Public Document Pack

Individual Decision

The attached report(s) will be taken as Individual Portfolio Member Decision(s) on:

Wednesday, 30th April, 2014

Ref:	Title	Portfolio Member(s)	Page No.
ID2759	**West Berkshire Climate Change Strategy and Action Plan**	Councillor Dominic Boeck	1 - 42
ID2760	**Renewable Energy Strategy & Recommendations: A Renewable Energy Target for West Berkshire**	Councillor Dominic Boeck	43 - 128

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Individual Executive Member Decision

Title of Report:	**West Berkshire Climate Change Strategy and Action Plan**
Report to be considered by:	Individual Executive Member Decision
Date on which Decision is to be taken:	30/04/2014
Forward Plan Ref:	ID2759

Purpose of Report:

To adopt the 'Climate Change Strategy' and Action Plan, a product of the Greener Sub-Partnership.

Recommended Action:

Consider the documents and approve them for adoption by West Berkshire Council.

Reason for decision to be taken:

This revised strategy embraces the many changes in policy and scientific thinking since the first attempt. It re-focuses the desire to tackle climate change, as demonstrated by the individual efforts of people, local communities, schools, businesses and organisations within West Berkshire, and puts in place a strategy that can affect change at a district level.

The Greener Sub-Partnership is keen for West Berkshire Council to acknowledge its recommendations and play a role in the implementation process by adopting the Strategy.

Other options considered:

No other options considered.

Key background documentation:

Nottingham Declaration 2006,
West Berkshire Climate Change Strategy & Action Plan,
West Berkshire Renewable Energy Strategy

Portfolio Member Details	
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Implications

Policy:	The production of a Strategy by the Greener sub-partnership may have implications for future council policy.
Financial:	The implementation of any element of the strategy will be determined by existing revenue and capital budgets.
Personnel:	N/A
Legal/Procurement:	Having a Climate Change Strategy is an obligation under the Nottingham Declaration*, of which the Council is a signatory. *The Nottingham declaration is now replaced by Climate Local, WBC is yet to commit to signing up to this.
Property:	N/A
Risk Management:	N/A

Is this item relevant to equality? Please tick relevant boxes	**Yes**	**No**
Does the policy affect service users, employees or the wider community and:		
• Is it likely to affect people with particular protected characteristics differently?	☐	☒
• Is it a major policy, significantly affecting how functions are delivered?	☐	☒
• Will the policy have a significant impact on how other organisations operate in terms of equality?	☐	☒
• Does the policy relate to functions that engagement has identified as being important to people with particular protected characteristics?	☐	☒
• Does the policy relate to an area with known inequalities?	☐	☒
Outcome (Where one or more 'Yes' boxes are ticked, the item is relevant to equality)		
Relevant to equality - Complete an EIA available at www.westberks.gov.uk/eia		☐
Not relevant to equality		☒

Consultation Responses

Members:

Leader of Council:	Councillor Gordon Lundie No Comment to make.
Overview & Scrutiny Management Commission Chairman:	Councillor Brian Bedwell No Comment to make.
Ward Members:	N/A
Opposition Spokesperson:	Councillor Royce Longton No Comment to make.
Local Stakeholders:	See formal consultation

Officers Consulted:	John Ashworth, Corporate Director – Environment Adrian Slaughter, Principal Energy Efficiency Officer
Trade Union:	Not consulted

Is this item subject to call-in?	Yes: ☒	No: ☐

If not subject to call-in please put a cross in the appropriate box:

The item is due to be referred to Council for final approval	☐
Delays in implementation could have serious financial implications for the Council	☐
Delays in implementation could compromise the Council's position	☐
Considered or reviewed by Overview and Scrutiny Management Commission or associated Task Groups within preceding six months	☐
Item is Urgent Key Decision	☐
Report is to note only	☐

Supporting Information

1. Background

1.1 West Berkshire Council support, and are members of, the Greener Sub-Partnership. This is a branch of the Local Strategic Partnership and is acknowledged as an important element of the Council's role in engaging with its residents, local business and voluntary sector.

1.2 The Greener Sub-Partnership is keen for West Berkshire Council to acknowledge its recommendations and play a role in the implementation process. This will be helpful in shaping local policy and give them a platform upon which to base future dialogue with interested parties.

2. History of the Climate Change Strategy

2.1 By signing the Nottingham Declaration* in October 2006, West Berkshire Council committed itself to producing a Climate Change Strategy. The purpose of the West Berkshire Climate Change Strategy and Action Plan was to fulfil this commitment and establish the framework for action in West Berkshire, to tackle the causes and consequences of climate change.

2.2 The previous version of the Climate Change Strategy, published in 2009, is outdated and in need of a refresh. There was a general consensus that the original document was too complex, detailed and lengthy, with a need to simplify the strategy. This 'refresh' overhauls the original strategy and changes the focus to much broader aspirations.

3. Equalities Impact Assessment Outcomes

3.1 No affected groups have been identified.

4. Conclusion

4.1 That West Berkshire Council adopts the Sub-Partnership's Climate Change Strategy and Action Plan.

*The Nottingham Declaration is now superseded by the Climate Local agreement, although WBC is still to sign up to this. The Climate Local agreement does not require Council's to have a Climate Change Strategy; however it does require Council's to set out an action plan of commitments.

Appendices

Appendix A - Climate Change Strategy - Final Version 2.0
Appendix B - CCS Action Plan Final Version

Climate Change Strategy

Document Control

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Version:	2.0	**Date Modified:**	3rd March 2014
Revision due			
Author:	Evangeline Wood	**Sign & Date:**	3rd March 2014
Owning Service	Culture and Environmental Protection		

Change History

Version	Date	Description	Change ID
0.2	17/02/2012	Additional case studies, review and re-formatting	EW
0.3	31/07/2012	Further review and update	EW
0.4	09/08/2012	Removal of case studies and refinement	EW
0.5	21/08/2012	Minor editing	EW
0.6	05/09/2012	Changes to case study and update of Local Authority emissions data	EW
0.7	06/11/2012	Reworking of Strategy	EW
0.8	03/04/2013	Changes as proposed 14/11/2012 and agreed 02/04/2013	EW
0.9	17/07/2013	Minor changes and updates due to new data	EW
1.0	05/08/20/13	Final changes as agreed at Greener Sub-Partnership meeting 02/08/13	EW
2.0	26/02/2014	Post Consultation changes	EW

West Berkshire PARTNERSHIP

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1. Foreword

Climate change is not just an environmental problem; it also has economic, social and health consequences. The generation and use of energy, transport, waste and the nature of our landscapes are all implicated.

This Strategy has been produced by the West Berkshire Partnership's Greener Sub-partnership. It shapes a plan with our partners and local communities to address the causes and impacts of climate change. This strategy takes a lead from the West Berkshire Partnership's Sustainable Communities Strategy, "*A Breath of Fresh Air*". Furthermore, national government is rolling out a series of programmes to be the 'greenest government ever', with the Climate Change Act (CCA) 2008 and subsequent Carbon Plans at its heart, this document needs to reflect our national ambitions.

This revised strategy embraces the many changes in policy and scientific thinking since the first attempt. It re-focuses the desire to tackle climate change, as demonstrated by the individual efforts of people, local communities, schools, businesses and organisations within West Berkshire, and puts in place a strategy that can affect change at a district level.

The challenge ahead is not a small one. In the 2011 Department of Energy and Climate Change (DECC) statistics, West Berkshire as a district was responsible for emitting 1,111,290 tonnes of carbon dioxide. On an end-user basis, with a population estimated at 154,100 people (2011), this works out at 7.2 tonnes of carbon dioxide per person per annum. Revised figures for the years 2005 to 2011 indicate there has been an 18% reduction in West Berkshire's carbon dioxide emissions per capita since 2005, despite an increase in overall population. This may be indicative of the improved efficiency of housing stock, vehicles and domestic appliances; and behaviour change over this period due to the economic recession and people becoming more energy-aware.

This Strategy sets out our vision of how West Berkshire as a district can improve its performance and play an exemplary role in the national effort to tackle climate change, and how the West Berkshire Partnership and its individual partner organisations can support this. Furthermore, this document will provide a structure for setting a context for the Green Deal and 'Big Society' proposed by national government.

Our approach towards tackling climate change will undoubtedly alter in the years to come as new information, resources and methods become available. This strategy nevertheless fulfils an important step in establishing a framework for action.

It is therefore important that the strategy addresses the right issues, identifies all the opportunities available, is realistic in its expectations, and is supported by you, your organisation and community.

Cllr Graham Pask
Chairman
West Berkshire Partnership

Cllr Dominic Boeck
Chairman
Greener Sub-Partnership

1. Introduction

1.1. *Purpose*

1.2. The purpose of the West Berkshire Climate Change Strategy (WBCCS) is to establish a framework for action in West Berkshire which will allow the West Berkshire Partnership (WBP) to tackle the causes and consequences of climate change. See Appendix A1 for details of why West Berkshire needs to take action and Appendix A2 for details on the possible impacts on West Berkshire.

1.3. *Background*

1.4. In 2008 the WBP published the West Berkshire Sustainable Community Strategy 'A Breath of Fresh Air.[1] Through regular scrutiny and update 'A Breath of Fresh Air' remains the Partnership's vision and statement of its aims for the West Berkshire environment through to 2026.

1.5. In 2009, the first Climate Change Strategy (CCS) was published to deliver the 'greener' aims in 'A Breath of Fresh Air'. Due to changes in Government policy and its approach to partnership working, a number of the targets in the first CCS are in need of review.

1.6. There was a general consensus that the original document was too complex, detailed and lengthy, with a need to simplify the strategy. This 'refresh' radically overhauls the original strategy and changes the focus to much broader aspirations.

1.7. The WBCCS is a non-statutory document and therefore does not itself have specific powers.

2. Vision

2.1. To reduce the carbon emissions of the district, by at least 17% by 2020 on 2005 levels*#, to mitigate against future climate change, whilst maintaining a strong economy by building in resilience (adaptation) to climate change.

2.2. To see the latest figures for West Berkshire, see Appendix A3.

3. Priorities

3.1. The CCS has been structured to compliment the related priority outcomes of the aforementioned Sustainable Community Strategy. Namely:

- To increase awareness of 'green' issues and how communities can contribute;
- To increase the use of renewable energy within the district;
- To become more efficient with the water we use;
- To reduce the level of commercial and municipal waste that is produced and increase the level of recycling in West Berkshire;

[1] West Berkshire Partnership, 2011: *Sustainable Community Strategy – A Breath of Fresh Air* http://www.westberkshirepartnership.org/index.aspx?articleid=15225

* Emissions are deemed as the district's per capita emissions, as outlined in DECCs annual release of Emissions within the Scope of influence of Local Authorities[11]

This target is effectively the same percentage decrease as the UK national target of a reduction of 34% on 1990 levels by 2020. A baseline of 2005 is used because DECC regional data is corrected with each release as far back as 2005, making data from previous years incomparable.

- To increase the proportion of food that is consumed from local sources;
- To conserve and enhance the environmental and historical characteristics of the area;
- To increase the use of sustainable transport.

4. Actions

4.1. To set the framework within which the WBP can achieve its collective and individual partner aims and objectives.

4.2. It is therefore intended to influence a very broad range of activity, including how the statutory functions of West Berkshire Council (WBC) are designed and delivered in the future and compliment WBC strategies and policies.

4.3. New strategies and policies will need to be written to address specific priorities, for example the need for a Renewable Energy Strategy for West Berkshire (RESWB), which is currently being undertaken.

4.4. The delivery of measures will be undertaken by the West Berkshire Partnership's Greener Sub-partnership (WBPGSP) through goal setting and action planning.

4.5. The WBP Strategy aims to focus on 10 key themes, these are:

1. Influencing Behaviour
2. Energy Efficiency
3. Renewable Energy
4. Water
5. Planning
6. Waste
7. Transport
8. Sustainable Procurement
9. Local Food
10. Natural Environment

4.6. The key themes directly affect the district's ability to mitigate and adapt to climate change. They cover both the residential and commercial sectors; WBP has influence on these sectors through links with its partners in the public, voluntary and private sectors. Appendix A3.13 outlines these key themes and their connection with climate change, as well as some of the actions West Berkshire have or are planning to take in order to mitigate and adapt.

4.7. Each theme has a number of targets attached to it; See the accompanying Action Plan for details of these targets. Targets will be regularly reviewed and adapted if necessary.

4.8. To describe the present situation, rationale, future intentions and actions for the WBP to take in order to achieve its objectives. For Case Studies outlining just some of the efforts of West Berkshire residents and businesses, refer to Appendix A5.

5. Implementation

5.1. *Performance monitoring*

5.2. Progress must be regularly tracked against the priorities and objectives, and opportunities for improvement should be identified and implemented as agreed. The LSP Greener Partnership will take on this responsibility with regular updates as part of its meeting cycle. Targets should be few and sufficiently high-level to allow representatives to determine and implement a solution to meet aims and objectives. The representative of the WBPGSP will meet with the individual leads to agree on individual targets derived from the actions within the accompanying Action Plan.

5.3. *Project Planning*

5.4. Initial actions, in support of the adoption and subsequent roll-out of this strategy, requires the Partnership to identify the most critical actions and to produce a high-level plan to assist implementation. The specific actions can be found in the accompanying Action Plan.

6. Summary

6.1. WBP and its partner organisations have and will continue to take action in order to reduce our CO_2 emissions, and improve our resilience to the affects of future climate change. In order to achieve this we will have clear targets, as set out in our accompanying Action Plan, and will work with our partners and members of the community towards achieving these.

6.2. To find out more about why we need to take action, the risks for West Berkshire, and what we are doing about it, as well as our plans for the future, how you can help and what others are doing, please refer to the attached Appendices and accompanying Action Plan.

Appendices

A1. Appendix 1: Why take Action?

A1.1 In 2013, the Fifth Assessment Report from the Intergovernmental Panel on Climate Change (IPCC), involving scientists from around the world; concluded that global temperatures have increased by 0.85°C during period 1880 -2012.[2] According to the IPCC, 1983-2012 is likely to have been the warmest 30 year period for the last 1400 years in the Northern Hemisphere. "It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th Century."

A1.2 We can expect to see global temperatures continue to rise for the next few decades regardless of what we do. This is because the climate takes about 30-40 years to react to the gases we emit today, meaning that current climate change is the result of our past emissions.

A1.3 Trapping more heat in our atmosphere is likely to have a number of effects on our climate. Predicting what these effects will be becomes harder as you focus on smaller geographical areas. The UK Climate Impacts Programme (UKCIP) has recently produced scenarios of future climate changes for the UK. Table 1 summarises these predictions for the UK in the 2080s, which can provide an indication of how we may expect the climate of West Berkshire to change over the coming decades.

Table 1: Predicted climate changes for the South East by the 2080s[3]

Climate Variable	Summary of Changes		
	Low Emissions Scenario	Medium Emissions Scenario	High Emissions Scenario
Winter mean temperature	Central estimate is an increase of 2.6°C. It is very unlikely to be less than 1.4°C and very unlikely to be more than 4.0°C.	Central estimate is an increase of 3.0°C. It is very unlikely to be less than 1.6°C and very unlikely to be more than 4.7°C.	Central estimate is an increase of 3.7°C. It is very unlikely to be less than 2.0°C and very unlikely to be more than 5.7°C.
Summer mean temperature	Central estimate is an increase of 3.0°C. It is very unlikely to be less than 1.4°C and very unlikely to be more than 5.1°C.	Central estimate is an increase of 3.9°C. It is very unlikely to be less than 2.0°C and very unlikely to be more than 6.5°C.	Central estimate is an increase of 4.9°C. It is very unlikely to be less than 2.6°C and very unlikely to be more than 8.1°C.
Summer mean daily maximum temperature	Central estimate is an increase of 4.1°C. It is very unlikely to be less than 1.4°C and very unlikely to be more than 7.4°C.	Central estimate is an increase of 5.3°C. It is very unlikely to be less than 2.3°C and very unlikely to be more than 9.2°C.	Central estimate is an increase of 6.7°C. It is very unlikely to be less than 3.0°C and very unlikely to be more than 11.5°C.

[2] IPPCC, 2013: Climate Change 2013: The Physical Science Basis: Synthesis Report - Summary for Policy Makers, http://www.ipcc.ch

[3] Jenkins, G.J., Murphy, J.M., Sexton, D.S., Lowe, J.A., Jones, P. and Kilsby, C.G., 2009: *UK Climate Projections: Briefing Report*. Met Office Hadley Centre, Exeter UK

A1.4 According to Defra (2009)[8] central predicted increases in average summer temperature for the South East are 1.6°C during the 2020s, 2.3°C by the 2040s and 3.9°C by the 2080s. We are already committed to an average rise in global temperatures of 0.6°C, temperature changes lag behind greenhouse gas emissions so we will need to adapt for this rise regardless of any reduction in emissions we can achieve now. However, reductions in emissions now will reduce the severity of impacts of climate change in the last half of the century, reducing the effects for future generations.

A1.5 The UK Government is bound to the terms within the CCA[4] and is determined to be the 'greenest' government ever. The UK is currently working to an ambitious Carbon Plan[5], which sets out an action list and timetable for carbon reduction and energy efficiency initiatives. These actions are wide-ranging, from the reformation of the electricity grid, with the introduction of the Feed In Tariff (FiTs) and Renewable Heat Incentive (RHI), through to renovating the existing housing stock (Green Deal), commercial carbon reduction (Green Investment Bank), and reducing emissions in both agriculture and waste disposal. Large organisations (who are not already engaged with the EU Energy Trading Scheme) that consume significant amounts of electricity have been charged with submitting a Carbon Reduction Commitment (CRC) report, which levies a charge on each tonne of CO_2 that it emits, thereby incentivising energy efficiencies to be made.[6]

A1.6 In the past, Local Authorities (LAs) "reported their performance against 198 indicators reflecting national priorities and negotiated targets with the Government on 35 National Indicators (NIs) through Local Area Agreements (LAAs)."[7] The indicators which related to climate change were:

- NI185- CO_2 reduction from LA operations
- NI186- per capita CO_2 emissions in the LA area, including emissions arising from buildings, industry and surface transport
- NI188- adapting to climate change

A1.7 In an Audit Commission review (2009), they found that NI186 "had resulted in action in many areas. However…that stronger levers may be required to encourage more comprehensive action and more ambitious targets."[7] The coalition Government has since abolished LAAs and the NIs. There is now no formal requirement for LAs to set emissions targets.

A1.8 "To avoid dangerous levels of climate change, global greenhouse gases must start to fall within the next decade and then be at least 50% below 1990 levels by 2050. The sooner we take action to achieve this, the greater the chance we will have of succeeding and the cheaper it will be."[8] As mentioned in Appendix A2.2 the cost of reducing greenhouse gases is estimated to be around 1% of world wealth but inaction will cost the economy many more times this.

A1.9 Under the 2008 CCA, the UK is committed to an 80% reduction by 2050 of emissions (on 1990 levels). In order to help achieve this targets are split into 4

[4] UK Government: *Climate Change Act 2008*, http://www.legislation.gov.uk/ukpga/2008/27/contents
[5] DECC, 2011: *Carbon Plan: Delivering our Low Carbon Future* http://www.decc.gov.uk/en/content/cms/tackling/carbon_plan/carbon_plan.aspx
[6] DECC, 2011: *CRC Energy Efficiency Scheme*, http://www.decc.gov.uk/en/content/cms/emissions/crc_efficiency/crc_efficiency.aspx
[7] CCC, 2012: How local authorities can reduce risk and manage climate risks http://www.theccc.org.uk/publication/how-local-authorities-can-reduce-emissions-and-manage-climate-risks/
[8] Defra, 2009, Adapting to climate change UK Climate Projections, http://www.defra.gov.uk/publications/files/pb13274-uk-climate-projections-090617.pdf

Carbon Budgets. The UK is in the second Carbon Budget period, to meet the fourth; emissions are required to be reduced by 50% on 1990 levels in 2025.

