together with a number of 'allowable solutions' which could include large scale 'off-site' renewable energy infrastructure, investment in energy efficiency measures for existing building stock, energy efficient white goods, building controls, and 'CO_2 offset' tariffs, e.g. towards a carbon investment fund. The latest policy developments suggest limiting the burden of 'on-site' measures, i.e. energy efficiency and directly connected low carbon energy supply, to 70% of the regulated carbon emissions whilst establishing a price cap for measures to address the remaining estimated carbon emissions.

Whilst it seems likely that the costs of achieving higher standards will ultimately be reflected in land values and sale prices, in the short term, the cost of delivering zero carbon could still place significant burden on developers. The study considers this further in terms of the assessment of additional costs of achieving carbon standards beyond the national zero carbon roadmap.

2.6 Renewable energy assessment

Within the study, an assessment of the potential for local renewable energy up to 2026 has been undertaken, looking at decentralised generation together with opportunities within future new development and retrofit within existing buildings. The methodology used is set out, including key assumptions and reference sources. The results of the analysis are presented for two future uptake scenarios: a Base Case and an Elevated Case. The work is presented for each Local Authority and in total for the study area, expressed in a range of ways including energy generated, percentage of heat and power needs that could be met from renewable sources and associated carbon reduction. Where possible the energy resources available within the study area are shown on an Energy Opportunities Map shown in Figure 1.

2.6.1 Wind Energy resources / potential

Wind energy resources and constraints have been mapped using GIS[14]. These have been overlaid to form composite maps of 'constrained' and 'less constrained' areas of possible development, which have then been used to calculate the technical potential for wind energy development. The geographic extent of this technical potential has been discounted to reflect development viability, as follows. Decentralised generation has been deemed viable for all sites with the potential for at least three large turbines where development costs and risks can

[13] Regulated emissions are those covered by Building Regulations, namely space heating, how water, lighting and ventilation; unregulated emissions are those not covered by Building Regulations, such as appliances and small power loads.
[14] Geographical Information Systems[15] The term Merchant wind power refers to the development of wind turbine(s) to power a dedicated on-site energy demand. Examples include Ecotricity's wind park at Ford, Dagenham.

potentially be justified. Smaller areas are deemed possible when developed on a 'merchant wind power'[15] or community basis, but only 10% of these sites are assumed to developable.

The technically viable sites are then cross-referenced with the average annual wind speed (since this is a critical factor for the viability of any wind farm site) to identify individual sites in the study which are perceived as optimal from a wind development perspective. The GIS mapping shows that the wind resource is generally reasonably good, with much of the study area experiencing average wind speeds[16] in excess of 6 ms^{-1} (metres per second) at a height of 45m above ground. This has been taken as a threshold of project viability. The best wind speeds are found largely in Staffordshire Moorlands, with other zones in Newcastle-under-Lyme, Stafford and Cannock Chase. However, many of the zones of high wind speed suffered from other physical or land designation constraints, thus largely presenting a mismatch between the critical factors of optimal wind speed and technically suitable land availability. Stafford and East Staffordshire appear to have the greatest wealth of technically viable land for large scale wind.

The analysis does not take into consideration the issues associated with cumulative landscape impact of multiple wind turbines. This is in agreement with DECC's recently published methodology[17] for estimating renewable energy targets at a regional level. It is impossible to understand the extent to which cumulative visual impact will affect an area without undertaking a specialist analysis. However, applying a rule of thumb buffer zone of 18 km[18] as a minimum spacing between wind farms would see the number of wind sites reduce to only four sites (23 wind turbines) within the entire study area.

Proximity to airports (e.g. Birmingham and East Midlands) means that some areas fall within zones of 'air safeguarding' consultation. Whilst this is not an 'absolute constraint' to the development of wind energy it is likely to have some influence on uptake. However, this is hard to predict since physical and communications interference will be assessed on a case by case basis. Furthermore, over the plan period it is anticipated that technical solutions could well overcome many concerns in this respect. For these reasons, in this study, the assessed potential for wind energy has not been artificially reduced to account for the potential impact of 'air safeguarding'.