A1.10 The updated projections suggest that the UK is likely to comfortably meet its first three carbon budgets. Projected emissions are lower for traded and territorial emissions in the second, third and fourth carbon budget periods than the October 2011 projections. However projected non-traded emissions are slightly higher in carbon budgets 1, 3 and 4. Therefore the margin by which the UK is projected to overachieve against the first three carbon budgets is smaller. There are a large number of factors contributing to the change in projected emissions including changes to savings estimates, updates to data and assumptions and changes to modelling methodology. "[9]

A1.11 The Committee on Climate Change report, How LAs can reduce emissions and manage climate risk[7] suggests that whilst LAs should include emissions reductions in line with these Carbon Budget levels, they should focus on drivers of emissions where they have influence. For example these may be to insulate 1000 homes by 2020, install 100 electric vehicle charging points or set additional requirements for planning permission, such as having to install cost-effective energy efficiency measures into the whole house when building extensions (a requirement by Uttlesford District Council in Essex).

[9] DECC, 2012, Updated Energy and Emissions Projections 2012, https://www.gov.uk/government/publications/2012-energy-and-emissions-projections

A2. Appendix 2: Impacts of Climate Change on West Berkshire

A2.1 Table 1 shows how the climate for the South East is predicted to change by the 2080s. The risks associated with these changes to our climate are a function of their potential impacts coupled with the probability of their occurrence. The potential impacts, in turn, could affect four broad areas of West Berkshire life, termed 'receptors': namely the Districts' people, property, economy and environment.

A2.2 *What is the risk to West Berkshire and what are we doing about it?*

A2.3 The implications of predicted climate change pose a significant risk to the safety, prosperity and environment of West Berkshire and beyond. We must take action to manage the climate change risks we cannot avoid (adaptation) whilst at the same time reducing our carbon dioxide emissions (mitigation) to avert even more dangerous climate changes in the decades beyond. The WBP believes this to be the right approach for the following reasons:

1. Cost-effectiveness – The Stern Review on the economics of climate change illustrated how costs to the global economy rise with increasing degrees of climate change, and that early action to limit the extent of climate change is ultimately cheaper than waiting to manage the impacts of climate change when they become more severe. It concluded that while dealing with climate change by cutting emissions of greenhouse gases will cost a lot of money – about 1% of the world's wealth – doing nothing about it will cost the world an awful lot more, anything from 5 to 20 times more.[10]

2. Quality of life – In addition to avoiding potentially very serious risks associated with future climate change, strong action to cut our greenhouse gas emissions can also improve other areas of our lives. For example, improving the energy efficiency of our homes can make them more comfortable and reduce our energy bills; improving our ability to walk, cycle or take public transport to move around West Berkshire could reduce car congestion and improve air quality and our health.

3. A sustainable economy – The future costs of doing 'business as usual' can be expected to increase, for example, due to increasing costs of energy and those associated with more frequent climate change impacts (e.g. insurance, clean-up and repair). A more sustainable, energy and resource efficient, and climate-resilient form of business must therefore be developed to ensure our economy remains strong and competitive.

4. National / Global fairness – 2011 DECC figures for per capita CO_2 emissions, indicate that people in West Berkshire currently produce 7.2 tonnes of CO_2 per person per year.[11] This is several times greater than the average person in India and China. Climate change requires co-ordinated action around the world, with leadership shown by those countries which have benefited most from using fossil fuels, including the UK. It should also be noted that the UK has exported some of its carbon footprint by the increase in manufacturing of our goods in other countries such as China and Taiwan, if we were to include these emissions, the UK's per capita CO_2 emissions would increase significantly. West Berkshire

[10] Stern Review on the Economics of Climate Change, 2006, http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_report.cfm

[11] DECC, 2011: Emissions within the Scope of influence of Local Authorities for 2005-11 https://www.gov.uk/government/publications/local-authority-emissions-estimates

therefore needs to deliver its fair contribution towards the international effort to tackle climate change.

5. Impact on Ecology and Farming – West Berkshire supports a great diversity of land use types and habitats, ranging from urban landscapes through arable and agricultural grasslands to a mosaic of wetland habitats. The local ecology not only supports the local agricultural economy but provides the residents of West Berkshire with excellent opportunities for quiet recreation, relaxation, walking and enjoyment of wildlife.

6. Fuel Security and Fuel Poverty – Though not directly linked to climate change, the UK is very vulnerable to global changes in energy stocks and must become more self-sufficient in its energy supply. Furthermore, as energy costs continue to rise, more will become fuel poor, placing extra pressure on our health and social care systems. Again, this exemplifies the need to find alternative, accessible and 'cheaper' forms of energy, which by virtue, should reduce carbon emissions.

A2.4 This strategy makes an initial assessment of five broad risk categories associated with future climate change in West Berkshire, identifying the associated impacts and probabilities of each where possible. These relate to flooding, water shortages, heat, higher wind speeds and subsidence.

A2.5 Table 2 provides an overview of how these risks may affect the aforementioned receptors in West Berkshire, which are further explained and exemplified in the following sections.

Table 2: Potential Impacts of Climate Change Risks in West Berkshire

Risks	Receptors			
	People	Property	Economy	Environment
Flooding	• Public health & safety risks • Long term physical & mental health impacts	• Building damage • Infrastructure damage	• Lost work days • Disruption to transport & supplies • Insurance & repair costs • Agricultural crop damage	• Habitat changes/loss • Restoration costs
Water Shortages	• Need for water rationing	• Hosepipe bans • Requirement for water efficient fixtures & fittings	• Disruption to water reliant processes • Closure of water reliant recreational activities	• Species & habitat stress & destruction • Deterioration of river & wetland ecology • Reduced water quality standards
Heat	• Increased risk of vector borne diseases • Increased heat stroke & other hot weather illnesses • Increased incidence of food poisoning	• Increased energy consumption from cooling & refrigeration • Infrastructure damage (tarmac melt, rail buckling) • Increased need for vegetation management	• Changes in demand for weather related goods & services • Additional staff health & safety risks • Heat stress to utilities & building services	• Species & habitat migration • Longer growing season • Increased frequency of toxic algal blooms • Increased fire risk
High Winds	• Public health & safety risks	• Damage to building structure & fittings • Loss of power & water supply	• Insurance & repair costs • Disruption to transport & supplies	• Tree damage
Subsidence	• Public health & safety risks	• Damage to building structures & fittings • Deterioration of sports grounds, courses & parks	• Insurance & repair costs	• Deterioration of public parks • Damage to tree roots

A2.6 These impacts may have knock-on effects which may accumulate to generate impacts at a much larger scale, such as population migration, price inflation or economic recession, as suggested by the Stern review into the economics of climate change.[12]

A2.7 Over time, our understanding of climate change and the local impacts will increase and it is expected that this initial assessment will have to be reviewed accordingly.

A2.8 Caution must be taken not to confuse sporadic extreme weather events with a general shift in climatic conditions. Readers will note that 'cold' is omitted from Table 2. Nonetheless, extreme cold has massive implications on health, transport and the economy. This is especially important with regards to fuel

[12] Stern Review on the Economics of Climate Change, 2006, http://webarchive.nationalarchives.gov.uk/+/http:/www.hm-treasury.gov.uk/sternreview_index.htm

poverty and general domestic energy efficiency (i.e. insulation and thermal comfort).

A2.9 *Flooding*

A2.10 The changes to the climate of the South East contained in Table 1 indicate that, depending on the emission scenario, winter rainfall may increase by between 18 – 30% by the 2080s.

A2.11 A review of the major flooding West Berkshire experienced in 2007 has indicated that the incidents fell into one, or a combination, of three categories:

1. Flash flooding – the bulk of the flooding in West Berkshire, this is the result of intense rainfall generating rapid run off causing water levels to quickly rise. These incidents were typically found to be mainly due to the water exceeding the infiltration capacity of the ground or the capacity of the local drainage network. This type of flooding can be expected to increase as the level and intensity of rainfall increases.

2. River flooding – caused by rising water levels within a river such that the river overflows its natural banks.

3. Groundwater flooding – the result of groundwater levels rising through continued rainfall to a point where the ground is saturated and subsequent rainfall causes the groundwater to rise to the point of flooding.

A2.12 Understanding and adapting to the potential impact of flooding is of particular importance as climate change predictions indicate that the frequency of extreme weather conditions resulting in flooding, such as those seen in July 2007 are likely to increase, i.e. the 1 in 100 year storm is now likely to be 1 in 10 years.

A2.13 During the July 2007 flooding a number of residential properties were flooded in West Berkshire, including 1107 in Thatcham, 151 in Newbury and 123 in Pangbourne. It was later determined that many of the cases of flooding were caused or contributed to by blocked culverts and poorly maintained watercourses. WBC has since become an active member of the Association of Drainage Authorities, adopting a land drainage policy based on the Land Drainage Act 1991, working closely with land owners to ensure periodic maintenance and improvement work to locations known to be a flood risk.

A2.14 "The Flood Risk Regulations 2009 implement the requirements of the European Floods Directive 2007, which aims to provide a consistent approach to managing flood risks across Europe."[13] These regulations cover four stages within a six year flood risk management cycle, the first two of which are covered by the Preliminary Flood Risk Assessment.

A2.15 Under the Flood and Water Management Act 2010, WBC undertakes the role of Lead Local Flood Authority. There are a number of key responsibilities, which include the development, application and monitoring of a Local Strategy for Flood Risk Management, maintaining an asset register of features considered to have an effect on flood risk and being a designated SuDS (sustainable drainage system) Approval Body (SAB).

[13] West Berkshre Council, Preliminary Flood Risk Assesment: Final Report June 2011 http://www.westberks.gov.uk/CHttpHandler.ashx?id=28234

A2.16 Work began in late 2012 on the Environment Agency's Kennet Flood Risk Management Strategy. The scheme is funded by a number of organisations including WBC, Newbury Town Council, Greenham Common Trust, Sovereign Housing and local businesses. For further information on the Flood Alleviation Scheme refer to Appendix A5.

A2.17 WBC has an overarching major incident plan outlining generic responses and preparations for an emergency. There are also specific event plans, one of which is an adverse weather plan (currently under review) and a drought plan which is currently being undertaken. As we have previously mentioned, extreme weather events are likely to become more frequent and we must be prepared for these as far as possible.

A2.18 ***Water Shortages***

A2.19 Paradoxical to the comments on flooding (extreme weather events), the climate predictions forecast an overall drier climate with potential depletion of aquifers and reservoirs.

A2.20 The Environment Agency (EA) is the organisation with primary responsibility for managing water resources and is represented on WBPGSP.

A2.21 Our water supply is determined by the level of rainfall which feeds our rivers and recharges groundwater levels. The predicted changes to the climate within the South East contained in Table 1 indicate that summer rainfall could decrease by 15 – 29% by the 2080's. Coupled with higher summer temperatures which increase evaporation rates and overall water demand, the level of water resources could decrease even further.

A2.22 The risk of water shortages and droughts can therefore be reasonably expected to increase as the climate changes. This would have varying degrees of impact upon water users, including West Berkshire residents, businesses, schools and other organisations, as well as the natural environment. To compound the problems, a larger population will have a larger water demand. If the climate becomes drier, agriculture will need more irrigation. This exemplifies the need to be much more water efficient and able to adapt accordingly to a drier climate.

A2.23 WBC is currently in the process of preparing a drought plan prompted by water shortages in recent years and the 2012 hose pipe ban. A number of years of below average rainfall contributed heavily to the drought but whilst some areas of the UK were in drought, others experienced heavy flooding. In fact, almost as soon as the ban came into force in the Thames Valley, periods of higher than average rainfall allowed the ban to be lifted. Climate change is likely to lead to variations in both the pattern and variation of droughts so we are acting now to adapt for the future.

A2.24 ***Heat***

A2.25 Table 1 indicates that in the South East the number of hot days (above 25°C) will increase to more than 50 days per year by the 2080s as a result of climate change, with average summer temperatures rising by between 3 – 4.9°C.

A2.26 The impacts of such heat waves can be devastating and affect people, the economy and the environment. WBC has a local Heat Wave Plan that is enacted if the temperature meets the criteria of hotter than 31°C during the day and 16°C at night for more than two consecutive days. The Department of Health's Heat Wave Plan for England (2013) outlines some of the effects of excessive heat on

people,[14] with the elderly and young, chronically ill and those with outdoor occupations or unsuitable living or working environments most at risk. It is also underpinned by heat wave alerts from the Met Office and a Heat health Watch Alert System (June to September). The Centre for Economics and Business Research estimated that the July 2006 heat wave cost the UK economy £211 million a day.[15]

A2.27 The natural environment is affected not only by heat waves but also changes to average temperatures which influence the habitat ranges of plants, insects and animals. Species which are already at the limit of their habitat ranges could face extinction. New species may also arrive that are better adapted to dealing with the higher temperatures, including insects that carry new diseases for which we are unprepared.

A2.28 ***Higher wind speeds***

A2.29 The impacts of higher wind speeds include breakage or removal of roof tiles and slates on buildings or, in exceptional circumstances, the removal of an entire roof. High wind speeds can also disrupt transportation and power supplies, damage trees and in extreme cases threaten the health and safety of people.

A2.30 Whilst extreme winds such as storms and hurricanes are usually destructive, an increase in normal wind levels could be beneficial. For example wind turbines could become a more viable option in areas where the wind speed was previously felt too low, generating free green energy and reducing carbon emissions.

A2.31 ***Subsidence***

A2.32 Subsidence is the condition whereby ground movement occurs without additional load being applied. It can occur due to a number of reasons, including where certain soils, such as clay, dry out and shrink, and is generally a consequence of the aforementioned directly weather related impacts. Re-hydration of soils over the winter months can cause them to swell, or 'heave', causing additional ground movement.

A2.33 Ground movement due to subsidence and heave can manifest itself as cracking in buildings, but damage can also occur to buried pipes, particularly when they cross foundations. In severe cases of ground movement underpinning of walls may be required.

A2.34 Assessing and managing the risk of subsidence and heave needs to be done on a site by site basis.

A2.35 ***West Berkshire's Strengths, Weaknesses, Opportunities and Threats in relation to Climate Change***

A2.36 Whilst we do not wish to detract from the message that climate change is negative, it should be noted that there are also potential opportunities in a changing climate. Table 3 gives a current appraisal of the Strengths, Weaknesses, Opportunities and Threats (SWOT analysis) West Berkshire faces in terms of climate change. This brief and generic analysis shows the opportunities that may

[14] Department of Health, 2013: *Heat wave plan for England 2013,* https://www.gov.uk/government/publications/heatwave-plan-for-england-2013 .
[15] The Telegraph, *Heatwave costs a cool £211m a day*, 20th July 2006, http://www.telegraph.co.uk/finance/2943770/Heatwave-costs-a-cool-211m-a-day.html

be presented, but also highlights what aspects need to be 'shored up' in order to address the changes effectively.

A2.37 According to Defra (2012) "some changes projected for the UK as a result of climate change could provide opportunities for agriculture and other businesses, although not outweighing the threats."[16] If water is not limiting, higher temperatures may lead to a rise in crop yields, 40-140% in wheat and 20-70% in sugar beat is a possibility according to Defra (2012).[16] Warmer temperatures could allow less common crops like blueberries to thrive, presenting additional commercial opportunities.

Table 3: SWOT Analysis of effects of Climate Change in West Berkshire

Strengths	Weaknesses
• Extended growing season • Solar power becomes more effective • Wind power becomes more effective	• Non-adaptable infrastructure (power supply, fuel security, agricultural practices etc) • Existing housing stock not very energy efficient or adaptable to high temperatures • Apathy to adapt lifestyle (energy efficiency, waste, water usage, travel etc)
Opportunities	**Threats**
• New crops – viticulture, olives, sunflowers • Construction – more efficient buildings and refurbishments = jobs • Growing renewable energy market = jobs	• Drought • Flooding • Storms • Mass migration • Alien plant and animal species becoming naturalised • Habitat destruction

[16] Defra, 2012, Summary of the Key Findings from the UK Climate Change Risk Assessment 2012, http://randd.defra.gov.uk/Document.aspx?Document=Summary_of_Key_Findings.pdf

A3. Appendix 3: West Berkshire's 'Carbon Footprint'

A3.1 Central government is driving the 'Big Society' agenda and recognises that local action is necessary to achieve many of the stretching national aspirations. Until recently, a number of now obsolete NIs specifically addressed CO_2 reduction within a locality. NI186 was the indicator that affected the whole of the district of West Berkshire.

A3.2 With the abolition of LAA's the WBP no longer has the binding targets of NI186 to achieve. However, WBP is voluntarily continuing work to reduce the CO_2 emissions throughout the district.

A3.3 These 'obsolete' CO_2 indicators are essentially about leading behaviour change. LAs and Partnerships are uniquely placed to provide vision and leadership to local communities, raise awareness and help change behaviours.

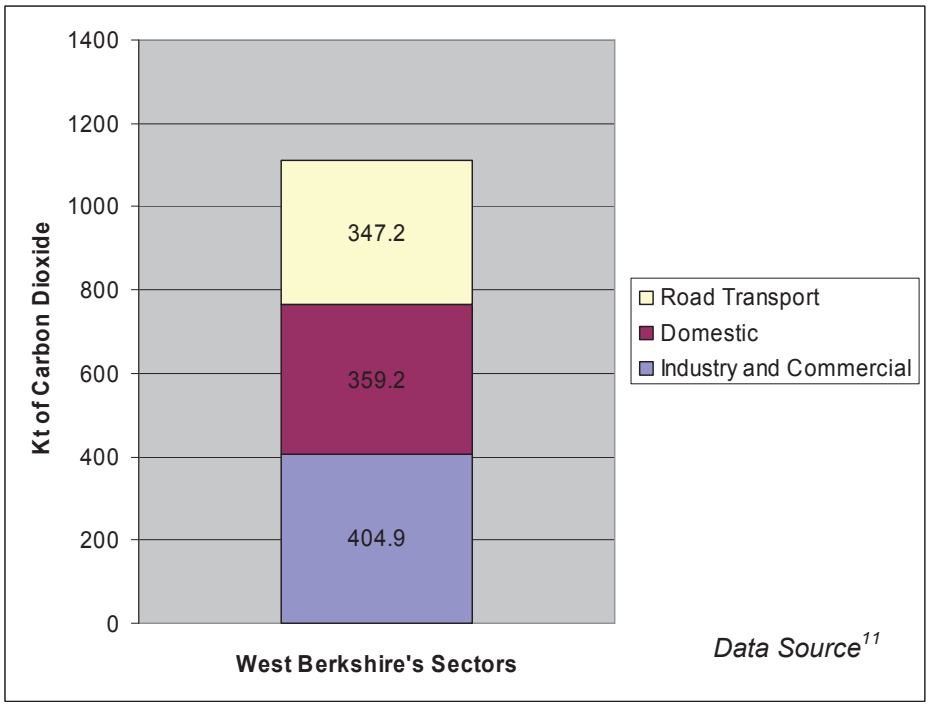
A3.4 In addition, legislation such as the CRC Efficiency Scheme has been brought in to tackle large emitters of CO_2. Organisations qualify for the CRC dependent upon the level of consumption through their half hourly meters. Once qualified then the organisation has to account for all their carbon emissions and a charge is levied on each tonne of carbon dioxide emitted. The idea is that large organisations will want to avoid paying these charges, making their operations/processes more energy efficient.

A3.5 *District 'Carbon Footprint'*

A3.6 Measuring the emission of greenhouse gases for West Berkshire is a complicated process, dependent on many factors including the availability of greenhouse gas emissions data and being able to reliably attribute this to activity within the district.