2.6.2 Biomass resources / potential

To evaluate biomass resource potential, an assessment of resources provided by the Local Authorities, Department for Environment Food and Rural Affairs (Defra) and other cited sources was carried out. Resource uptake curves produced for the Department of Energy and Climate Change (DECC) were then applied to define the likely roll-out of generation capacity across the study area. The assessment covers a range of feed stocks available for bio-energy in the region including: Crop residues, Animal manures, Energy crops, Residues from forestry operations, Sawmill co-products, Waste components of biogenic origin (wood waste, food/kitchen waste, green waste, paper and card).

Just one scenario is assumed for biomass development, based on all of the available local biomass resource being used according to the market uptake curves. It is assumed that this increase in use of biomass resources also reflects an increase in planning approval rates for biomass power and Combined Heat and Power (CHP) projects, maturing of the supply chain and reduction / management of development and planning risk. The assessment also assumes that there is no net import of biomass fuels from beyond the study area. In practice

[15] The term Merchant wind power refers to the development of wind turbine(s) to power a dedicated on-site energy demand. Examples include Ecotricity's wind park at Ford, Dagenham.
[16] Annual Mean Wind Speed (using data from the national Windspeed Database, available at http://www.decc.gov.uk/en/windspeed/default.aspx/)
[17] Renewable and Low-carbon Energy Capacity Methodology - Methodology for the English Regions, DECC, January 2010
[18] Based upon the Sinclair-Thomas matrices (available at http://www.cprw.org.uk/wind/Hlords/hlapp1.htm), where visual impact is low/medium

there will be free transit into and out of the each authority and the study area as a whole but limiting the analysis to the study area boundary ensures the resource potential between neighbouring authorities is not double counted.

The conclusion from this work is that there is moderately good biomass resource in Lichfield, South Staffordshire and Stafford, which could potentially deliver an equivalent of approximately 6.3%, 4.6% and 4.4% of each district's energy needs by 2025/26. The estimated potential for East Staffordshire, Staffordshire Moorlands, Tamworth, Newcastle and Cannock Chase could deliver around 3.21%, 1.85%, 1.37%, 1.36% and 0.96% of their respective total energy demand by 2025/26.

2.6.3 Hydro power resources / potential

Overall the analysis has identified a limited potential from hydropower, from 17 sites across the study area resulting in an estimated potential of 1.5MW. The analysis has been restricted by the data available regarding the technical suitability of potential sites (largely existing weirs). However, the Environment Agency are currently conducting UK-wide study of hydropower resource potential, updating the previous reported work which should provide useful information which should be cross-referenced with the analysis conducted here. Presently the Agency can only confirm the existence of potential development sites (which are far more numerous than identified from other sources). These sites have been mapped in the Energy Opportunity Map for the study area and the recommendation is made for further site specific data to be sought from the Agency once their study is complete (no date was provided by the Agency).

2.6.4 New build development – low and zero carbon energy potential

The precise nature of the technical solutions for a specific new build development will vary depending on the scale, density and mix of the development. However, in order to assess the potential carbon standards that could be appropriate for the proposed new development in the study area, it is necessary to identify the characteristics of the developments and their suitability for installing low to zero carbon technologies. To enable this analysis each of the main development locations identified have been characterised into one of five development types: Urban infill; Rural infill; Settlement extension; Urban extension and Large urban extension/ New settlement. These are defined in section 8.

The smaller developments that constitute urban infill, rural infill and settlement extension are typically less appropriate for communal systems and therefore the optimum energy strategy will consist of highly energy efficient buildings with individual building integrated technologies (microgeneration). Urban extensions are at the larger size and density necessary to support a communal system in some or all of their development areas, and are large enough potentially to establish a long term power purchase or co-development agreement with a wind turbine developer or justify the creation of a local community owned Energy Services Company (ESCO) on behalf of the future development. It is deemed that projects over 1,000 dwellings could have the potential for communal heating and CHP serving the highest density zones. These are general rule of thumb categorisations used to support the analysis of the overall potential within future development.

Modelling of overall potential from new development has been carried out for two scenarios representing a range of carbon standards, called Base Case and Elevated Case:

- The Base Case assumes that all new developments meet the changing building regulations including achieving zero carbon through on site and off-site measures from 2016 for domestic development and 2019 for non-domestic development. Low and zero carbon technologies are applied based upon what is deemed suitable for the expected 'type' of development

- The Elevated Case assumes that larger developments have 20% renewables in the period 2010-2013. After this date, Code Level 4 (44% regulated carbon reduction) is assumed to be required under revised Building Regulations for residential schemes which will supersede the Elevated Case target. Large urban extensions / new settlements (residential & non-residential) are assumed to be able to achieve zero carbon as of 2013. The viability of meeting these advanced standards has been examined later in the study.