A3.7 Using the data from DECC[11], Figure 1 below presents the 'carbon footprint' for West Berkshire in 2011.

Figure 1: West Berkshire District's 'Carbon Footprint' 2011



A3.8 West Berkshire's per capita emissions have decreased from 8.1 tonnes CO_2 per person in 2010 to 7.2 tonnes CO_2 per person in 2011. Data is available for the years back to and including 2005 and is adjusted to take account of changes in the way the most recent data set has been calculated. Any significant changes are outlined in DECC's Methodology Summary.[17]

A3.9 There are a number of aspects to the data presented in Figure 1 which have important implications for the calculation and future monitoring of West Berkshire's 'carbon footprint'.

A3.10 Firstly, CO_2 emissions are allocated to the point at which energy or fuel is used, rather than the location of the power station where the energy was produced, i.e. on an 'end user' basis.

A3.11 Secondly, in order to compare West Berkshire with other areas in the UK it is useful to divide the total figure of 1,111,290 tonnes of CO_2 by the area's population. With a mid-year population estimate in 2011 of 154,100, this works out at 7.2 tonnes CO_2 per person. This figure does not correspond to the calculation of a personal 'carbon footprint' for a resident in West Berkshire. It is a measure of the districts 'carbon footprint' divided by its population which enables performance of the district to be related to other areas.

Table 4: Local Authority carbon footprint

Local Authority	Carbon footprint (tonnes CO_2 per person)
Aylesbury Vale	5.3
East Hampshire	6.6
South Oxfordshire	6.6
Test Valley	6.9
Vale of the White Horse	7.8
West Berkshire	7.2
West Oxfordshire	6.7
Wiltshire	6.5

Data Source[11]

A3.12 Using the same process of calculation, the average South-East resident's carbon footprint comes out at 5.5 tonnes CO_2 per person. See Table 4 above to compare figures more locally. Striving to reduce the figure year on year is perhaps of the most importance rather than the figure itself, particularly as the changes to the methodology can result in significant changes to the emissions each data release. Geographical differences, industries and businesses, as well as population, make direct comparison between authorities difficult.

A3.13 Thirdly, the methodology used by DECC18 to calculate West Berkshire's 'carbon footprint' excludes emissions of greenhouse gases other than CO_2. It also excludes emissions which are judged by DECC to be largely beyond the ability of local District measures to influence, including aviation and motorway traffic.

[17] DECC, 2013: Local Authority CO_2 emissions estimates 2011: Methodology Summary,https://www.gov.uk/government/publications/local-authority-carbon-dioxide-emissions-methodology-notes

[18] DECC, 2013: Local and regional CO2 emissions estimates for 2005-2011 for the UK: Technical Report https://www.gov.uk/government/publications/local-authority-carbon-dioxide-emissions-methodology-notes

A4. Appendix 4: How can we reduce the impact of climate change in West Berkshire

A4.1 The first Climate Change Strategy was structured on a number of actions that were being addressed nationally and locally. There was consensus within the Partnership that these 'original' targets were too numerous, not under the control of the WBP or too difficult to measure. Therefore, in this version of the refresh, the targets and outputs have been simplified.

A4.2 An appraisal was given to 'key themes' that directly affect the district's ability to mitigate and adapt to climate change. The themes are cross-cutting, with the LA undertaking certain statutory obligations (such as planning control) which cannot be omitted from the document. However, the key themes cover actions to be undertaken throughout the residential and commercial sectors in West Berkshire. The WBP has influence on each of these sectors through its links with its partners in the public, voluntary and private sectors.

A4.3 ***There are ten key themes:***

1. Influencing Behaviour
2. Energy Efficiency
3. Renewable Energy
4. Water
5. Planning
6. Waste
7. Transport
8. Sustainable Procurement
9. Local Food
10. Natural Environment

A4.4 Each target will be delivered through the existing mechanisms that the WBPGSP has at its disposal. The accompanying Action Plan set out the activities we plan to work towards to help achieve our aims for each individual area.

A4.5 ***Key theme 1: Influencing Behaviour***

A4.6 A significant proportion of energy and resource wastage can be attributed to behavioural traits of individuals. Energy use, by its nature is a very difficult thing for the human mind to quantify or rationalise. We have been used to 'flicking a switch', or 'turning a tap' for many years and this disassociation from the energy source can leave us taking electricity, gas, oil and water for granted. Ultimately leaving us vulnerable to the over-use or wasting of energy.

A4.7 It is vitally important to educate all sectors of the community on how to mitigate and adapt to climate change. This includes broadcasting information on fuel security, climate change and sustainable development. Developing an energy efficient and sustainable culture is key for these generations to adapt to and mitigate climate change. WBC strives to lead by example with integrated policies within all areas of the Council, it is vital that WBC shares its achievements with the wider community. To help, encourage and inspire others to take action. Reducing energy waste and fuel use can save a huge amount of money, a rural West Berkshire resident by changing behaviour, has implemented a number of energy saving measures and has saved in the region of £9000 per annum (p.a.) by reducing such costs, see Appendix A5.1 to see how.

A4.8 *Key theme 2: Energy Efficiency*

A4.9 Being more energy efficient is a key element of mitigating against the effects of peak oil, becoming more energy secure and above all, tackling the root cause of man-made climate change. There are also financial benefits for being more energy efficient, which as energy prices rise will have more weighting in individual behaviour.

A4.10 The Council has trialled a number of different energy efficiency lighting measures within its own buildings. Such trials allow important factors like light levels and human comfort to be considered in-situ before rolling out measures on a large scale. This allows the best fitting measure to be chosen with a greater degree of accuracy and knowledge of any advantages and disadvantages that may be experienced.

A4.11 Within the local community, St George's Church has undertaken and are part way through a retrofit project. Electricity is now mainly produced by PV panels and heat will eventually be predominately provided through a ground source heat pump, see Appendix A5.2.

A4.12 *Key theme 3: Renewable Energy*

A4.13 West Berkshire is a landlocked, mainly rural constituency, and has considerable potential for renewable energy production and use based on deployment of technologies generating power from the wind, sun, waste and plants (primarily trees).

A4.14 The UK's national objective is a target of 15% of energy use from renewables by 2020. The proposed WBP RESWB sets out to illustrate what immediate potential exists to harness local renewable energy sources in West Berkshire by undertaking a desktop survey of the district utilising current knowledge and data in applying known constraints.

A4.15 Within West Berkshire, we have a number of limiting factors on renewable energy production, e.g. the Area of Outstanding Natural Beauty (AONB) which covers most of the district and Sites of Special Scientific Interest (SSSIs). The proposed RESWB deals with this issue in greater detail and rather than repeat the information here, the reader is referred to this document. Whilst these areas may limit our scope for renewables, they do not completely rule out development.

A4.16 . According to the afore mentioned RESWB there is still the potential of supplying more than half the districts heat and power needs by renewable energy sources. An example of what could be achieved is the Faccombe Estate in the AONB, where a small wind turbine was granted permission; see Appendix A5.3.

A4.17 *Key theme 4: Water*

A4.18 As explained in A2.21, climate change is likely to result in decreased rainfall in West Berkshire of 15-29% by the 2080's, leading to general drought conditions, decreases in aquifer recharge (when rain tops up groundwater) and an increased likelihood of extreme weather events, such as flash flooding. The latest district profile indicates that West Berkshire's population continues to rise, putting evermore pressure on the water-stressed South East of England.

A4.19 Additionally, drinking water and sewage treatment account for 1% of the UK Greenhouse Gas emissions.[19] Large electric motors are used for pumping mains water and treating sewage. The heating of water in homes (central heating, washing, cooking etc) account for one third or more of the average home's energy usage[20] or 5% of the UK's Greenhouse Gas emissions.[19] Being more water efficient, at work or at home, will play an important role in pre-empting any further depletion of the aquifers. Furthermore, the less water that is pumped or heated, the less greenhouse gases are emitted.

A4.20 Sustainable Drainage Systems (SuDS) can be installed or retrofitted to buildings/developments to minimise their mains water usage. SuDS either use 'grey water' (rain water that is filtered and collected) to flush toilets or other applications that do not require potable water; or divert rain water away from drains/sewers through natural drainage systems, such as ponds, drain ditches and permeable pavements. An example of a rainwater harvesting system can be seen at Thatcham Nature Discovery Centre, see Appendix A5.4. SuDS are an important climate change adaptation tool for reducing flooding and increasing ground water recharge in the West Berkshire area.

A4.21 As mentioned in Appendix A2.15 WBC is designated as Lead Local Flood Authority (LLFA) under the Flood and Water Management Act 2010. The Act requires all new developments to incorporate SuDs which must be approved by the LLFA before works can commence. The Act will require the LLFA to establish a SuDS Approval Board (SAB) to assess and approve the drainage proposals as a separate but parallel part of the planning approval process. This part of the Act is expected to be enacted in spring 2013 by which time the LLFA will be required to produce a SuDS policy, which will give guidance to developers.

A4.22 ***Key theme 5: Planning***

A4.23 Planning has an important role to play in helping to deliver CO_2 emission reductions across West Berkshire. To achieve sustainable development this will need to be done in combination with, not only environmental factors, but also economic and social factors as well. Of course, using planning policy and development management, reducing CO_2 emissions can achieve all of these in unison by seeking new residential and non-residential development to include: renewable, zero and low carbon energy technologies; offering advice regarding listed buildings and conservation areas; renewable development installation within the AONB; community renewable energy projects and the potential for developing heat networks. An example of this can be seen at Flint Cottage, see Appendix A5.5, a 17th Century cottage destroyed by fire was replaced by an eco cottage on re-building, taking advantage of renewable energy and other low carbon measures. It is important to encourage sustainable choices where the opportunity arises.

A4.24 WBC's Planning Policy team are responsible for West Berkshire's LDF Core Strategy,[21] part of which, CS15, relates to sustainable construction and energy efficiency. It states that proposed residential developments should reach Code for Sustainable Homes Level 4 rating. From 2016, all residential development should reach Level 6 rating.

[19] DEFRA, 2008: *Future Water: The Government's Water Strategy for England*, http://archive.defra.gov.uk/environment/quality/water/strategy/pdf/future-water.pdf
[20] Energy Savings Trust (EST) 2011: *Water Energy Calculator*, http://www.energysavingtrust.org.uk/In-your-home/Water/Water-Energy-Calculator
[21] WBC, 2012, West Berkshire Core Strategy DPD: http://www.westberks.gov.uk/index.aspx?articleid=4021

A4.25 For non-residential developments a BREEAM pre-assessment must show the likely rating achieved will be 'Excellent'. Major developments are also required to achieve reductions in CO_2 emissions from renewable energy or low/zero carbon energy generation on site or in the locality of the development locally.[21]

A4.26 The forth-coming Zero Carbon Regulations will require investment opportunities and developer contributions. Climate Berkshire, which is made up of the 6 Berkshire Councils along with other key partners across Berkshire, has commissioned an assessment into how the Local Planning authorities can implement the regulations successfully. The Assessment makes recommendations on local opportunities from developer contributions, outlines investment opportunities for low carbon energy and retro fitting; and provides a policy framework with a roadmap for renewable energy and retrofit options to 2020.

A4.27 ***Key theme 6: Waste***

A4.28 The management of waste is one of the most visible environmental services provided within local communities. Encouraging the "Three 'R's": Reduce, Reuse, Recycle is vitally important for resource efficiency. Producing less waste initially, reusing waste products and finally recycling them has multiple energy efficiency gains (less energy used in the production of products, less transportation etc). The community Furniture Project (CFP) is a particularly good example of reuse, see Appendix A5.6. In 2010, the charity diverted an estimated 588 tonnes of waste from landfill for reuse.

A4.29 Municipal waste is managed by the LA and there are significant targets to reduce the amount of waste that is sent to landfill and increase levels of recycling. The management of commercial waste is separate to municipal waste and is regulated by the Environment Agency, though as yet, there is no legislation demanding commercial waste recycling rates. However, landfill tax is becoming evermore expensive, so there are good economic reasons not to landfill commercial waste.

A4.30 In 2002 WBC adopted its 20 year plan for waste management titled "A Municipal Waste Management Strategy for West Berkshire", which set the Council's waste vision of maximising recycling and composting and reducing waste sent to landfill. This strategy was followed by an application to the Government's Private Finance Initiative (PFI) to seek capital funding for the implementation of the strategy. It was recognised early on that the Council's waste services and local facilities needed significant changes and investment. In June 2003, the Council was awarded £56 million over a 25 year period to assist with the funding of implementing this strategy.

A4.31 Utilising this funding, a 25 year Integrated Waste Management Contract was awarded to Veolia Environmental Services in March 2008 to work with the Council in making improvements happen and invest in services and local facilities.

A4.32 Between June and October 2011, significant improvements were made under the Integrated Waste Management Contract to the existing Kerbside Recycling Collection Service, which saw additional materials being added to the service. Residents now have a seven stream kerbside recycling service which includes the collection of glass, cans, plastics bottles, textiles, paper, cardboard, green and food waste; significantly reducing the amount of waste sent to landfill. Between 2008 and 2011 recycling levels have increased from 22% to over 46%. In 2012/13, recycling levels increased again to 50% (un-audited data).

A4.33 ***Key theme 7: Transport***

A4.34 Carbon emissions from domestic transport currently represent 21% of the UK's domestic emissions.[22] Out of all transport in the UK, domestic road transport is by far the biggest emitter at around 92%. In terms of West Berkshire, 31% of CO_2 can be attributed to road transport (see Figure 1) which is a large source of carbon in the district. Per capita, this figure is likely to be proportionately higher for residents in the rural areas of the district because of the increased use of vehicles.

A4.35 WBC's Transport Policy Team are responsible for the Local Transport Plan for West Berkshire[23]. The Local Transport Plan (LTP) sets out a framework for the delivery of transport in West Berkshire, within this there are a number of policies and supporting plans. These include: Walking, cycling, travel planning and car sharing.

A4.36 The LA, residents and businesses have little control over the emissions from road transport generated from the M4 and A34, as these are arterial national routes. However, encouraging people to use cars less, public transport more and cycling and walking whenever possible are the key messages to reduce carbon emissions across the district. To encourage walking and cycling to school, many schools are signed up to the Go Kinetic scheme, see Appendix A5.7, which encourages walking or cycling to qualify for stamps which can then be exchanged for rewards.

A4.37 ***Key theme 8: Sustainable Procurement***

A4.38 Sustainable procurement is 'a process whereby organisations meet their needs for goods, services, works and utilities in a way that achieves value for money on a whole life basis or cradle to grave in terms of generating benefits to society and the economy, whilst minimising damage to the environment.'[24] WBC uses a Sustainable Procurement Risk Assessment Methodology (SPRAM) to highlight risks and mitigate against them on contracts over £50,000, refer to Appendix A5.8 for further details.

A4.39 How a person, business or Council buys, or procures, goods and services can influence the local and global environment – how much is bought, whether recycled products are bought, where goods are supplied from, e.g. in the UK or from abroad. Procurement can also affect the quality of life of West Berkshire's residents.

A4.40 There are a number of Environmental Management Systems (EMS) in place that organisations can ascribe to, such as ISO14000 series and the Eco-Management and Audit Scheme (EMAS). Preferentially using businesses that have attained these standards means that they have appraised their own environmental processes, resulting in a lower-carbon product or service. In a competitive market, this may encourage other businesses to use an EMS to improve their overall efficiency and could be used as a unique selling point.

[22] DfT, July 2009, Carbon Reduction Strategy for Transport
http://webarchive.nationalarchives.gov.uk/20090725194518/http://www.dft.gov.uk/pgr/sustainable/carbonreduction/low-carbon.pdf
[23] WBC, 2011: Local Transport Plan for West Berkshire 2011-2026
http://www.westberks.gov.uk/index.aspx?articleid=18646
[24] Defra, 2006: Procuring the Future
http://www.defra.gov.uk/publications/2011/03/28/pb11710-procuring-the-future/

A4.41 *Key theme 9: Local Food*

A4.42 "The supply of food to UK consumers produces about 160 mega tonnes of CO_2 equivalents ($MtCO_2e$), or 19% of the UK's total greenhouse-gas emissions."[25] A key part of reducing emissions associated with food production is promoting the growth and consumption of local food as the food will have significantly less "food miles."[26]

A4.43 Food miles relates to the distance that food is transported. "Food accounts for 25% of the distance travelled by lorries in the UK, and 12 billion miles driven a year by consumers. The social and environmental costs of food transport - including significant green house gas emissions - are £9 billion a year."[27]

A4.44 There are many local food groups and food growing initiatives in the West Berkshire area that contribute to an increase in local food production and consumption, thereby reducing food miles. Continued support and promotion of these groups should entail an upward trend in the consumption of local and seasonal produce and a subsequent downward trend in the emissions of greenhouse gases. See Appendix A5.9 for a local example.

A4.45 *Key theme 10: Natural Environment*

A4.46 Ecosystems are incredibly complex interactions between living organisms and their environment. Biodiversity is essential for a healthy ecosystem and disruptions to or destruction of a habitat can dramatically affect the biodiversity to the detriment of the ecosystem. Healthy ecosystems and habitats rich in biodiversity are estimated to be "worth at least £30bn a year in health and welfare benefits to the general public", according to the UK National Ecosystems Assessment.[28]

A4.47 The natural environment is important to consider in relation to climate change in two ways. Firstly, natural habitats such as woodlands act as important carbon sinks (areas of land and/or process that remove carbon dioxide from the atmosphere) and, secondly, climate change is likely to affect the biodiversity (type, number and variety of species) that live in West Berkshire.

A4.48 At present there are a number of locally, regionally and nationally important conservation and nature reserves within West Berkshire. How these sites and the surrounding land are managed will determine the biodiversity now and in the future.

[25] Friel et al, 2009: *Public health benefits of strategies to reduce greenhouse-gas emissions: food and agriculture*; The Lancet Vol. 374, Issue. 9706 pp.2016-2025
[26] Friends of the Earth, 2007: *Briefing: Food and Climate Change* http://www.foe.co.uk/resource/briefings/food_climate_change.pdf
[27] Food Ethics Council, undated: *Food Miles* http://www.foodethicscouncil.org/topic/Food%20miles
[28] UK NEA, 2011: *UK National Ecosystem Assessment*, http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx

A5. Appendix 5 Case Studies

A5.1 *Influencing Behaviour*

A5.1.1 CASE STUDY: HOW TO CUT YOUR CARBON FOOTPRINT DRAMATICALLY & SAVE MONEY, RURAL WEST BERKSHIRE RESIDENT

Electricity

- Fitted low energy lighting throughout the house
- Fitted solar panels on the side roof of the house, not visible to the public
- Replaced aging 6 kW cooker with a 2 kW version doing the same job
- Put up drying rails obviating the need to use a tumble dryer
- Keep fridge on 2/3 setting
- Only boiling enough hot water when making hot drinks
- Drying hair naturally rather than using a hair dryer

Result - Electricity consumption is half the typical UK bill, for a much larger than average house, and just 10% of that of the previous occupants.
Saving - £1000 p.a.

Heating

- Replaced 20+ year old boiler with a new condensing boiler - halving oil bill
- Installed a wood fuel burner due to oil prices increasing +90% since 2007
- Grade II listed building - installed secondary glazing and persuaded the Council to allow double glazing in new extension
- 300mm of loft insulation
- Heavy curtains and draft excluder on the front door
- Putting on another layer when chilly

Result - Only consume 1500l of oil p.a; typical house consumes 5000l p.a.
Saving - £2000 p.a.

Reducing fuel use

- On changing job, chose to work from home having previously drove 40,000 miles p.a.
- Bought small car for local journeys, kept Executive car for business use, eventually replacing both with one low energy diesel car
- Sought advice about fuel efficient driving techniques and now get 60 mpg
- Cycle and walk for local journeys
- Combine activities - visit Newbury for the day, doing all the jobs in one go

Result - Fuel use reduced from 5000l to 600l p.a.
Saving - £6000 p.a.

A5.2 *Energy Efficiency*

A5.2.1 CASE STUDY: ST GEORGE'S CHURCH, WASH COMMON

St George's was a large church with an inefficient and expensive to run heating system. The building was cold and unattractive to community groups, and used for less than 15% of the available time. A project to improve the buildings efficiency is currently underway and it is hoped that the building will be more attractive for community use as the project progresses. The three phases of the project are being carried out once the funding is available. As well as fund raising by the church congregation and local community, a number of grants have been received by various local and national organisations and charities.

The project consists of three phases:
Phase 1:

- Strengthening main roof to accept the weight of solar panels and a new ceiling.
- Installation of 129 solar roof panels with associated control systems
- Installation of electronic public display panels, illustrating energy generated by the solar panels.
- Connection to the National Grid for the export of electricity.
- Re-forming and insulation of the main ceiling.
- Secondary glazing of high windows.
- Fitting of new rain water guttering and pipes to cure damp problem.

Phase 2:

- Glazed external thermal lobby at the main entrance
- Two pairs of automatic double doors enabling independent disabled lobby access
- Re-forming part of a car park to provide gently sloping access to the lobby.
- Insulation of remaining ceilings.
- Secondary glazing of a large window.

Phase 3:

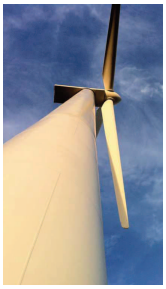
- 130 metre deep boreholes.
- Ground Source Heat Pump
- Zoned under floor heating.
- Glazed off meeting room/internal thermal lobby at the minor entrance.

Phase 1 of the project was completed in March 2011, on time and to budget. Phase 2 began in June 2011 and was completed in November 2012, the final phase launched in January 2013. The solar panels produce just under 25 kW peak output, meaning not only will the church generate enough electricity for its own needs but also a surplus to be sold to the grid.[29] The panels are estimated to be earning around £6000 p.a. which is being fed back into the fund towards Phase 3 of the project. Latest figures indicate 24,000 kWh is being produced annually from the panels.

[29] George Goes Green, 2011, http://georgegoesgreen.org

A5.3 *Renewable Energy*

A5.3.1 CASE STUDY: FACCOMBE ESTATE WIND TURBINE



Planning permission was granted for a small wind turbine on the Faccombe Estate, to the south of Newbury, in 1993. The estate is located 260m above sea level and in an Area of Outstanding Natural Beauty (AONB).

A new turbine, a Vestas V39 with a 39m rotor and 35m tower, was commissioned in January 2012 and is expected to deliver 800MWh of electricity a year. The electricity produced is used on the estate and any surplus goes back to the grid and is consumed by houses within the village.[30]

A5.4 *Water*

A5.4.1 CASE STUDY: NEWBURY FLOOD ALLEVIATION SCHEME, EA

"Newbury is vulnerable to river flooding. The banks and water levels of both its river and canal are up to 2.5 metres higher than the floodplain in this built-up area.

Major flooding in Newbury occurred during 1947 due to melting snow, and again in 1960. Newbury town centre was affected as well as residential areas to the south. More recently, in 2000 and 2003 flooding occurred on a smaller scale, highlighting Newbury's continuing vulnerability.

Surface and groundwater flooding are also problems, and were experienced in summer 2007. The scheme does not address these sources of flooding, which are being investigated separately.

Newbury Flood Alleviation Scheme will reduce the risk of river flooding to 1 in 100 – or a 1 per cent chance of flooding in any one year.

The scheme will benefit:

- more than 380 residential and almost 70 commercial properties
- the A339 and A4 London Road
- 5 listed buildings and 2 Scheduled Monuments
- 2 nursery schools
- 2 residential homes for the elderly

By investing £1.6 million now; we estimate that we will avoid damages of £33.7 million over the lifetime of the flood defence."[31]

Work began in late 2012 and is supported by contributions from West Berkshire Council, Newbury Town Council, Greenham Common Trust, Sovereign Housing and several Newbury businesses.

[30] Distribution Generation, 2012, Faccombe Estate, http://distgen.co.uk/projects/faccombe
[31] Environment Agency, 2012, Newbury Flood Alleviation Scheme, http://www.environment-agency.co.uk/homeandleisure/floods/125115.aspx

A5.5 *Planning*

A5.5.1 CASE STUDY: FLINT COTTAGE, WEST BERKSHIRE.2 CASE STUDY: FLINT COTTAGE, WEST BERKSHIRE

Following the loss by fire of a 17th Century thatched cottage in December 2007, the owner decided to construct a modern, sustainable home in its place. The location, inside the North Wessex Downs AONB limited the design and meant keeping a traditional external appearance.

The building incorporated considerable insulation, far greater than the minimum requirements by Buildings Regulations, low energy lighting where possible as well as a number of solar passive features to make the best use of its south facing position.

Eighteen solar PV panels were installed to produce electricity, three flat plate panels to provide hot water and a multifuel burner providing space heating and hot water.[32]

A5.6 *Waste*

A5.6.1 CASE STUDY: COMMUNITY FURNITURE PROJECT

The Community Furniture Project is a charity which specialises in the reuse of furniture, electrical goods, bikes and bric-a-brac. It has three branches, two of which are in Newbury. The donated items are collected from homes in the district or donated directly to the branches and the collection point at the Household Waste Recycling Centre on Newtown Road (A339). Items are sorted, mended, tested and resold to the general public. Concessionary rates are available to those on certain benefits.

In the year ending March 2013, the reuse of donated items diverted an estimated 588 tonnes of waste from landfill (based on the Furniture Reuse Network (FRN) tonnage figures agreed by DEFRA). This saves on CO_2 emissions, however, the CO_2 equivalents in Case Study Table 1 only account for the Greenhouse Gas (GHG) emissions saved by the items not being sent to landfill, and not those saved by not having to manufacture a new item.

[32] TV Energy, 2011, Case Study: Achieving a Zero Carbon Family Home http://www.tvenergy.org/content/files/case-studies/achieving-a-zero-carbon-sustainable-family-home-1315405095.pdf

Case Study Table 1

Type of Reused Item	Number of tonnes of CO_2e saved by reusing one tonne of a donated item
Small Appliance	7.4
Large Appliance	7.4
Furniture	2.7
Textiles	19.5
Paints	2.6

The sale of the donated items also supports the Community Furniture Project's training activities and allows it to give meaningful volunteering opportunities to a wide range of people in West Berkshire.

A5.7 *Transport*

A5.7.1 CASE STUDY: GO KINETIC – WEST BERKSHIRE COUNCIL'S WALK TO SCHOOL REWARD SCHEME

Go Kinetic is a walk to school reward scheme designed to encourage more children to regularly walk or cycle to school. It has been running successfully in over 20 schools across West Berkshire since 2005. It can be started at any time in the school year, and has been shown to decrease the proportion of children being driven to school by an average of 9%. In some schools, the proportion of children walking after starting Go Kinetic can be 15 to 20% higher than prior to running the scheme. Of the children walking to school, 23% say that they are walking because of Go Kinetic.

Go Kinetic is designed as a framework, with schools choosing which aspects they would like to run. Each pupil is given a Go Kinetic 'Passport' where walking journeys are recorded by means of a stamp. Children have to walk a minimum distance of 400 metres to qualify for their stamp. Rewards are given out at 15, 25, 50 stamps and include hi-vis pencils, zip tags and free swimming sessions.

Following the success of Go Kinetic, a simpler version was developed alongside the Nursery Schools focused on promoting walking, cycling and scooting for the under 5s. Steposaurus, a dinosaur themed scheme, is run in the same way as Go Kinetic. Pupils who walk, cycle or scoot to nursery are awarded a sticker to stick on their Steposaurus card. Rewards are given at 5, 10 and 15 walks and are available both for the child (snap wraps, zip tags and stickers) and parents (free activity session at a local leisure centre).[33]

[33] WBC, 2012, Go Kinetic
http://www.westberks.gov.uk/index.aspx?articleid=6582

A5.8 *Sustainable Procurement*

A5.8.1 CASE STUDY: WEST BERKSHIRE COUNCIL'S SUSTAINABLE IMPACT ASSESMENT (SPIA)

The Sustainable Procurement Impact Assessment (SPIA) was designed to help identify the main sustainability risks associated with all WBC contracts in excess of £50,000. For contracts in excess of 3 years, SPIA should be undertaken annually to ensure that new policies and targets in relation to sustainable development are taken into account.

SPIA is a spreadsheet based assessment, in which sustainability questions (that can be applied to all contracts) are answered. Where there is a risk, a mitigation score is required. Once completed, risks and mitigations are clearly highlighted and can be kept in check.

A5.9 *Local Food*

A5.9.1 CASE STUDY: GROWING 2GETHER

Growing 2gether welcomes people from all walks of life and gives the chance to learn about horticulture and market gardening, and offers a space for therapeutic gardening. It is a partnership operation between the Community Furniture Project and West Berkshire Mencap.

Growing 2gether offers volunteering and training opportunities at a 1.5 hectare site, for local groups and individuals. Alongside the training aspect, local food economies and awareness are strongly promoted, through selling and marketing the food grown. Furthermore, promotion of the work is conducted through regular open days and events across the district.

A5.10 *Natural Environment*

A5.10.1 CASE STUDY: THE THATCHAM NATURE DISCOVERY CENTRE

The Thatcham Nature Discovery Centre attracts around 150,000 people annually and is sited next to old gravel pits (last worked in the early 1980's) and an expanse of natural wetland reed bed habitat.

The Thatcham Nature Discovery Centre is open throughout the year allowing the public access to these rare habitats. A number of regionally and nationally scarce animal, plant and fungal species can be found in the area. The Centre itself is an education facility, providing opportunities to learn about the natural environment, animal and plant life and sustainable development.

The building was refurbished in 2007 to improve its energy/water efficiency. Sustainable building design and materials were used, and systems such as a biomass boiler, solar thermal panels and rainwater harvesting were installed.[34] The environmental credentials of the building's fabric and functioning are core to the ethos of the Centre and are promoted in conjunction with its other activities.

[34] West Berkshire Council, 2011: http://www.westberks.gov.uk/index.aspx?articleid=5427

Other relevant documentation

Further Reading

UKCIP, What is Climate Change, 2012
http://www.ukcip.org.uk/essentials/what-is-climate-change

Related Policies and Strategies

A Breath of Fresh Air: *West Berkshire's Sustainable Community Strategy 2011/12*
http://www.westberkshirepartnership.org/index.aspx?articleid=15225

Climate Change Act 2008
http://www.legislation.gov.uk/ukpga/2008/27/contents

Energy Act 2011
http://www.legislation.gov.uk/ukpga/2011/16/contents/enacted/data.htm

The Fourth Carbon Budget
http://downloads.theccc.org.uk.s3.amazonaws.com/4th%20Budget/CCC-4th-Budget-Book_with-hypers.pdf

West Berkshire Council: West Berkshire Core Strategy DPD
http://www.westberks.gov.uk/index.aspx?articleid=4021

West Berkshire Council: *Local Transport Plan*
http://www.westberks.gov.uk/index.aspx?articleid=18646

GREENER SUB PARTNERSHIP CLIMATE CHANGE STRATEGY ACTION PLANS

This Action Plan is intended to accompany the West Berkshire Partnership's Climate Change Strategy (CCS). It sets out the main actions that will be undertaken in order to work towards the group's vision of at least a 17% reduction of CO_2 emissions on 2005 levels by 2020. The Greener Sub-Partnership will produce an annual Action Plan to cover individual actions aimed at working towards these targets and other priorities.

The CCS is a non-statutory document and therefore does not itself have specific powers.

1. INFLUENCING BEHAVIOUR				
	ACTION	**LEAD ORGANISATION**	**KEY PARTNERS**	**TIMESCALE**
1	Promote environmental best practice to the public and business	WBC (Energy Management)	AWE WBP	Ongoing
2	Support communities in creating new greening groups in West Berkshire. At least two new greening groups to be created.	WBGE	WBC (Energy Management)	Dec 2015
3	Promote partnership working and energy efficiency measures to businesses through the Green Business Network	AWE	Chamber of Commerce WBC WBP	Ongoing
4	Identify partners and produce a Local Climate Impacts Profile (LCLIP) to aid understanding of vulnerabilities to weather, raise awareness and enable preventative actions.	WBC (Energy Management)	To be identified	To be determined- The LCLIP could take up to 3 months to complete

2. ENERGY EFFICIENCY				
	ACTION	**LEAD ORGANISATION**	**KEY PARTNERS**	**TIMESCALE**
1	Promote energy conservation measures, FiT, RHI and Green Deal to communities, residents and businesses	WBC (Energy Management & Housing)	AWE TV Energy WBGE	Ongoing, long term projects
2	Develop the West Berkshire Green Business Network, which will address issues such as how commercial landlords and tenant businesses can mutually benefit by refurbishment of buildings and disseminate information on energy efficiency in a commercial setting	AWE	BID Chamber of Commerce TV Energy WBC (Economic Development, Energy Management & Housing) WBP	Ongoing

3. RENEWABLE ENERGY				
	ACTION	**LEAD ORGANISATION**	**KEY PARTNERS**	**TIMESCALE**
1	Produce and adopt a Renewable Energy Strategy enabling understanding of what is viable in West Berkshire	TV Energy	WBC (Energy Management)	To be adopted by Apr 14
2	Provide support for Community-owned renewable energy projects and investigate further opportunities with WBC building stock and developers	WBC (Energy Management & Planning)	TV Energy	Ongoing
3	Raise awareness of renewable energy, e.g. organising and supporting Eco-Building Open Days	WBC (Energy Management)	TV Energy WBGE	Ongoing

4. WATER				
	ACTION	**LEAD ORGANISATION**	**KEY PARTNERS**	**TIMESCALE**
1	Ensure WBC are complying with the Flood & Water Management Act 2010 including: • Flood response management • Flood Investigations Sustainable Development	WBC (Highways)	Environment Agency Utilities	Ongoing & Complying with legislative timescales.
2	Promote water conservation, reuse and sustainable drainage systems	WBC (Energy Management, Highways & Planning)	AWE Environment Agency Green Business Network Utilities WBGE	Ongoing
3	Raise public awareness of flood risk and climate change issues	WBC (Energy Management & Highways)	Environment Agency Utilities WBGE	Ongoing
4	Publicise the availability of Enhanced Capital Allowance (ECA) water efficiency products to West Berkshire businesses through the Green Business Network	AWE	Environment Agency WBC (Economic Development & Energy Management)	Ongoing

5. PLANNING				
	ACTION	**LEAD ORGANISATION**	**KEY PARTNERS**	**TIMESCALE**
1	Promote the use of renewable energy in new residential developments as a move towards attaining Code for Sustainable Homes Level 6	WBC (Energy Management & Planning)	TV Energy WBGE	Ongoing towards mandatory Code 6 for new developments in 2016
2	Use planning policy to promote the use of Sustainable Drainage Systems in all new developments in West Berkshire as a move towards greater water efficiency	WBC (Highways & Planning)	Environment Agency Utilities	Ongoing towards mandatory Code 6 for new developments in 2016

3	Ensure planning policy provides a framework that responds to the need to mitigate and adapt to climate change including moving to a low carbon economy	WBC (Energy Management & Planning)		Ongoing

6. WASTE

	ACTION	LEAD ORGANISATION	KEY PARTNERS	TIMESCALE
1	Promote waste minimalisation and recycling	WBC (Waste)	AWE CFP Veolia WBGE	Ongoing
2	Develop a West Berkshire Green Business Network	AWE	Chamber of Commerce WBC (Economic Development)	Ongoing
3	Produce an integrated Waste Strategy for commercial waste for West Berkshire	AWE	Waste companies WBC (Waste Team)	Dec 2014

7. TRANSPORT

	ACTION	LEAD ORGANISATION	KEY PARTNERS	TIMESCALE
1	Investigate how WBC can increase cycling uptake amongst its employees e.g. cycle buy/cycle to work scheme, re-launching pool bikes	WBC (Transport Policy)	Local cycle shops	Ongoing
2	Encouraging residents, businesses and schools to travel sustainably by promoting low carbon alternatives and ensuring infrastructure allows for sustainable travel choices	WBC (Transport Policy)	WBGE WBC (Energy Management)	Ongoing
3	Travel Planning – Work with businesses, residential developments, schools and individuals to use the most sustainable mode of travel	WBC (Transport Policy)	AWE WBGE WBC (Energy Management)	Ongoing
4	Work with partners to investigate and install electric vehicle charging points in West Berkshire	WBC (Energy Management)	Commercial Partners OLEV WBC (Transport Policy)	Mar 2015

8. SUSTAINABLE PROCUREMENT				
	ACTION	**LEAD ORGANISATION**	**KEY PARTNERS**	**TIMESCALE**
1	Wherever possible, promote the purchase of local sustainably sourced/made products in West Berkshire	CFP	WBC (Economic Development, Energy Management & Procurement) WBGE	Ongoing
2	Ensure that procurement policies take into account mitigation and adaptation to climate change	WBC (Procurement)	WBC (Energy Management Team)	Ongoing

9. LOCAL FOOD				
	ACTION	**LEAD ORGANISATION**	**KEY PARTNERS**	**TIMESCALE**
1	Secure a funding package to promote local food in West Berkshire	Growing 2gether	Hungerford Food Festival WBC (Energy Management, Environmental Health & Trading Standards)	June 2014
2	Subject to funding, set up a local food quality mark, support Hungerford Food Festival and investigate the set up of further food festivals in West Berkshire	Growing 2gether	Hungerford Food Festival WBC (Energy Management, Environmental Health & Trading Standards)	Mar 2016
3	Promote the consumption of local food in West Berkshire	Growing 2gether	Allotment groups Organic Research Centre WBC (Energy Management, Environmental Health & Trading Standards) WBGE	Ongoing

10. NATURAL ENVIRONMENT				
	ACTION	**LEAD ORGANISATION**	**KEY PARTNERS**	**TIMESCALE**
1	Engage the public in methods they can use to increase biodiversity in their gardens and how they can support wildlife in times of extreme weather	WBC (countryside)	BBOWT Living Landscape Project Nature Discovery Centre West Berkshire Countryside Society	Mar 2015
2	Produce simple guidance on the methods local business can use to increase biodiversity within their operations	WBC (countryside)	BBOWT Living Landscape Project Nature Discovery Centre West Berkshire Countryside Society	Dec 2014

Individual Executive Member Decision

Title of Report:	**Renewable Energy Strategy & Recommendations: A Renewable Energy Target for West Berkshire**
Report to be considered by:	Individual Executive Member Decision
Date on which Decision is to be taken:	30/04/2014
Forward Plan Ref:	ID2760

Purpose of Report: **To adopt 'The Renewable Energy Strategy' a product of the Greener Sub-Partnership.**

Recommended Action: **Consider the documents and approve them for adoption by West Berkshire Council.**

Reason for decision to be taken: The UK has a National Target of 15% renewable energy primary generation by 2020. This Strategy sets out and suggests a target for West Berkshire based on the districts constraints for how much the district could contribute. In order for the Strategy to be used for planning evidence purposes it is required to be adopted by West Berkshire Council.

Other options considered: No other options considered.