It was found that, on average, the renewable energy potential associated with meeting the changing building regulations is equivalent to meeting 1-2% of the Authorities' energy needs by 2025. This rises slightly for the Elevated Case but not dramatically, since all development is assumed to be zero carbon from 2016/2019.

2.6.5 Worked examples site energy strategies

Site energy strategies were applied to four development sites in the study area, to provide worked examples of a range of schemes which would achieve the range of carbon standards proposed in the target framework.

In summary the findings of this study were as follows:

- The larger developments present a greater range of options, whereas smaller developments are limited to using microgeneration technologies and particularly solar PV at the higher carbon standards
- The Feed-in Tariff (FIT) and potentially the Renewable Heat Incentive (RHI) can provide long term revenue for renewable energy installations and this can significantly influences capital costs, assuming the revenue can be capitalised[19]. In most cases, in fact, energy efficiency improvements cost more than renewable energy solutions, where they access capitalised tariffs. It is therefore important to include minimum energy efficiency standards within the local authority targets in order to secure the associated long term carbon reduction benefits from energy efficiency measures.
- For non-domestic developments, options for energy efficiency and renewable energy will vary greatly depending on the design and site constraints. Our analysis of Tipping St has shown biomass heating to be the most suitable option. However, this assumes biomass will be available and that the building is designed for a water based heating system (rather than air-conditioning or direct radiant heating).
- It is important for developers to consider energy efficiency and renewable energy targets from the earliest stage of development, to ensure designs can accommodate the most suitable sustainable energy solution.

Full details of the study are available in the Camco Report entitled "Staffordshire development-specific sustainable energy strategies – worked examples" from August 2010.

2.6.6 Existing built environment - resources / potential for low carbon generation

To assess the potential within the existing built environment, i.e. retrofit into existing buildings/land, within the study area, our assessment is informed by a recent study[20] commissioned by regional and central government, which considered the potential for microgeneration uptake in a number of regions. Our analysis takes, as our Base Case scenario, assessment of uptake based on the policy scenario of implementing both power and heat tariffs at a national level, which is currently in progress. These tariffs are likely to be the

[19] In principle this is possible as rights to future revenue can be re-assigned (away from the building owner) and evidence is already appearing of equipment suppliers offering capital cost reduction in lieu of rights to future revenue from the Feed-in Tariff
[20] The growth potential for Microgeneration in England, Wales and Scotland, Element Energy, June 2008

key drivers in this market sector. The Elevated Case is a 30% increase on the Base Case to reflect additional local and regional support programmes that could potentially be provided.

The analysis shows that by 2025, microgeneration can typically meet 2.1% to 3.9% of the authorities' heat and power energy in the base case, rising to 2.9% to 5.1% of energy in the Elevated Case scenario.

2.6.7 Bringing it all together: impact of development standards and decentralised generation and local targets

The overall results have then been benchmarked against a 'localised national target range' for 2020/21. This is explained in section 10, but in simple terms it is an attempt to isolate those parts of the national 15% delivery scenario (for 2020) which it would be reasonable to assume can be delivered within the study area and individual districts, for example, by excluding off-shore wind energy, renewable transport fuels and co-firing of renewable fuels. It is important to note that excluding co-firing of renewable fuels removes the impact of biomass co-firing at Rugeley Power Station; whilst this is clearly happening at a local level it would significantly distort the analysis for the Cannock Chase and the entire study area and so was excluded on this base.

The results, summarised in Figure 3, show that for the study area, under the Base Case scenario, i.e. the most conservative view of potential from the various energy supply options, around 8% of energy needs could be met from low carbon sources. This significantly exceeding the (2004) 4% target in current regional energy strategy, and falls between the lower and upper margins on the 'localised national target range' for 2020. The 8% figure is made up of a 5% contribution towards heating energy and 14% towards electricity consumption.

The results suggest that across the study area it will be necessary to establish policy that aims to deliver uptake rates similar to the Elevated Case scenario. Some authorities have a far greater potential available to them (relative to their energy demand) and this particularly relates to those that are less populated and more rural. Hence, it is important to consider district benchmarks and targets in the context of the county, with the expectation that some authorities should achieve targets (relative to district energy demand) greater than others. In other words, authority level targets (and subsequent policy) should be guided by the strategy to maximise the use of low carbon energy resources. Moreover, it is contended that those authorities with apparently limited potential should establish ambitious targets (relative to potential) to ensure they are making a effective contribution to the overall target.