Key background documentation: West Berkshire Renewable Energy Strategy
A Renewable Energy Target for West Berkshire

Portfolio Member Details	
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Implications

Policy:	The production of a Strategy by the Greener sub-partnership may have implications for future council policy.
Financial:	There are no direct financial implications from this report.
Personnel:	N/A
Legal/Procurement:	N/A
Property:	N/A
Risk Management:	N/A

Is this item relevant to equality? Please tick relevant boxes	**Yes**	**No**
Does the policy affect service users, employees or the wider community and:		
• Is it likely to affect people with particular protected characteristics differently?	☐	☒
• Is it a major policy, significantly affecting how functions are delivered?	☐	☒
• Will the policy have a significant impact on how other organisations operate in terms of equality?	☐	☒
• Does the policy relate to functions that engagement has identified as being important to people with particular protected characteristics?	☐	☒
• Does the policy relate to an area with known inequalities?	☐	☒
Outcome (Where one or more 'Yes' boxes are ticked, the item is relevant to equality)		
Relevant to equality - Complete an EIA available at www.westberks.gov.uk/eia	☐	
Not relevant to equality	☒	

Consultation Responses

Members:

Leader of Council:	Councillor Gordon Lundie – No comment to make.
Overview & Scrutiny Management Commission Chairman:	Councillor Brian Bedwell – No comment to make.
Ward Members:	N/A
Opposition Spokesperson:	Councillor Royce Longton – In view of the recent incidence of flooding locally, and the dire predictions in the report from the UN's Intergovernmental Panel on Climate Change, we feel very strongly that the target for renewable energy production in West Berkshire should be raised significantly from the 6% to 11% of consumption by 2020 towards the national target of 15%. We accept that this could not be achieved without substantial development of wind turbines

	and solar farms. We therefore recommend that such developments should be actively encouraged in appropriate locations, and that the Council's planning policies should be revised to allow such developments at sites with the least damaging impact.
Local Stakeholders:	See formal consultation
Officers Consulted:	John Ashworth, Corporate Director - Environment
	Adrian Slaughter, Principal Energy Efficiency Officer
Trade Union:	Not consulted

Is this item subject to call-in?	Yes: ☒	No: ☐

If not subject to call-in please put a cross in the appropriate box:

The item is due to be referred to Council for final approval	☐
Delays in implementation could have serious financial implications for the Council	☐
Delays in implementation could compromise the Council's position	☐
Considered or reviewed by Overview and Scrutiny Management Commission or associated Task Groups within preceding six months	☐
Item is Urgent Key Decision	☐
Report is to note only	☐

Supporting Information

1. Background

1.1 West Berkshire Council support, and are members of, the Greener Sub-Partnership. This is a branch of the Local Strategic Partnership and is acknowledged as an important element of the Council's role in engaging with its residents, local business and voluntary sector.

1.2 The Greener Sub-Partnership are keen for West Berkshire Council to acknowledge its recommendations and play a role in the implementation process. This will be helpful in shaping local policy and give them a platform upon which to base future dialogue with interested parties.

2. Local Environment

2.1 West Berkshire is a landlocked, mainly rural constituency, with considerable potential for renewable energy production. There is enough potential for West Berkshire to be theoretically self-sufficient in energy. Such a transition however would likely affect landscape, biodiversity, infrastructure and development and in the short to medium term would be highly contentious and deemed unacceptable.

2.2 The Renewable Energy Strategy sets out to show what potential exists for renewable energy in West Berkshire, applying various constraints. The scale of technology required to achieve various percentages of renewable production are discussed. The Renewable Energy Target for West Berkshire proposes a target for the production of renewable energy in West Berkshire considering the constraints discussed in the Strategy.

3. Equalities Impact Assessment Outcomes

3.1 No affected groups have been identified.

4. Conclusion

4.1 That West Berkshire Council adopts the Sub-Partnership's Renewable Energy Strategy and recommendations report.

Appendices

Appendix A - West Berkshire Renewable Energy Strategy
Appendix B – A Renewable Energy Target for West Berkshire

TV Energy

A RENEWABLE ENERGY TARGET FOR WEST BERKSHIRE

TV Energy has been requested by the Local Strategic Partnership to recommend a target for renewable energy contribution that West Berkshire (WB) might adopt. This based on a strategy paper completed in 2012 (a summary of findings is presented here).

The national target that WB might aspire to is 15% renewable energy primary generation by 2020. This would need to be achieved from a very low starting point of an estimated 2.5% contribution. However, this would be purely aspirational and from the analysis carried out in 2012 would seem far too high to be credible and highly unlikely to be achieved. Of course, the national target will include a significant contribution from off-shore generation of which wind energy will play the greatest role. As years go by, tidal, tidal stream and perhaps wave power might also contribute significantly.

WB is landlocked and **only on shore technologies are relevant**. Great advances are being made in the deployment of some appropriate technologies such as solar PV and thermal, heat pumps and increasingly biomass/ woodfuel. Government incentives remain (FIT, ROCs, RHI, Green Deal etc.) and the domestic renewable heat incentive has just been published and will, for example, pay 12.2p/kWh for biomass installations. **This must accelerate deployment for domestic retrofit and new developments.**

For green field sites, there remains considerable reluctance to embrace wind energy at scale (locally and politically), this would be a major component of achieving the higher targets set out in the report. A number of solar farms are being proposed and these seem more likely to make progress as they are less visually intrusive.

On the negative side also, is the likelihood that the Biofuels Directive will not be fully implemented. However, this is very hard to call and as a result, **it is recommended that a target be set without the inclusion of transport**.

For final consideration is the future trend in energy consumption. Over recent years there has been a steady reduction but this is not expected to continue as the economy moves out of recession. **Prudently, a figure that assumes zero or a modest further reduction in energy use should be used.**

Taking into account the above remarks, losing transport presents the range 2.5 – 11% contribution. Low or no change in consumption narrows the range to 3.6 – 8.5%.

An aggressive approach (business+ in the modeling) for domestic and other installations and a business as usual/ modest take on greenfield projects (so minimal wind and some solar farms for example) would reduce the 8.5% figure to nearer 7%.

On this basis, a target of a minimum of 7% should be set for renewable energy contribution by 2020 from local sources representing at least a doubling of output from that currently being achieved.

TV Energy

SUMMARY OF STRATEGY FINDINGS (2012)

West Berkshire (WB) is a landlocked, mainly rural constituency and has considerable potential for renewable energy production and use based on deployment of technologies generating power from the wind, sun, waste and plants (primarily trees). The accessible potential available from these renewable resources is of a similar order to the total primary energy needs of the area in terms of heating and power as well as transport and could theoretically make WB self-sufficient in energy.

Such a whole hearted transition to a 'low carbon economy' would create considerable socio-economic benefits for the community in terms of job and business creation, wealth creation and retention plus a range of social gains resulting from the availability of cheaper energy (e.g. the ability to address fuel poverty and energy affordability). However, in order to harness large amounts of these renewable resources there would by necessity be major implications for landscape, biodiversity, infrastructure and development. Such impacts are seen to be highly contentious in many instances and as such will severely constrain deployment in at least the short to medium term (up to 2020). Longer term with uncertainties in conventional fuel availability for heating (coal, oil, gas) and for power supply (coal, gas, nuclear) at acceptable prices, what is deemed unacceptable currently is likely to change and greater deployment might be expected as a result. Added to this long term, is the impact that climate change is likely to have causing unpredictable changes to our local environment, for example through an increase in wind speed and duration, solar gain and rainfall frequency and amounts of precipitation (affecting rivers and plant growth).

The rate and degree of these economic and environmental changes is hard to predict but will surely influence local people and social attitudes to beneficial change to ameliorate these impacts as much as possible. The interaction with the planning and development policies of West Berkshire Council (WBC) and the leadership shown by local councillors will become increasingly important in plotting the way ahead.

Ultimately, the main report carried out for the LSP in late 2012, sets out to illustrate what immediate potential exists to harness local renewable energy resources in WB and so to continue the move towards a more sustainable way of living and working for local people providing greater security of supply, affordability and lower emissions. The report shows how the technical potential is essentially illusory but through applying various constraints (physical environment, regulation and designations) a core of activity and 'accessible potential' exists that could catalyse real change in WB and potentially contribute up to 11% of primary energy by 2020 to be met from local renewable energy sources.

CONCLUSIONS

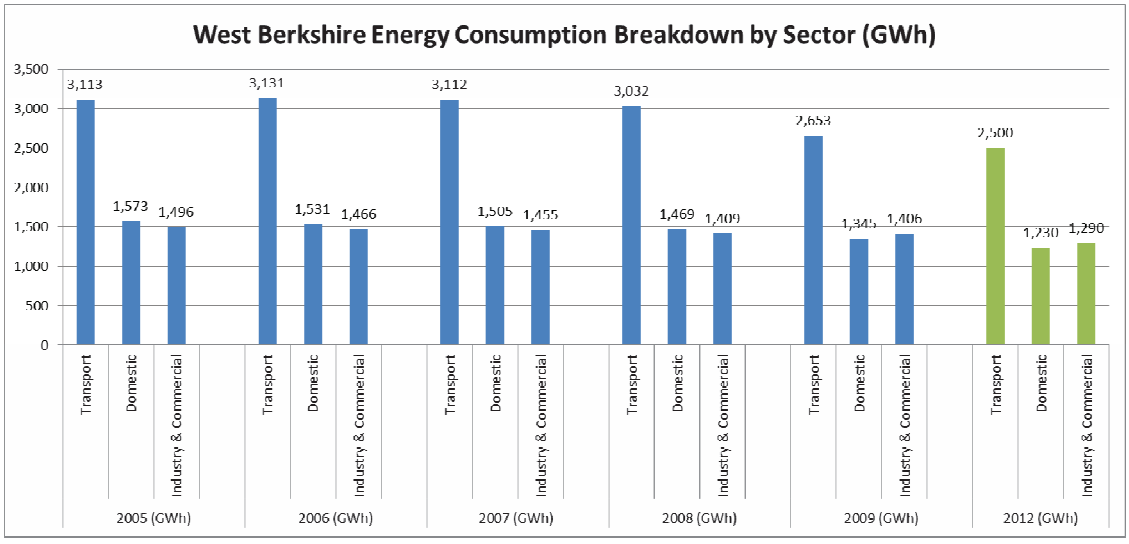
- A core of activity and 'accessible potential' exists that could catalyse real change in WB and potentially contribute up to **11% of primary energy by 2020** to be met from local renewable energy sources.
- Given the very many constraints on development, what then might realistically be achieved over the next 6 years in WB? Taking a pragmatic view there are seen to be three general areas where WB might seek to bring forward and influence renewable energy projects:

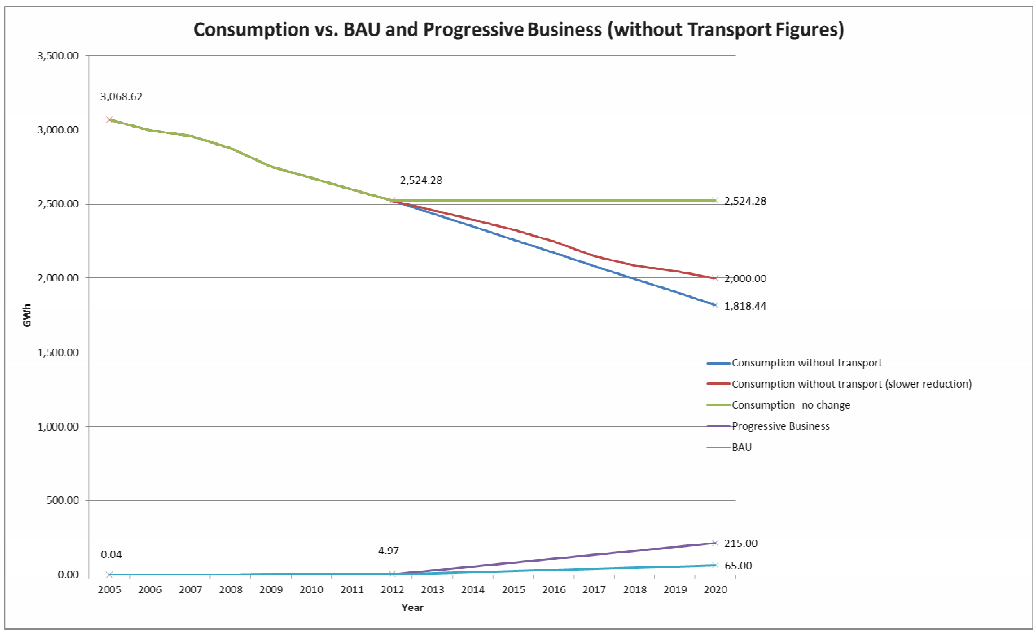
1. Projects based on existing developments and housing (so 'retrofit' technology')
2. Projects based on planned housing and commercial developments/ infrastructure (so 'new' but integrated developments)
3. Projects based on 'greenfield' sites (so completely 'new' developments)

- The first two areas are less likely to have a significant additional visual impact over and above that anticipated by the existing or planned developments and as such should be less controversial. ***However, it is the third area where most untapped potential lies***. To note also that installing retrofit technology at scale can also be disruptive unless well planned and executed.
- The 6 years to 2020 will pass quickly and hence if significant impact is to be achieved to increase the amount of renewable energy used then urgent action is needed. The LSP including the council can only expect to have limited influence so where best to focus efforts bearing in mind the rapidly evolving national energy policy and fiscal incentives directed at supporting greater use of renewables.
- The following table sets out what might realistically be brought forward in WB by 2020. The following sections then go on to explore the numbers included in the table. Two scenarios are considered (1) a **Business as Usual** or BAU based on zero local intervention and allowing the market place to dictate progress – extrapolating largely from TV STATS figures and (2) a more progressive scenario based on LSP (including WB council) prioritisation called **Business+** delivering a x3 benefit in terms of GWh produced.
- The Table below explores the estimated levels of renewable energy contribution that might result from bringing forward the packages of projects outlined earlier. Note the significant impact that the national programme extending renewable energy use with transport fuels (based on the Biofuels Directive seeking 10% of fuels to be renewable by 2020) has on the totals. However, a note of caution when interpreting these figures since there is some debate as to whether this Directive will be fully enforced.

	Heat and Power without Transport	Heat and Power with Transport
Lowest consumption vs. progressive Business	11.00%	10.89%
Slower reduction of consumption vs. progressive business	10.00%	10.37%
No change in consumption vs. progressive Business	8.50%	9.26%
Lowest consumption vs. BAU	3.60%	6.76%
Slower reduction of consumption vs. BAU	3.25%	6.62%
No change in consumption vs. BAU	2.50%	6.27%

Table 1, Percentage of heat, power and transport consumption vs. BAU and Progressive business figures





Renewable Energy Strategy for West Berkshire

LOCAL STRATEGIC PARTNERSHIP

October 2012

West Berkshire COUNCIL

TV Energy

This report has been prepared by TV Energy on behalf of the LSP and West Berkshire Council. Report reference TVR285.

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ABBREVIATIONS

AONB	Area of Outstanding Natural Beauty
NWD	North Wessex Downs
RE	Renewable Energy
PV	Photovoltaic
CLG	Communities and Local Government
AGL	Above Ground Level
LSA	Life Cycle Assessment
BHA	British Hydro Association
MSW	Municipal Solid Waste
AD	Anaerobic Digestion
EfW	Energy from waste
Defra	Department of Food and Rural Affairs
DECC	Department of Energy and Climate Change
Cumec	Cubic meters per second
NRFA	National River Flow Archive
TVE	Thames Valley Energy
DECC	Department of Energy and Climate Change
FIT	Feed in tariff
RHI	Renewable heat incentive
WB	West Berkshire

FOREWORD

This report is set out in three sections: (1) a concise renewable energy strategy document discussing current levels of energy consumption and proposing a range of renewable energy resources that might be deployed to satisfy local energy needs. The report goes on to suggest a range of projects utilising the various technologies along with energy targets that might be applicable for 2020.

The strategy draws on (2) a short document observing relevant references to renewable energy in the West Berkshire Core Strategy issued in 2012 with linked references to the North Wessex Downs AONB and AWE Aldermaston and finally (3) a detailed technical exploration of the renewable energy resource in West Berkshire.

EXECUTIVE SUMMARY

West Berkshire (WB) is a landlocked, mainly rural constituency and has considerable potential for renewable energy production and use based on deployment of technologies generating power from the wind, sun, waste and plants (primarily trees). The accessible potential available from these renewable resources is of a similar order to the total primary energy needs of the area in terms of heating and power as well as transport and could theoretically make WB self sufficient in energy. Indeed, given the substantial reductions in energy needs (as reported by DECC) year on year, WB could before long have a potential surplus of energy and might consider becoming an energy exporter.

Such a whole hearted transition to a 'low carbon economy' would create considerable socio-economic benefits for the community in terms of job and business creation, wealth creation and retention plus a range of social gains resulting from the availability of cheaper energy (e.g. the ability to address fuel poverty and energy affordability). However, in order to harness large amounts of these renewable resources there would by necessity be major implications for landscape, biodiversity, infrastructure and development. Such impacts are seen to be highly contentious in many instances and as such will severely constrain deployment in at least the short to medium term (up to 2020). Longer term with uncertainties in conventional fuel availability for heating (coal, oil, gas) and for power supply (coal, gas, nuclear) at acceptable prices, what is deemed unacceptable currently is likely to change and greater deployment might be expected as a result. Added to this long term, is the impact that climate change is likely to have causing unpredictable changes to our local environment, for example through an increase in wind speed and duration, solar gain and rainfall frequency and amounts of precipitation (affecting rivers and plant growth).

The rate and degree of these economic and environmental changes is hard to predict but will surely influence local people and social attitudes to beneficial change to ameliorate these impacts as much as possible. The interaction with the planning and development policies of West Berkshire Council (WBC) and the leadership shown by local councillors will become increasingly important in plotting the way ahead.

Ultimately, this report sets out to illustrate what immediate potential exists to harness local renewable energy resources in WB and so to continue the move towards a more sustainable way of living and working for local people providing greater security of supply, affordability and lower emissions. The report shows how the technical potential is essentially illusory but through applying various constraints (physical environment, regulation and designations) a core of activity and 'accessible potential' exists that could catalyse real change in WB and potentially contribute up to 11% of primary energy by 2020 to be met from local renewable energy sources.

TV Energy (TVE) was commissioned on behalf of the Local Strategic Partnership (LSP) to carry out this strategic review of the potential for renewable energy (RE) deployment across WB. The report should be considered alongside other reviews being carried out on waste, carbon, food and travel as part of an overall climate change strategy. This document should aid WB council in setting up practical and achievable RE targets for a sustainable West Berkshire.

1. A RENEWABLE ENERGY STRATEGY FOR WEST BERKSHIRE

ENERGY CONTEXT (2012)

1. West Berkshire (WB) is a landlocked, mainly rural constituency and has considerable potential for renewable energy production and use based on deployment of technologies generating power from the wind, sun and biomass (primarily trees). *NB. Energy from waste is not considered in detail in this report.* The 'accessible' potential available from these renewable resources is estimated to be of a similar order to the total energy needs of the area in terms of transport, heating and power requirements and could theoretically make WB almost self sufficient in energy. See Table 1 and Figure 1 below and also Annex 1: renewable energy potential.