With respect to individual authorities the analysis results suggest that East Staffordshire, Lichfield and Stafford have the potential to exceed the upper level of the 'localised national target' target of 10%, when considering the Elevated Case scenarios. South Staffordshire can be added to this group to achieve the lower range of the 'localised national target' of 7.5% based upon the Base Case scenario, but all other authorities would fail to do so. It should be noted that the results for most authorities are significantly influenced by the wind energy potential and the assumptions made within this part of the analysis.

The potential for Stafford far exceeds the other authorities and this is due to the concentration of both biomass and wind energy resources available. Wind energy, for example, makes up approximately 45% of the estimated resource for 2020.

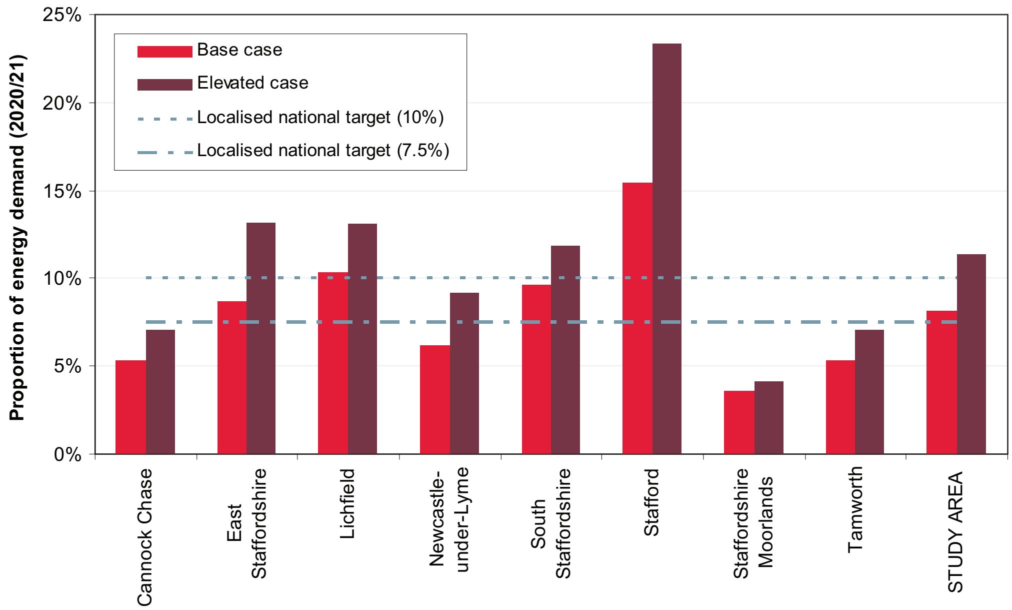

Figure 3 Benchmarking of supply potential for renewable energy

It is recommended that each authority establishes renewable energy targets with reference to the analysis of potential completed. In order for Staffordshire Moorlands, Tamworth, Newcastle, and Cannock to attempt to hit the localised national benchmarks it is necessary for each to establish targets, policies and support measures aimed at delivering the Elevated Case scenarios. For the other authorities, achieving targets at some level between the Base Case and Elevated scenarios, achieving the 7.5% targets as a minimum, would be reasonable. Achieving the Base Case potential in each district would enable the lower level benchmark to be achieved at the county level, but only by a small margin. It is important therefore that district targets are established in the context of the results achieved at a county level with some authorities going beyond Base Case potential to provide headroom above the lower benchmark at county level and to aspire towards the upper benchmark.

2.7 New build development –carbon standards

Within the study, options for setting development carbon standards have been considered. In particular the study looked at options for exceeding the nationally proposed zero carbon buildings roadmap, reviewing associated benefits including:

- achieving increased carbon reduction;
- supporting early action within the local development market; and;
- ensuring current opportunities for delivering lower carbon development are not lost particularly for major development sites
- developing locally developed delivery mechanisms, for example, a locally administered carbon investement fund, providing wider local carbon reduction benefits.