Technology/resource	**Accessible energy including** arable land and AONB (GWh)	**Accessible energy excluding** arable land and ANOB (GWh)	Existing Use (TV STATS) GWh
Large wind	1273	146	0
Small wind	94		0.041
Solar PV	31.45		1.378
Solar thermal			0.113
Solar ground arrays	2959	949	0
Hydro			0
Biomass	98.15		2.656
Heat Pumps	146		0.897
Total	**4601.6**	**1464.6**	**5.085**

Table 1, Renewable energy potential

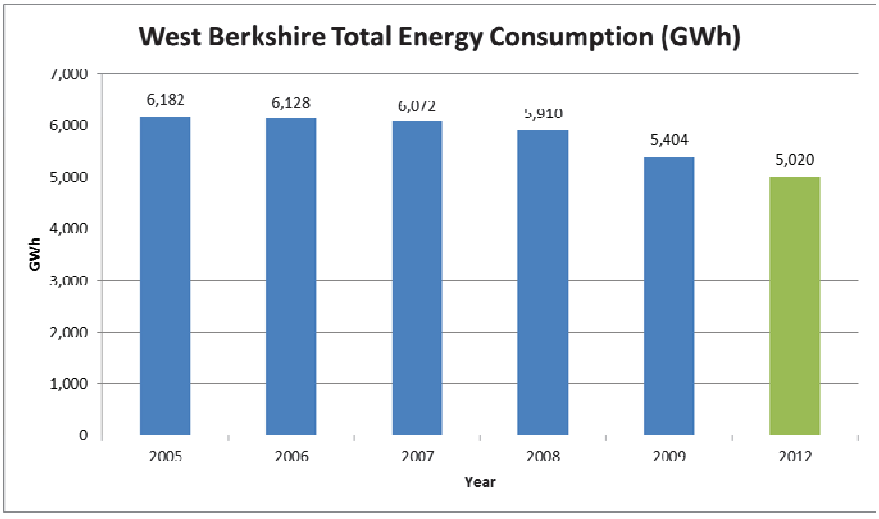

Figure 1, West Berkshire Total Energy Consumption[1] (with predicted 2012 figures)

[1] Figures from http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/regional/total_final/total_final.aspx

2. However, major constraints to deploying technology in WB rapidly reduce this potential. For example, accepting that large wind energy devices and extensive solar farms are unlikely to be deemed acceptable in the North Wessex Downs AONB on the grounds of visual intrusion reduces this potential considerably.

3. Nevertheless, even excluding these areas, there is still a significant potential capable of supplying more than half of WB's heating and power needs. See Figures 1 and 2 illustrating energy consumption for the period 2005 – 2012, the prediction for energy needs in 2012 is of the order of 2,520GWh for domestic, industrial and commercial use (excluding transport).[2]

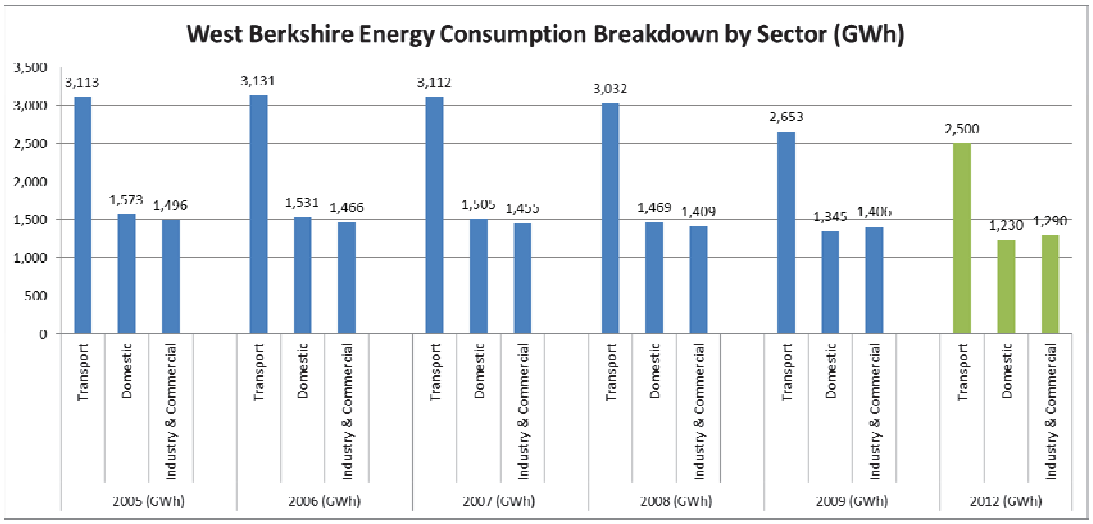

Figure 2, West Berkshire Energy Consumption Breakdown by Sector (with predicted 2012 figures)

4. In the short to medium term (say to 2020), any strategy that seeks to move renewables forward in WB is going to be largely dictated by the need to minimise visual impact, given the great sensitivities to conserving landscape locally. However, if this constraint is allowed to dominate longer term then ***there must be an acceptance that only limited progress can be made to harness the local potential*** since the degree of visual impact is roughly proportional to the scale and energy intensity of renewable energy projects. Figure 3 below seeks to illustrate this point and is supplemented by a table explaining the 'capacity factors' for various technologies and scales. The higher the factor the more effective is the technology in simple terms.

5. This point is well made considering how little progress has been made in WB to date. Table 1 far right column shows the very modest use of renewables reported by TV Energy in the 'TV STATS' evidence base review completed in September 2012[3]. Forward movement is also limited, see Figure 4. The exception to this lies with PV (photovoltaics installations) where progress is being made as a result of new fiscal incentives introduced by central government. Note also the poor position with respect to other Local Authority areas across the Thames Valley as shown in Figure 5 below.

[2] http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/regional/total_final/total_final.aspx

[3] West Berkshire statistics report 2012

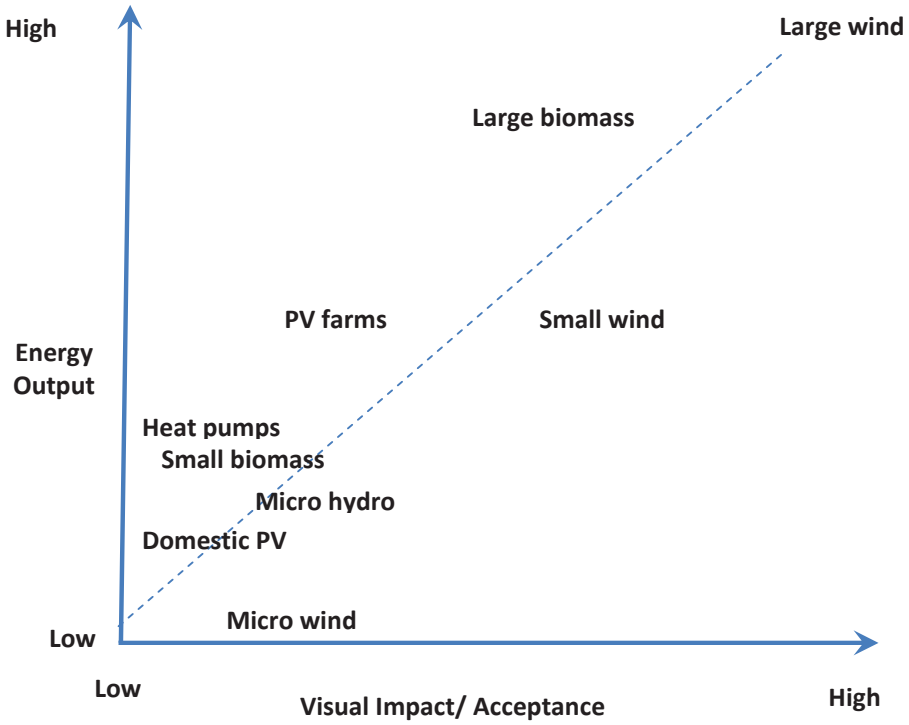

Figure 3, Visual impact versus Energy output

Technology	Capacity factors
Onshore wind (large >100kW)	26%
Onshore wind (small 5-50kW)	15%
Onshore wind (micro <5kW)	4%
Solar PV	10%
Solar thermal	13%
Biomass heat - domestic (<50kW$_{th}$)	10%
Biomass heat - community/commercial (>50kw$_{th}$)	20%
Low head hydro	40%
Ground Source Heat Pump	30%

Table 2, Technology capacity factors

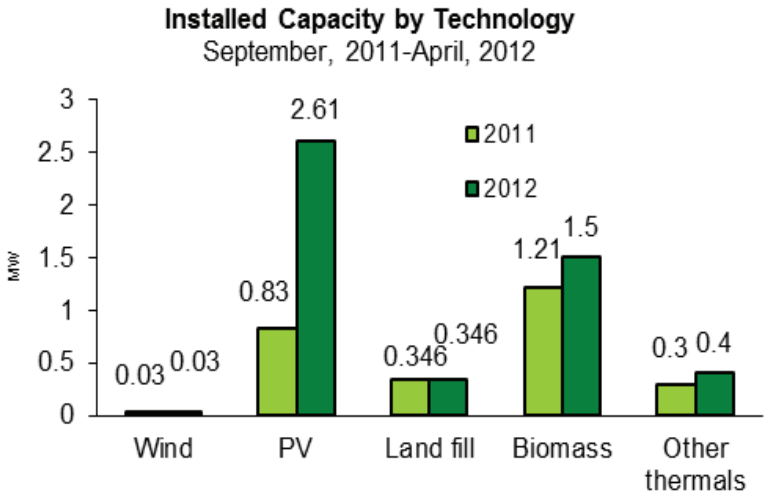

Figure 4, Renewable energy installed capacity (MW) in WB

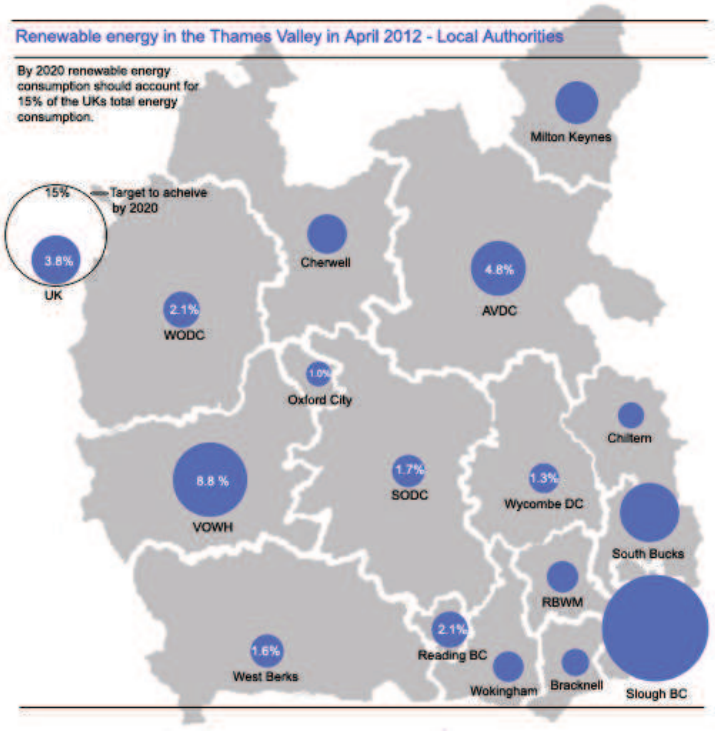

Figure 5, TV Local Authority percentage RE use map

6. The draft WB climate change strategy[4] makes no reference to a target for renewable energy use by 2020 but to come into line with national expectations should be seeking 15% of primary energy being met by renewables. Taking transport use into account as well as heating and power, WB currently stands at a very modest 1.6%.

[4] Draft version available through West Berkshire Council, due for release later in 2012

LOOKING AHEAD (2012 – 2020)

7. Given the very many constraints on development, what then might realistically be achieved over the next 8 years in WB? Taking a pragmatic view there are seen to be three general areas where WB might seek to bring forward and influence renewable energy projects:

- Projects based on existing developments and housing (so 'retrofit' technology')
- Projects based on planned housing and commercial developments/ infrastructure (so 'new' but integrated developments)
- Projects based on 'greenfield' sites (so completely 'new' developments)

8. The first two areas are less likely to have a significant additional visual impact over and above that anticipated by the existing or planned developments and as such should be less controversial. ***However, it is the third area where most untapped potential lies***. To note also that installing retrofit technology at scale can also be disruptive unless well planned and executed.

9. Looking ahead, there appears to be a desire to see more renewables being both generated and used as a part of a wider strategy to move towards a lower carbon economy and a more sustainable future for local citizens. The recently approved Core Strategy[5] adopted by West Berkshire Council (WBC) on Monday 16 July 2012 is central to considerations here. This follows the publication of the Inspector's Report into the examination of the document on 6 July 2012. The strategy is the lead document of the Council's new Local Plan and sets out the vision for the District, together with key policies to guide development over the period up to 2026. ***As such, it will have a major role in determining what can and what cannot move forward relating to new energy infrastructure.*** Also, of key significance is that the plan has been informed by extensive consultation and has been subject to sustainability appraisal to assess the social, environmental and economic impacts of policies. Hence, it can be used to 'take the temperature' of the District and to see what appetite there is for change enabling renewables to be adopted on a wider scale. The tie in with the Core Strategy and policy is explored in detail in the next section of the report.

WHAT MIGHT BE ACHIEVED BY 2020?

10. The 8 years to 2020 will pass quickly and hence if significant impact is to be achieved to increase the amount of renewable energy used then urgent action is needed. The LSP including the council can only expect to have limited influence so where best to focus efforts bearing in mind the rapidly evolving national energy policy and fiscal incentives directed at supporting greater use of renewables.

11. The following table sets out what might realistically be brought forward in WB by 2020. The following sections then go on to explore the numbers included in the table. Two scenarios are considered (1) a **Business as Usual** or BAU based on zero local intervention and allowing the market place to dictate progress – extrapolating largely from TV STATS figures and (2) a more progressive scenario based on LSP (including

[5] http://www.westberks.gov.uk/CHttpHandler.ashx?id=31637&p=0

WB council) prioritisation called **Business+** delivering a x3 benefit in terms of GWh produced.

BUSINESS AS USUAL (BAU)

BAU -What might be achieved in 2020 (number)

		PV/Solar thermal (kW_e)	Heat pumps (kW_{th})	Biomass (kW_{th})	Wind (kW_e)	Hydro (kW_e)	AD (kW_e)
Existing (Retrofit)	Domestic housing (each @)	1,619[6]	1,619	100	3[7]	0	0
		2	5	15	6	0	0
	Other (each @)	104[8]	20[9]	8[10]	5	1	3
		30	100	500	9	50	200
New (Integrated)	Domestic housing (each @)	950[11]	950	1[12]	0	0	0
		2	5	1000	0	0	0
	Other (each @)	0	0	0	0	0	0
		0	0	0	0	0	0
Greenfield (each @)		2[13]	0	0	1	1	0
		2,000	0	0	1,300	50	0

Table 3, 2020 Renewable Energy Projections (BAU)

BAU -What might be achieved in 2020 (output GWh)

		PV/Solar thermal	Heat pumps	Biomass	Wind	Hydro	AD	Total
Existing (Retrofit)	Domestic housing	2.84	21.27	1.31	0.02	0.00	0.00	**25.45**
	Other	2.73	5.26	7.01	0.06	0.18	2.10	**17.33**
New (Integrated)	Domestic housing	1.66	12.48	1.75	0.00	0.00	0	**15.90**
	Other	0.00	0.00	0.00	0.00	0.00	0	**0.00**
Greenfield		3.50	0.00	0.00	2.96	0.18	0.00	**6.64**
		10.74	**39.01**	**10.07**	**3.04**	**0.35**	**2.10**	**65.32**

Table 4, 2020 Renewable Energy Projection (BAU, GWh)

[6] 10% of all suitable houses within West Berkshire
[7] Continued on a trend from TV Stats
[8] 10% of all suitable commercial/educational/industrial buildings within West Berkshire
[9] 2% of all suitable commercial/educational/industrial buildings within West Berkshire
[10] 1 secondary school per year to have a biomass boiler installed
[11] 20% of all new houses planned within West Berkshire
[12] 1 District heating scheme within the new housing developments within West Berkshire
[13] 2 Ground mounted PV systems; Thatcham and ....

12. Irrespective of targets, the potential for positive change affecting most lives in WB in the short term and increasing quality of life lies here. Looking holistically at current housing stock and retail/ commercial/ industrial buildings and improving energy efficiency as well as introducing micro-renewable energy technology must have a high priority. Some technologies are ideally suited for retrofit and include solar thermal and PV. Some technologies require more consideration but can be equally effective and include biomass/ wood and heat pumps. Heat pumps in particular might provide a significant potential. The 'Renewable Heat Incentive' (RHI) is seen to be an important consideration in the short term at least to mobilise heat based renewables.

13. Existing planning rules can help to encourage change and the strict enforcement of Building Regulations where changes are proposed (e.g. extensions to existing stock) is essential to improve stock over a period of time. Much micro-technology is within the bounds of 'permitted development' apart from sensitive locations, listed buildings and designated areas. Here too, a positive attitude is also needed.

14. Of great importance is to ensure that WB works effectively with the 'Green Deal' and providers as this is rolled out over the coming months. The incentives within this new government initiative should revolutionise the incorporation of micro-renewables allowing the momentum established for PV to carry over to other technologies as outlined in paragraph 12 above.

15. The table above footnotes expectations for this scenario, using a figure of 10% intervention for domestic and commercial retrofit, 20% for all new build and a modest introduction of biomass in schools (8) with very limited introduction of large scale wind (1 turbine) and solar farms (2). A single low head hydro scheme is also envisaged.

16. One District Energy scheme is considered possible at scale for a new development. This might be a hybrid scheme also using gas to cope with peak loads and perhaps as a Combined Heat and Power (CHP) project. Such a facility serving around 400 dwellings would require a land footprint of around 200sq.m, with boiler flues likely to be over 8m above ground level.

17. New commercial/ industrial developments are unknown but could contribute.

18. Energy from waste projects may also contribute to the total but are not considered here. Currently there is a small contribution from landfill gas, but this will diminish over time and become insignificant by 2020. MSW digestion or advanced processing (e.g. through pyrolysis or gasification) is also possible, the latter already proving highly contentious (proposed facility at Chieveley). Hence, there is the possibility of a modest contribution by 2020 and this needs to be considered in relevant waste strategies.

PROGRESSIVE (BUSINESS+)

Progressive Business -What might be achieved in 2020 (number)

		PV/Solar thermal (kW_e)	Heat pumps (kW_{th})	Biomass (kW_{th})	Wind (kW_e)	Hydro (kW_e)	AD (kW_e)
Existing (Retrofit)	Domestic housing (each @)	3,239[14]	3,239	250	10	0	0
		2	5	15	6	0	0
	Other (each @)	209[15]	104[16]	25[17]	25	2	8
		30	100	500	9	50	200
New (Integrated)	Domestic housing (each @)	1,900[18]	1,900	3[19]	0	0	0
		2	5	1000	0	0	0
	Other (each @)	5	10	5	5	0	0
		25	100	500	15	0	0
Greenfield (each @)		15[20]	0	1[21]	10	3	3
		2,000	0	2,000	1,300	50	200

Table 5, 2020 Renewable Energy Projections (Progressive Business)

Progressive Business -What might be achieved in 2020 (output GWh)

		PV/Solar thermal	Heat pumps	Biomass	Wind	Hydro	AD	Total
Existing (Retrofit)	Domestic housing	5.67	42.56	3.29	0.08	0.00	0.00	**51.60**
	Other	5.49	27.33	21.90	0.30	0.35	5.61	**60.98**
New (Integrated)	Domestic housing	3.33	24.97	5.26	0.00	0.00	0	**33.55**
	Other	0.11	2.63	4.38	0.10	0.00	0	**7.22**
Greenfield		26.28	0.00	3.50	29.61	0.53	2.10	**62.02**
		40.89	**97.49**	**38.33**	**30.08**	**0.88**	**7.71**	**215.36**

Table 6, 2020 Renewable Energy Projection (Progressive Business, GWh)

[14] 20% of all suitable houses within West Berkshire
[15] 20% of all suitable commercial/educational/industrial buildings within West Berkshire
[16] 10% of all suitable commercial/educational/industrial buildings within West Berkshire
[17] 3 biomass installations in commercial/educational/industrial per year
[18] 40% of all new houses planned within West Berkshire
[19] 3 District heating scheme within the new housing developments within West Berkshire
[20] 10 Ground mounted PV systems.
[21] 1 independent Biomass system, electricity only!