In summary, the areas of acceleration considered were:

- requiring 10% reduction in regulated and unregulated emissions through low or zero carbon energy measures in all development from 2010

- requiring 20% reduction in regulated and unregulated emissions through low or zero carbon energy supply in all development from 2013 and from 2010 where lower cost solutions are available
- requiring 44% reduction in regulated emissions from 2010 where lower cost solutions are available
- requiring the zero carbon standard to apply from 2013 where lower cost solutions are available

Based upon these points of acceleration (compared with the national zero carbon roadmap) a target framework has been established as shown in Table 1. The framework only relates to domestic development since the equivalent roadmap for for non-domestic development is still to be resolved. We do however recommend Low and Zero Carbon energy generation targets to be set for non-domestic targets and these are discussed later in this section.

Table 1. Proposed carbon standard framework

<table>
<tr><th rowspan="2">Period</th><th colspan="3">Domestic Reductions</th><th rowspan="2">Resulting range in carbon reduction (Regulated emission equivalent)</th></tr>
<tr><th>Regulated (vs Part L 2006)</th><th>Minimum Proportion of Low and Zero Carbon energy generation* (against total carbon**)</th><th>Un-regulated</th></tr>
<tr><td>2010-13</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Minimum***</td><td>25%</td><td>10%</td><td>0%</td><td>25 - 42%</td></tr>
<tr><td>Maximum$^{\chi}$</td><td>44%</td><td>20%</td><td>0%</td><td>44 -78%$^{\chi\chi}$</td></tr>
<tr><td>2013-16</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Minimum***</td><td>44%</td><td>20%</td><td>0%</td><td>44 -78%$^{\chi\chi}$</td></tr>
<tr><td>Maximum$^{\chi}$</td><td rowspan="4">100% (min. 70% Carbon compliance / 30% AS$^{\chi\chi\chi}$)</td><td rowspan="4">Obsolete at this carbon standard</td><td rowspan="4">100% (Carbon compliance or AS)</td><td rowspan="5">100 – 150%</td></tr>
<tr><td>2016-19</td></tr>
<tr><td>Minimum***</td></tr>
<tr><td>Maximum$^{\chi}$</td></tr>
<tr><td>Post 2019</td><td colspan="3">Zero Carbon</td></tr>
</table>

*Depending on the technical solutions this may not result in additional carbon savings.

** total carbon = 100% regulated plus 100% unregulated emissions

***To be applied to all housing development including those of less than 10 dwellings to ensure consistency with Code for Sustainable Homes

$^{\chi}$ where lower cost solutions are available because of technical opportunities, e.g. community heating, biomass heating / CHP, large wind energy, surplus heat or scale of the development

$^{\chi\chi}$ unlikely to result in this maximum level of savings since the 44% regulated emissions reduction target will typically require a significant element of renewable energy.

$^{\chi\chi\chi}$ AS = Allowable Solutions

The framework establishes standards in terms of carbon reduction and as such does not set specific standards for energy efficiency. This then leaves developers to decide on the appropriate mix of energy efficiency and low carbon energy supply (and allowable solutions when the target is zero carbon). Energy efficiency is typically the ‘least cost’ approach and will therefore form the cornerstone of most low carbon solutions. However, financial incentives such as the Feed-in Tariff and potential Renewable Heat Incentive may in future present a disincentive for energy efficiency. We recommend that compliance against the framework is monitored over time, specifically to enable Authorities to review whether minimum energy efficiency standards are required.

Within the framework, targets are set out on a minimum and maximum basis to provide a clear starting point for the developer and for the Planning Authority to review what the appropriate target should be in the case of each development that comes forward. The expectation would be that the planning policy for carbon targets would be framed such that the onus would be placed upon the developer to prove that the maximum targets were not viable, in the context of the specific carbon reduction solutions available. Thereafter the developer would be required to justify what target could be achieved between the minimum and maximum standards, with a backstop requirement of the minimum target[21]. In general the maximum target would apply

[21] *Applicants, as with other policy requirements, could challenge this but they would need to demonstrate clear evidence that the minimum requirement makes the specific development they propose unviable.*

only to those development sites that can viably incorporate lower cost solutions (which the Planning Authority would need to test), i.e.:

- Connecting to existing communal heating network near the development site or connect to appropriate source of surplus heat
- Developing communal heating and / or CHP on site, particularly where biomass can be the principal fuel
- Developing wind energy on or near to the development site, with a physical connection to the development site

This will tend to mean that the maximum targets are applied to larger, higher density developments, or where low cost generation opportunities exist.