19. Under this enhanced scenario, the rate of introduction of technology to existing housing and other existing buildings is doubled to 20% by 2020. For new housing up to a 40% intervention rate.

20. The real impact of this scenario is in the deployment of large volumes of micro-technologies (solar and heat pumps) boosted by a modest number of larger scale solar (15), wind (10 turbines) and biomass projects (25) including District Energy schemes (5). Included is one 'stand alone' high efficiency wood fired power station and 3 low head hydro schemes.

21. **New developments** offer the opportunity for integrated use of renewable energy technology often at scale with the concomitant benefits of lower costs of installation and lower profile of introduction. It is essential that all major new developments incorporate a significant level of renewables as such opportunities occur rarely and are generally 'once in a lifetime' events. Planning policy needs to fully embrace this requirement.

22. Of particular interest with larger developments is the use of District Energy (DE) schemes where biomass might be used as the predominant fuel alongside natural gas.

23. In WB, there are a few notable developments coming forward such as Newbury Racecourse (1,500 homes) and Sandleford (2,000 homes) plus regenerating the centre of Thatcham to provide higher quality shopping and facilities for residents and visitors. In Thatcham there will also be an additional 900 homes, Theale 350 homes and within the eastern part of the District, a broad location for development is identified on the, taking in the Eastern Urban Area of Tilehurst, Calcot and Purley on Thames, as well as the rural service centre of Theale.

24. The racecourse contains a commitment to 'generate on-site renewable energy'. Such commitments need to be followed up and a minimum target percentage should be included on a pro rata basis bearing in mind 15% of usage should come from renewables by 2020.

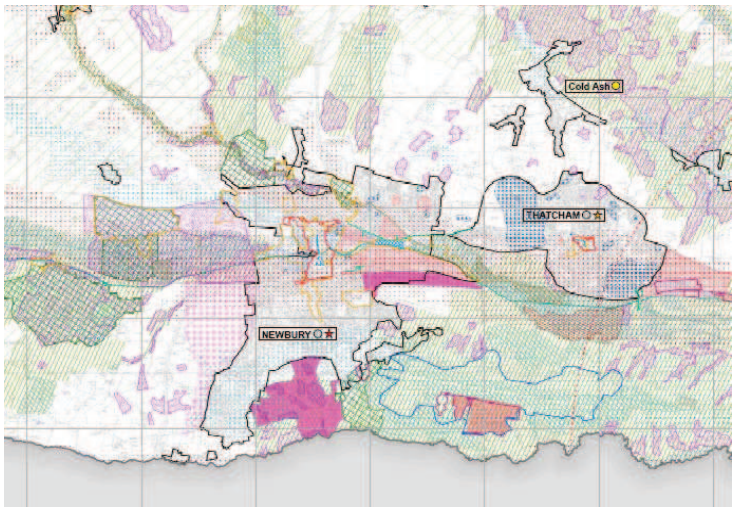

Figure 6, Map showing the position of two major developments in WB (lilac)

25. The most controversial and difficult to establish will be the **large, independent schemes** featuring wind, solar and biomass. Clusters of up to 3 x 1.3MWe wind schemes might sensibly fit within the local landscape as has been extensively discussed in several SE England renewable energy strategy documents in the recent past.

26. Large solar arrays may be less difficult to bring forward given their lower profile and ease of fit within the landscape. A biomass power station would need to have good transport links to meet fuel supply needs and would entail considerable impact (scale, stack/ emissions, traffic movements).

27. In order to support an expansion in biomass/ wood fuel use in West Berkshire (with or without the stand alone facility) there will be the need to develop wood fuel supply infrastructure. In particular, a 'Tree Hub' that is capable of supplying high quality fuel on a consistent basis. This would then draw on a myriad of local suppliers and help boost the local rural economy.

POTENTIAL RENEWABLE ENERGY TARGETS

28. Based on the scenarios examined, WB might expect to be able to achieve a renewable energy target of between **6 and 11%** (based on primary energy needs so heat, power and transport) depending upon the level of positive support of new technology introduction.

29. The ranges are illustrated below showing the interplay of the BAU and Business+ strategies for heat and power plus heat, power and transport when set against three possible future energy consumption estimates (based on projecting forward from 2012 at the same level, straight line based on 2005 – 2009 and a middle case reduction).

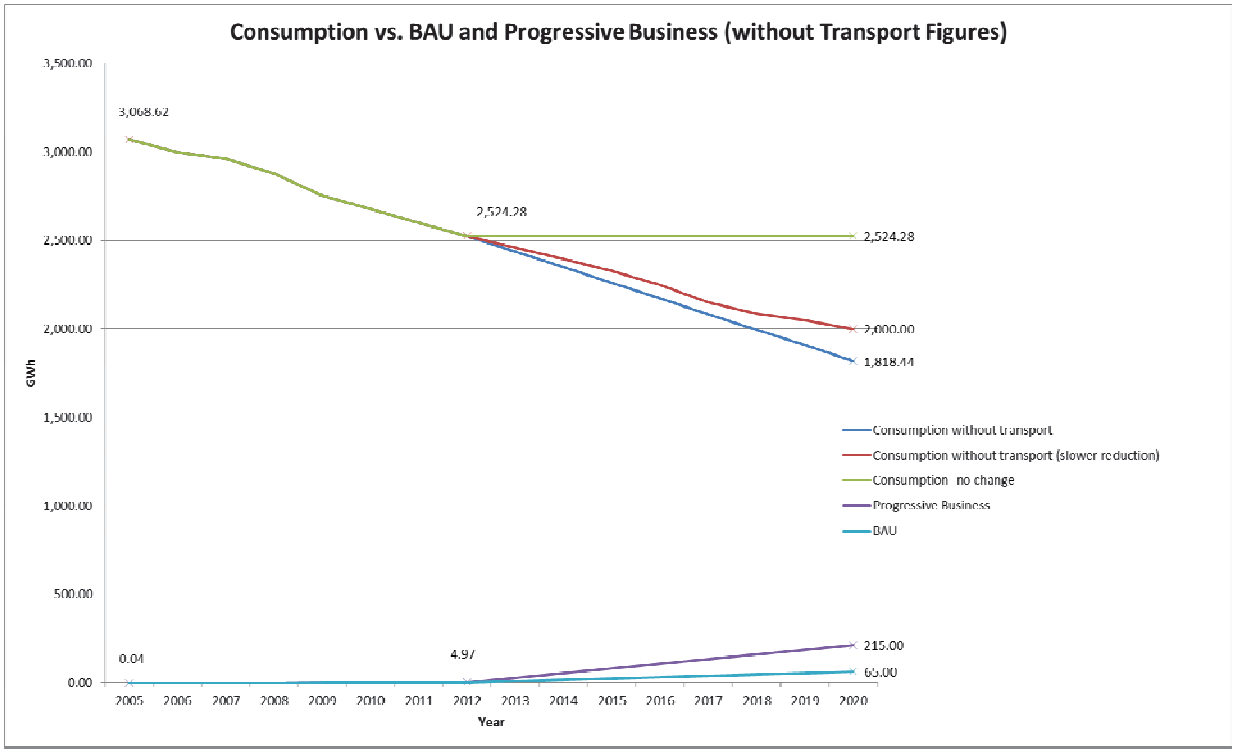

Figure 7, Consumption vs. BAU and Progressive Business (without Transport Figures)

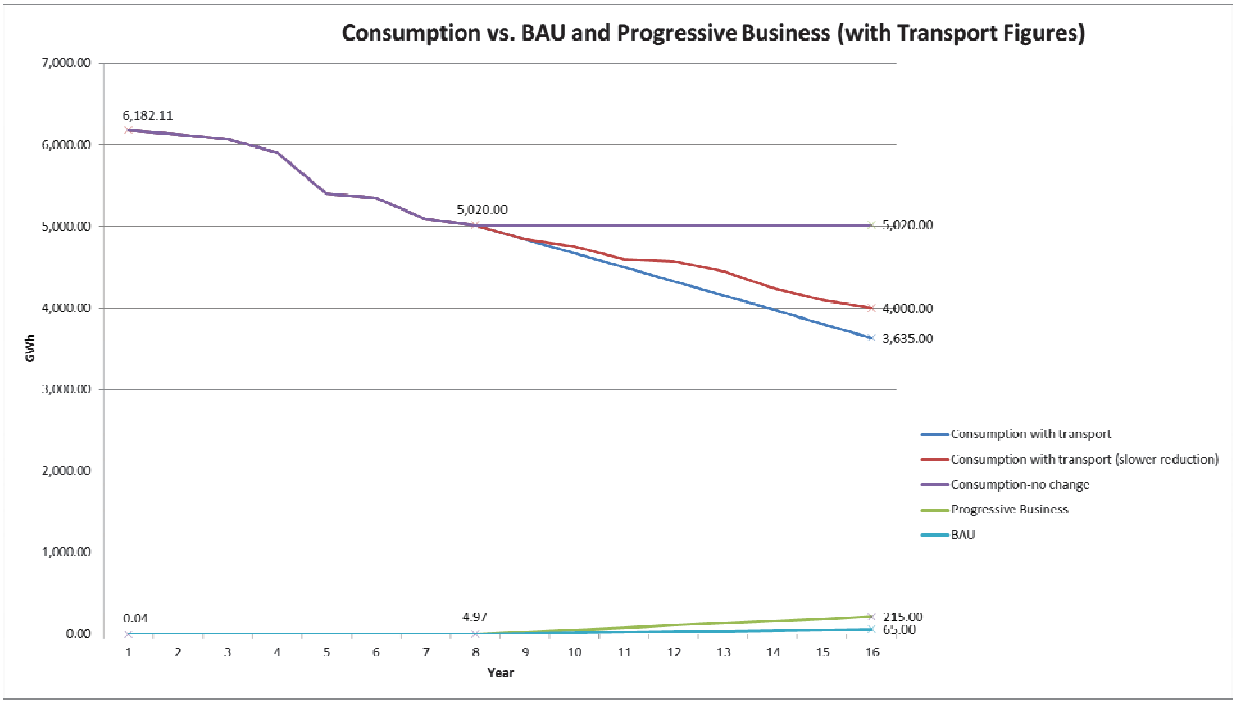

Figure 8, Consumption vs. BAU and Progressive Business (with Transport Figures)

30. The Table below explores the estimated levels of renewable energy contribution that might result from bringing forward the packages of projects outlined earlier. Note the significant impact that the national programme extending renewable energy use with transport fuels (based on the Biofuels Directive seeking 10% of fuels to be renewable by 2020) has on the totals. However, a note of caution when interpreting these figures since there is some debate as to whether this Directive will be fully enforced.

	Heat and Power without Transport	Heat and Power with Transport
Lowest consumption vs. progressive Business	11.00%	10.89%
Slower reduction of consumption vs. progressive business	10.00%	10.37%
No change in consumption vs. progressive Business	8.50%	9.26%
Lowest consumption vs. BAU	3.60%	6.76%
Slower reduction of consumption vs. BAU	3.25%	6.62%
No change in consumption vs. BAU	2.50%	6.27%

Table 7, Percentage of heat, power and transport consumption vs. BAU and Progressive business figures

QUESTIONS RAISED BY THE STRATEGY DOCUMENT

1. TARGETS: To what extent does WB wish to harness local renewable energy resources? What is the political appetite for change? Is reaching 15% by 2020 a serious consideration – this would be in line with national endeavours? Is a lower target seen to be acceptable as WB is land locked and does not have access to marine based renewables? 11% would seem to be achievable but only with a commitment to introduce modest levels of large scale technology. 8% would be a more realistic figure if micro-

renewables were deployed at volume. What resources has WB available to step up activity to achieve higher targets?

2. Working with the AONB needs exploring to see to what extent technology might be introduced within its boundaries. Note recent appeal decision (see Annex 2) reinforcing concerns about visual impact. Nevertheless, there are some good examples of renewables in other environmentally sensitive locations (see Annex 3). Hence, perhaps compromises can be reached?
3. GREEN DEAL: How will WB ensure that the maximum advantage is taken of the Green Deal? This will be essential to create the volume micro-renewables deployment envisaged.
4. ESCo: should WB create an Energy Service Company to help mobilise resources, show leadership and innovate? This might be wholly owned or a partnership model. Local ownership might be one way to counter local opposition to developments transferring some of the benefits to those most impacted.
5. COUNCIL INVESTMENT: should the council be investing in exemplar projects (e.g. a solar farm or biomass boiler/ tree hub) to help kick start local activity? Should the council be investing in its own property portfolio and demonstrating best practice?
6. SOCIAL HOUSING: How will WB ensure that the best deal is obtained for people most at risk of fuel poverty? Should there be closer liaison on energy with HAs and private landlords.
7. PROMOTION/ MARKETING: How will WB raise the profile of renewables and continue to track progress? Should there be a separate energy campaign? If an ESCO is created this might be used as the vehicle.
8. PRIVATE SECTOR: How best to promote to this sector and engage? Use local exemplars such as Waitrose to show benefits. Work with AWE.
9. DISTRICT ENERGY: should a review be carried out to explore local potential in detail a document to examine decentralized RE is alluded to in the core strategy)?
10. PLANNING: are the Core Strategy and policies sufficiently robust to deliver the necessary change (see next section)?

2. LINKAGE WITH WB CORE STRATEGY (2012)

The recently approved Core Strategy[22] adopted by West Berkshire Council (WBC) on Monday 16 July 2012 is central to how renewables might proceed in the short to medium term. This adoption follows the publication of the Inspector's Report into the examination of the document on 6 July 2012. The strategy is the lead document of the Council's new Local Plan and sets out the vision for the District, together with key policies to guide development over the period up to 2026. **As such, it will have a major role in determining what can, and what cannot move forward relating to new energy infrastructure.** Also, of key significance is that the plan has been informed by extensive consultation and has been subject to sustainability appraisal to assess the social, environmental and economic impacts of policies. Hence, it can be used to 'take the temperature' of the District and to see what appetite there is for change enabling renewables to be adopted on a wider scale.

The major reference in the strategy revolves around Policy CS15 as seen below. This concentrates on the potential to make new developments more energy efficient and where possible, to utilise renewable energy technologies. The idea of 'decentralised renewable energy' is to be investigated through a future Local Plan Document it is stated. This will also highlight the potential for any commercial scale RE opportunities.

Policy CS15 – Sustainable Construction and Energy Efficiency			
Linked Objectives - 1: Tackling Climate Change, 2: Housing Growth			
Core Strategy Outcome	Delivery Indicators	Target	Data Source
New development should support the aim of reducing CO_2 emissions	The level of renewable, low or zero carbon energy will be calculated via the design SAP (96) or SBEM (97) test, whichever is the most appropriate, at the planning application stage	Positive trend	Thames Valley Energy statistics and in house monitoring.
	Number and percentage of developments meeting required BREEAM and Code for Sustainable Homes standard	100% of eligible applications	In house monitoring

Figure 9, Policy CS15

There is the inherent understanding that in order to reduce local carbon emissions and meet national targets, a policy approach that supports and reflects the 'significant challenge ahead needs to be adopted'. Any renewable energy schemes, it states, should also be efficient –

[22] http://www.westberks.gov.uk/CHttpHandler.ashx?id=31637&p=0

although how this is to be defined and to what purpose is unclear. This policy is to be delivered through the Development Management process. The amount of renewable energy generation and developments meeting the policy criteria is to be reported in the Annual Monitoring Report. Finally, the council intends to achieve **a presumption in favour of sustainable development** (in accordance with the National Planning Policy Framework which was issued in March 2012) through application of this policy.

Currently, Code Level 3 or 4 is required for new build. Then progressively from 2013, Code Level 4 will be required and then Code Level 6 by 2016 (zero carbon). These changes will ensure that increasing amounts of micro-renewables are deployed. Likewise for non-residential, from 2013 BREEAM excellent will be needed reaching zero carbon by 2019. Although of slower impact, this change should encourage the greater deployment of renewable energy technology.

So, is this policy strong enough to achieve the dramatic early change that might enable WB to move up the league and to achieve a contribution in RE terms that would keep pace with national targets (so 15% by 2020)? The Core strategy recognises that WB is one of the highest electricity users in the SE, is in the upper quartile of local authorities for CO_2 emissions within the region and has high fuel poverty levels compared to other authorities. This is clear evidence and justification that West Berkshire needs to do more to meet national targets in relation to CO_2 emissions reduction. Hence, should the Council be looking to show greater leadership by adopting best practice across its own property portfolio and by influencing other stakeholders?

Under 'Strategic Objectives' the following relevant statement is also made: (1) To **exceed national targets for carbon dioxide emissions reduction** and deliver the District's growth in a way that helps to adapt to and mitigate the impacts of climate change. *Since renewables are one of the most effective ways of reducing carbon emissions this would tend to point to the need to seek delivery of higher targets for renewable energy (so at least Business+).*

A major challenge relates to the considerable non-technical barriers that restrict developments of significant scale across much of the District. For example, some 74% of the land area lies within an 'Area of Outstanding Natural Beauty' and as such has considerable influence on the scale and nature of any developments put forward within its boundaries. The AONB is mindful of the need to respond to the challenges of climate change, however, this does not include allowing developments that might negatively impact on the landscape or character of the area.

In effect this policy approach massively reduces the potential to generate RE within West Berkshire. Is this reasonable and what weight should be given to such policies and their impact on Core Strategy objectives?

RELATED PLANS

North Wessex Downs AONB Management Plan: The Plan is driven by the primary purpose of AONB designation - **conservation and enhancement of natural beauty**. It places a strong emphasis on the delivery of an integrated and sustainable approach, with vibrant rural economies and communities.

NWDAONB Vision: A vision of vast, dramatic, undeveloped and locally distinct chalk downlands with extensive areas of semi-natural chalk grassland, contrasting with well-wooded plateaux, arable lands and intimate and secluded valleys, all rich in biodiversity and cultural heritage; a national landscape that stands apart from the increasing urban pressures that surround it; where people live, work and relax; and where visitors are welcomed and contribute to a vibrant rural economy.

On sustainable development

• Ensuring that all decisions take account of climate change.

• Taking an integrated approach by thinking of the environment, economy and community together to identify, encourage and support those aspects of the local economy that can positively contribute to maintaining and enhancing natural beauty.

• Encouraging the integrated management of land that delivers multiple benefits such as protection of water resources, enhanced flood control, habitat creation, and landscape enhancement.

• Promoting landscape-scale responses to ensure that the protection of the environment permeates all aspects of land use rather than being considered on isolated sites.

Acceptable mitigation measures include:

• Increased reliance on renewable energies, biomass heating from local fuel stocks and appropriately scaled renewable energy generation.

• Enhanced domestic and commercial
energy efficiency.

• Greater availability of alternative fuels for cars, commercial vehicles and plant machinery e.g. batteries, LPG, bio-fuels.

• Improved availability and accessibility of sustainable modes of transport (bus services, cycling).

• Greater use of timber from sustainable woodland in construction .

• Carbon capture as an objective of habitat creation and management of woodlands.

The Atomic Weapons Establishment (AWE) has two bases in this area, at Aldermaston and Burghfield. AWE is an important provider of local jobs but has implications for the future level of development in the immediate area.

In the interests of public safety, residential development in the inner land use planning consultation zones of AWE Aldermaston and AWE Burghfield is likely to be refused planning permission by the Council when the Office for Nuclear Regulation (ONR) has advised against that development. All other development proposals in the consultation zones will be considered in consultation with the ONR, having regard to the scale of development proposed, its location, population distribution of the area and the impact on public safety, to include how the development would impact on "Blue Light Services" and the emergency off site plan in the event of an emergency as well as other planning criteria.