For most development sites it will be technically possible to achieve a 20% reduction in total carbon (regulated and unregulated emissions) using on-site renewable technologies such as PV, solar water heating and biomass boilers.

For larger development (generally over 1,000 units) or where lower cost solutions are available, we are proposing that a target of meeting zero carbon standards ahead of 2016 is set, given that the Feed-in Tariff (FIT) and potentially the Renewable Heat Incentive (RHI) will support these schemes. At this scale it is considered that infrastructure could in many cases be supported through an Energy Services Company (ESCO).

To provide additional support for the achievement of the zero carbon standards, the development of local 'allowable solutions (AS)' strategies (and delivery vehicles) ahead of the 2016 milestone, should be considered. This will enable authorities to present the lowest cost options to the development sector at an early stage and also ensure that investment for local carbon reduction priorities, e.g. communal heating infrastructure or civic renewable energy projects, is captured at an early stage.

The development target framework only considers residential development. Since a zero carbon roadmap for non-domestic buildings does not exist, it is impossible to review opportunities for acceleration. Ahead of the conclusion of the on-going consultations in this area, it is recommended that 10% and 20% renewable / low carbon energy supply targets are established from 2010 and 2013 respectively, to be applied to regulated and unregulated emissions. We propose that unregulated emissions are calculated as fixed 20% of regulated emissions for all development types over 1,000m^2, for the reasons of simplicity in applying the policy.

Viability of the higher carbon standards needs to be considered on a local authority basis to ensure targets are generally deliverable in the local area without conflicting with other key objectives, such as the provision of housing, appropriate proportions of affordable housing and bringing forward economic development sites.

Each of the Planning Authorities needs to satisfy itself that the targets as they are framed are generally financially viable within the current development markets (and take account of possible future conditions). Carbon reduction targets cannot be considered in isolation and viability needs to be considered alongside viability of the development generally against prevailing market conditions, whilst considering additional costs such as including affordable homes, providing Section 106 contributions and delivering against other sustainability standards such as Lifetime Homes and the Code for Sustainable Homes / BREEAM.

Financial viability studies should consider both costs and potential incomes associated with low carbon development:

- Additional costs of energy efficiency measures
- Additional costs of renewable / low carbon supply technologies
- Additional maximum costs of Allowable Solutions

- Potential capitalised revenue from renewable energy tariffs
- Potential capital contribution for an Energy Services Company
- Potential additional sales / rental value.

All but the last item is analysed within the study and data is presented that could be used within viability studies. The results are not straightforward to interpret because of the wide range of technical solutions and the development types that need to be considered. However, overall the conclusions of the cost modelling suggest that when capitalisation of future revenues (ESCO arrangements and accessing renewable energy tariffs) are accounted for, the net additional costs for each point of acceleration are relatively small. The early provision of 'allowable solutions' will also significantly aid the introduction of a zero carbon standard.

2.8 Policy Recommendations

In summary our recommendations from the study are as follows:

Supporting low carbon new development

Recommendation 1: Require developers to achieve carbon reduction targets for new residential development as set out in the carbon targets framework. Require developers to achieve 10% and 20% renewable / low carbon energy supply targets from 2010 and 2013 respectively for all non-residential development types over 1,000m^2. Require developers to specifically consider the viability (technical and otherwise) of community heating, biomass heating, CHP and utilising surplus heat

Recommendation 2: Conduct development viability assessment(s) to collectively consider the full range of planning obligations, e.g. affordable homes, S106, alongside the estimated additional costs and potential incomes associated with achieving lower carbon development from ESCOs, capitalisation of the renewable energy tariffs and 'allowable solutions'.

Recommendation 3: Establish a Carbon Investment Fund mechanism, either unilaterally, or as a group, to support implementation of the 'allowable solutions', particularly aimed at supporting the proposed acceleration to the zero carbon standard to 2013 for major development.

Recommendation 4: Conduct high resolution heat mapping and feasibility analysis (including market assessment) of district heating and CHP around locations identified as having potential, i.e. where major development and/or surplus heat occur alongside existing high energy consumption intensity

Recommendation 5: Include infrastructure requirements for the low carbon energy technologies, particularly for district heating, where they are known within local infrastructure plans.

Low and zero carbon technology in decentralised and existing built environment applications

Recommendation 6: Provide specific planning protocols for those small-scale technologies not classed as Permitted Development.

Recommendation 7: Develop delivery and funding strategies to maximise the uptake of energy efficiency and low carbon energy supply in the existing built environment, notably around public sector buildings, managed housing and private sector housing. Where Carbon Investment Funds are developed these could support investment in this area.

Recommendation 8: Conduct analysis of the potential for fuel switching in off-gas grid locations, since this provides discrete opportunities for the switching to lower carbon fuels, particularly with the introduction of the Renewable Heat Incentive in 2011.

Decentralised generation

Recommendation 9: Develop clear criteria-based planning policy for the key stand-alone generation technologies, notably wind energy and bio-energy projects

Recommendation 10: Publish maps showing indicative areas of potential for wind energy development and spatial distribution of other resources and consider establishing appropriate targets at local authority level and/or study area/county level.

Recommendation 11: Conduct a review of the landscape impact from wind energy and biomass in sensitive parts of the study area

Recommendation 12: Review hydropower potential across the study area as and when site specific energy data is made available from the on-going Environment Agency UK-wide resource study

Other recommendations including compliance enforcement and monitoring

Recommendation 13: Publish, within each authority's LDF documents, summaries of the Low and Zero Carbon (LZC) energy resource potential and its potential long term contribution when benchmarking against national targets (and regional targets as and when they are updated to reflect national targets)

Recommendation 14: Establish a low carbon / renewable energy planning steering group with a remit covering the strategic issues raised within this study, and with representation from all authorities within the county (including the county council)

Recommendation 15: Establish a monitoring mechanism and conduct detailed annual monitoring of Low and Zero Carbon (LZC) energy uptake in each authority. LZC that is not subject to local planning approval will need a different approach from that development passing through local planning.

Recommendation 16: Establish expert low carbon planning assessment services, either on an individual Authority basis, or more cost effectively through shared-working across a number of authorities or across the county. Assessment services would need to adequately deal with the technical and financial aspects of low carbon standards, and enable critical negotiation around development as it comes forward.

Recommendation 17: Provide training for Development Control officers to assess energy and carbon reduction strategies. Implementation of this recommendation will need to be consistent with the recommendation to establish expert low carbon planning assessments services, which if conducted on a shared working basis, would externalise the approach to assessment.

Recommendation 18: Require suitable on-site carbon monitoring to be installed in major new development to enable assessment of long-term (carbon) performance compliance.

Recommendation 19: In supporting **Recommendation 18** conduct a study to establish a financial penalty scheme based upon a financial bond returnable on achievement of long term (carbon) performance compliance

Recommendation 20: Develop a county-wide biomass supply chain infrastructure strategy

2.9 Non-Planning Delivery Mechanisms

Planning policy is a core plank of local strategies for delivering decentralised energy generation and low carbon development. However, to maximise the chances of success it has to be married with a range of non-planning measures that should attempt to create local delivery leadership, promote demand for low carbon solutions and the supply of services required to deliver and facilitate the delivery of the key solutions, particularly:

- Low carbon infrastructure (communal heating networks), to enable connections between new development, the existing built environment, sources of surplus heat and waste-to-energy opportunities (incineration and anaerobic digestion of municipal waste)
- Develop a county-wide strategy for the development of the biomass fuel markets for heat and power generation:
  - Identifying the gaps in the existing supply chain and major opportunities for project development (district heating, new low carbon development, off-gas fuel switching)
  - Identifying funding opportunities
  - Implementing strategic market development interventions
- Provide or facilitate financing mechanisms that support delivery of local Allowable Solutions that enable zero carbon development to be achieved, whilst supporting priority carbon measures, e.g. communal heating infrastructure, civic renewable energy projects and carbon reduction measures in the existing built environment
- Provide or facilitate financing measures that facilitate access to capitalisation of the future revenues from energy generation or energy saving, e.g. Energy Services Company solutions, Renewable Tariff capitalisation and low interest loans, to minimise direct cost for land development
- Capture external grants such as innovation funding and structural funds. Examples of this include European Regional Development Funds, European Investment Bank investment development and planning funding for Ecotowns, and Housing Growth Funds from CLG that may be able to support the development of low carbon infrastructure projects in support of growth.

These issues are reviewed within the report.