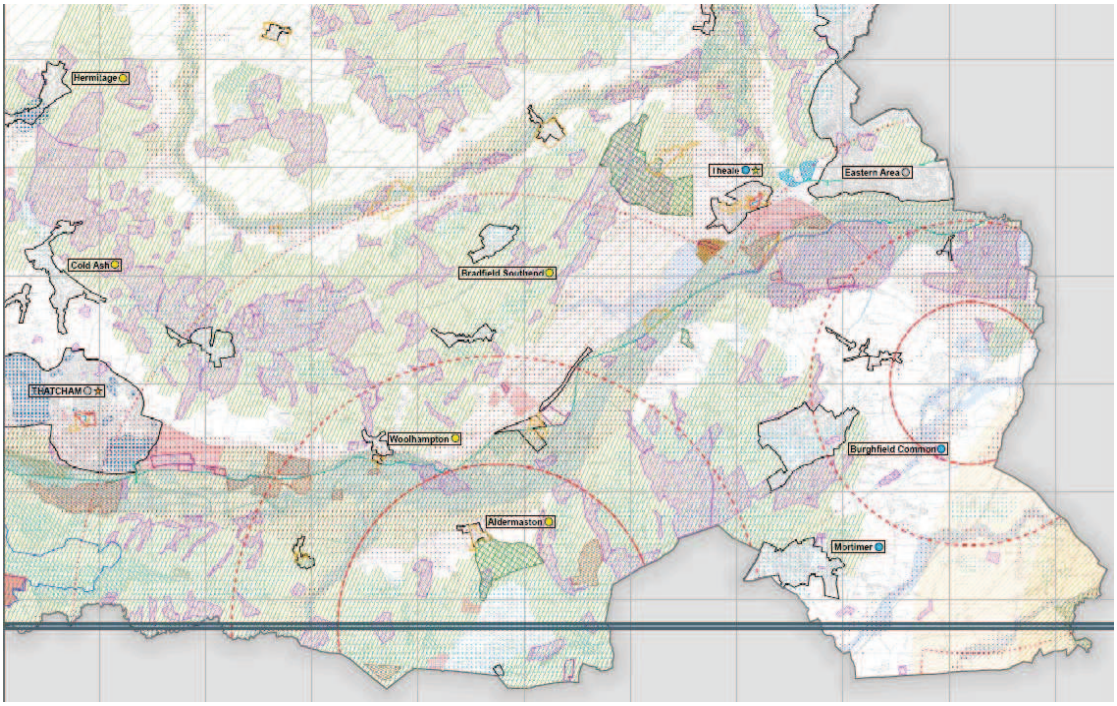

Figure 10, AWE consultation zones

ANNEX 1: RENEWABLE ENERGY RESOURCE ASSESSMENT

1 INTRODUCTION

1.1 Background

Renewable energy (RE) can play a major role in sustainable development and mitigating Climate Change effects. As the government is bound legally to source a proportion of its energy from renewable sources, it is imperative that all local governing bodies take action to help meet the target. This requires long term strategies such that targets can be achieved in the most economical and environmentally friendly way. Above all, with the UK becoming a net importer of fuel in 2004[23], the UK needs to diversify and build up its indigenous energy sources and thereby reduce the reliance on foreign fuels including coal, gas and electricity.

The key drivers for renewable energy can be summarised as:

- Climate Change mitigation (emissions reduction)
- Energy security and sustainability
- Local employment, business growth and economic benefit

The report is the result of desktop study carried out to assess the renewable energy resource that can be realised in the short term in West Berkshire and the possibility of harnessing such resources. During the assessment, wherever possible, every effort has been made to follow the recommendations made by the DECC methodology[24] for resource assessment as closely as possible.

Previously, Thames Valley Energy (TVE) has carried out a series of strategy projects embracing West Berkshire over the past 12 years on behalf of the following organisations:

- Government Office of the South East (GOSE) on behalf of DTI
- South East England Regional Assembly (SEERA)
- South East England Partnership Board (SEEPB)
- South East England Development Agency (SEEDA)

These studies have given a solid foundation to understanding the potential for West Berkshire. Further work to refine the study and to give a clearer view of local conditions has been required. In particular, to make sense of the constraints imposed by the North Wessex Downs AONB.

1.2 Objectives

This strategy is set out in order to help shape the future development of renewable energy in West Berkshire and focuses mainly on renewable electricity and heat. The study maps out the level of deployment of different energy resources across West Berkshire.

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[23] www.parliament.uk/briefing-papers/SN04046.pdf
North sea declining: Link

[24] Renewable and Low-carbon Energy Capacity Methodology. Methodology for the English Regions, January 2010 [available at: http://www.decc.gov.uk/assets/decc/what%20we%20do/uk%20energy%20supply/energy%20mix/renewable%20energy/ored/1_20100305105045_e_@@_methodologyfortheenglishregions.pdf]

The key objective of this strategy is to illustrate how West Berkshire can move towards a more sustainable (low carbon) and energy secure future. The report aims to:

- Show the current level of renewable energy deployment in West Berkshire
- Illustrate the potential of the renewable energy resource in West Berkshire
- Examine constraints to deployment
- Consider target setting to underpin future deployment
- Provide some insights for other related strategies which directly affect the district's sustainability

1.3 Policy background

The UK Government is committed to progressively reducing the nation's carbon emissions resulting from the production and use of energy. The Climate Change Act 2008 sets out a binding UK national target for greenhouse gas emission reduction of 34% by 2020 and 80% by 2050, as compared to 1990 levels. As a part of this overarching strategy, the UK is seeking to satisfy 15% of energy use through deploying renewable energy technology rising to some 50% by 2050.

The EU by contrast, aims to tackle Climate Change by sourcing 20% of its energy (for transport, electricity and heat) by 2020 from renewable energy. The UK government has agreed to assist the EU in the Climate Change effort by signing up to EU Renewable Energy Directive (2009) and committing itself to sourcing 15% of its total primary energy through sustainable means. The Low Carbon Transition Plan (2009) along with Renewable Strategy (2009) sets out how the UK is going to set targets and reduce emissions. The lead scenario in the strategy anticipates 30% of electricity, 12% of heat and 10% of transport energy to come from renewable source (making 15% of all energy use).

The Energy Act (2008) has put in place financial incentives to stimulate deployment in the renewable sector viz. The Feed-in-tariff (FIT) and the Renewable Heat Incentives (RHI) from which private, public and even domestic consumers can benefit. Additionally, the 'Green Deal' is to be introduced in autumn 2012 which will have significant implications for investment in the sector.

Regional Planning Guidance, since rescinded nationally, nevertheless helped to set a benchmark for renewable energy development through the South East Plan. This aimed to have 209MW of installed capacity in the Thames Valley by 2016. The target set for West Berkshire was 18.5MW by 2016[25]. However, by the end of 2011, the district was well short of this figure (see later).

1.4 Limitation

This report seeks to provide estimates of the technical/ theoretical potential for renewables in West Berkshire concentrating on those technologies and resources that can make a real difference to heat and power generation, namely:

[25] Council Motion: Renewable Energy in West Berkshire. [Link to the file]

- Wind power (electricity)
- Biomass and waste (heat and electricity)
- Solar power (heat and electricity)

Other technologies that can have a limited impact include low head hydro (electricity) and heat pumps (heat). Waste (MSW) is dealt with elsewhere and will only be referred to here.

Various constraints are then applied to show a more pragmatic view of the local potential. These constraints are discussed but it is not possible to consider all of these in detail given the required brevity of the assessment. Nevertheless, it is possible to give a reasonable indication of the actual capacity of the district.

2 WEST BERKSHIRE AREA

The district known as West Berkshire covers an area of 272 square miles (704 km2)26 and has a total population of approximately 154,000[27] giving a population density of about 218/ km2, making West Berkshire one of the least densely populated areas in the South East. In 2001, census data indicated a population of 144,500 showing that there is steady growth in numbers. Newbury and Thatcham are the most densely populated areas with a combined population of around 50,000. There are approximately 64,79028 residential properties in the district.

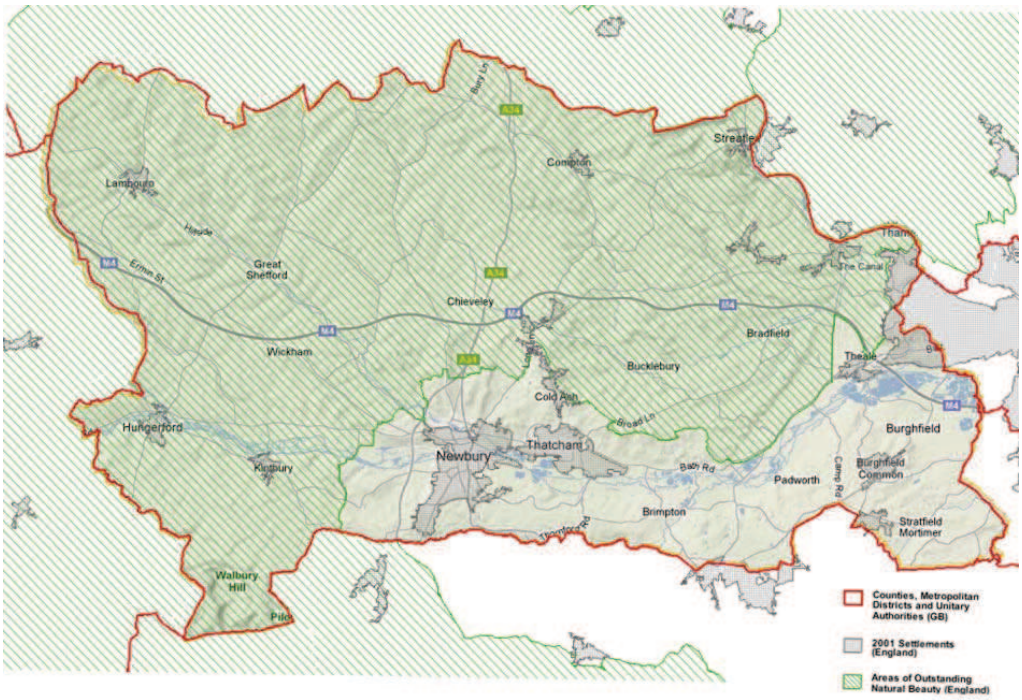

Figure 11, Boundaries of North Wessex Downs AONB (in green) West Berkshire district (in red)

Approximately 74% of the district lies within the boundary of the North Wessex Downs AONB which is a protected landscape based upon its scenic beauty and ecological value. The remaining area includes the towns of Newbury and Thatcham plus is also the home of the Atomic Weapons Establishment (AWE). There are a number of airfields including RAF Welford where restrictions will apply. Each of these designations has major implications for the deployment of RE schemes and will be discussed later.

[26] Westberks.gov.uk: http://www.westberks.gov.uk/CHttpHandler.ashx?id=29521&p=0
[27] Office of National Statistics: http://www.neighbourhood.statistics.gov.uk/HTMLDocs/Excel%20Local%20Profiles/Demography%20Local%20Profile.xls
[28] Communities and Local Government (CLG): http://www.communities.gov.uk/housing/housingresearch/housingstatistics/housingstatisticsby/stockincludingvacants/livetables/

3 WEST BERKSHIRE ENERGY USAGE

3.1 Energy Usage

The total energy consumption of West Berkshire in 2008 is shown graphically below.

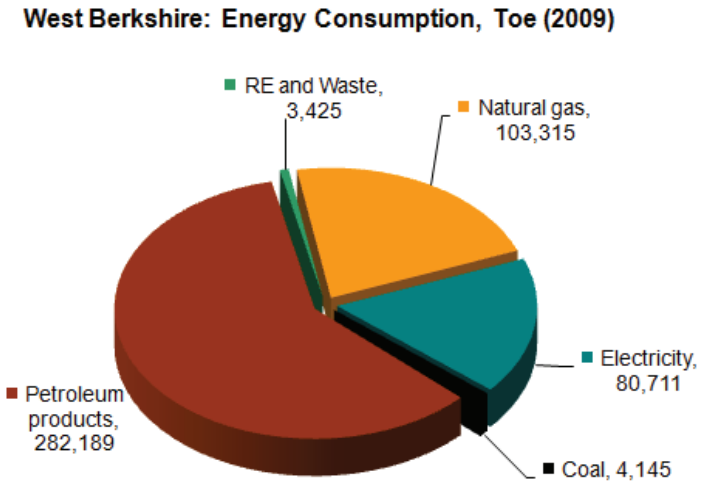

Figure 12, Energy Consumption of West Berkshire (Source: DECC2008)

In 2010, West Berkshire used approximately 342 GWh of electricity and 712 GWh of gas in the domestic sector. Additional data is shown in table 8 below from which the total CO_2 emissions of the district for 2010 (from gas and electricity use) can be estimated. The CO_2 emissions were 484 kilo-tonnes (from electricity) and 246 kilo-tonnes (from the gas usage[29]). The district also has additional CO_2 emission of approximately 83 kilo-tonnes from heating oil and coal usage. These emission figures do not include emissions from other sources such as road transport.

	Electricity (kWh)		Gas (kWh)	
	Total	Ave. /household	Total	Ave./ household
Domestic	341,921,619	6,199	712,040,739	16,132
Non-domestic	578,674,917		486,477,712	
Total	920,596,536		1,198,518,451	

Table 8, Estimated gas and electricity demand in West Berkshire (2010)[30, 31].

In addition, the district consumed 3.3 ktoe and 18.7 ktoe of coal and heating oil respectively in 2009. Based on these consumption data, the per capita CO_2 emissions (excluding road transport) of the district is approximately 5 tonnes per year which is around 60% more than the national average[32].

[29] Conversion factor: 0.526kg/kWh (electricity) and 0.205kg/kwh (gas). This factor is used throughout the report.
[30] Compiled from MLSOA data published in March 2012 found at:
http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/regional/mlsoa_llsoa/mlsoa_2010/mlsoa_2010.aspx
or http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/regional/gas/gas.aspx (loads faster)
[31] http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/regional/regional.aspx
[32] This accounts for gas and electricity usage only. Transport emission is not included.

3.2 Existing use of Renewable Energy Systems

TVE has monitored the use of renewable energy across the SE Region for 12 years through the SEE-STATS and TV STATS projects. Currently, TVE continues to monitor project progress across the Thames Valley, including West Berkshire. This data collection and collation feeds into the national database RESTATS maintained on behalf of DECC.

Towards the end of 2011, there were 273 renewable energy installations in West Berkshire with a combined installed capacity of 2.7 MW. This includes both heat and power and supplied approximately 1% of the district's total energy needs. Figure 13 shows the relative capacity of the technologies installed in the district. The current installed capacity is about 15% of the previously designated 2016 target.

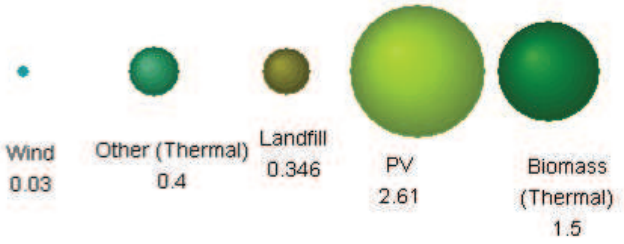

Figure 13, Installed capacity of current projects in West Berkshire (in MW)

Figures 6 and 7 show heat usage by the sector and the residential heat demand in the district as taken from the National Heat Map.

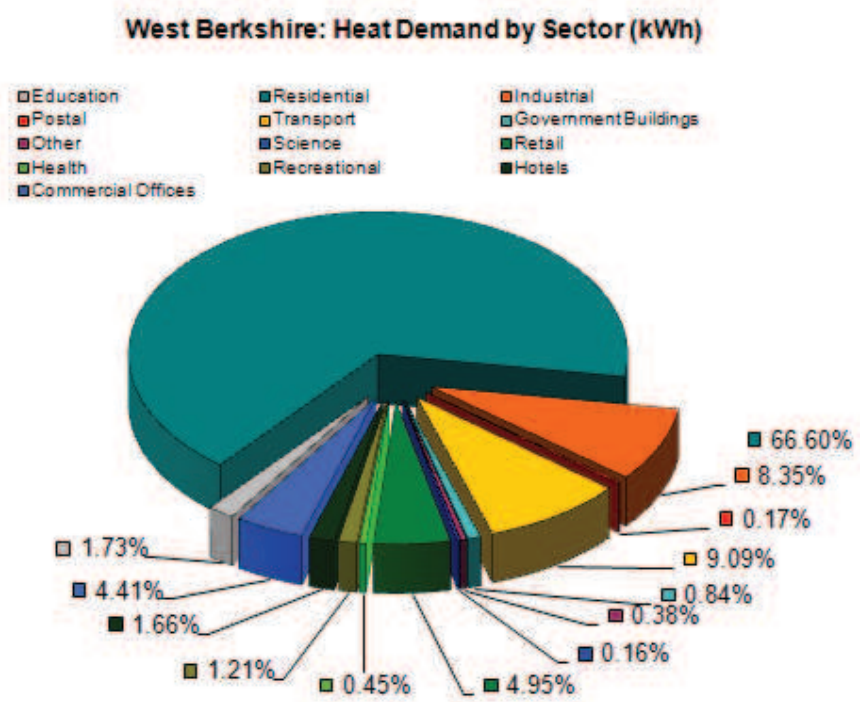

Figure 14, West Berkshire heat usage-Heat usage by sector.

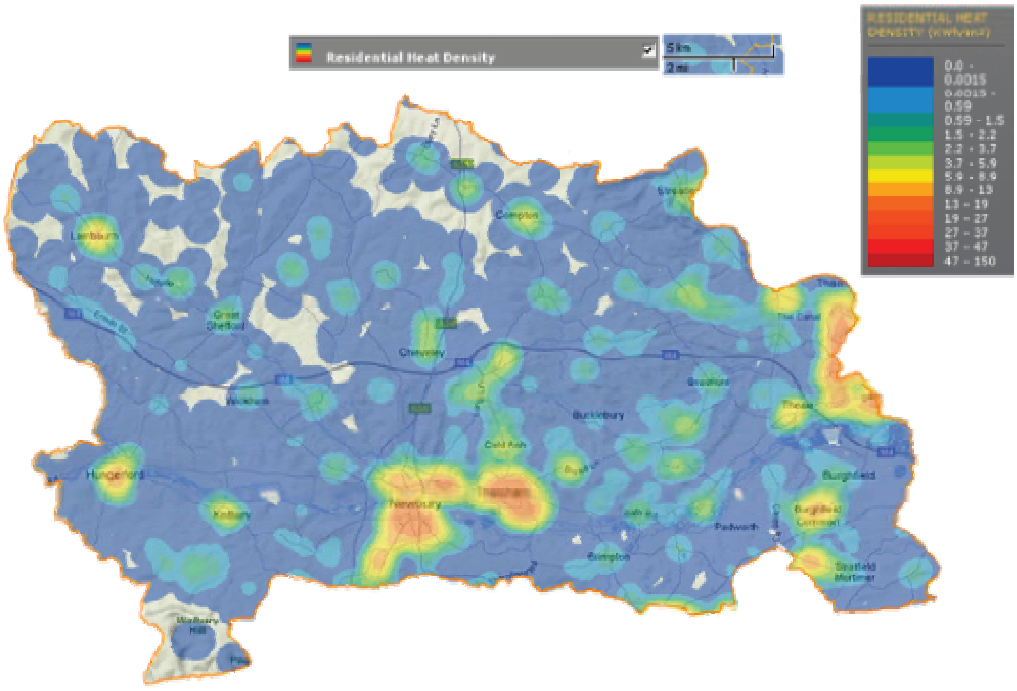

Figure 15, West Berkshire heat usage map, residential heat density[33]

Maps: Link

[33] DECC. National Heat Map

Figures 8 and 9 are snapshots of current energy state of the district. It is apparent that majority of the energy comes from conventional sources and renewable energy constitutes only a small fraction of it.

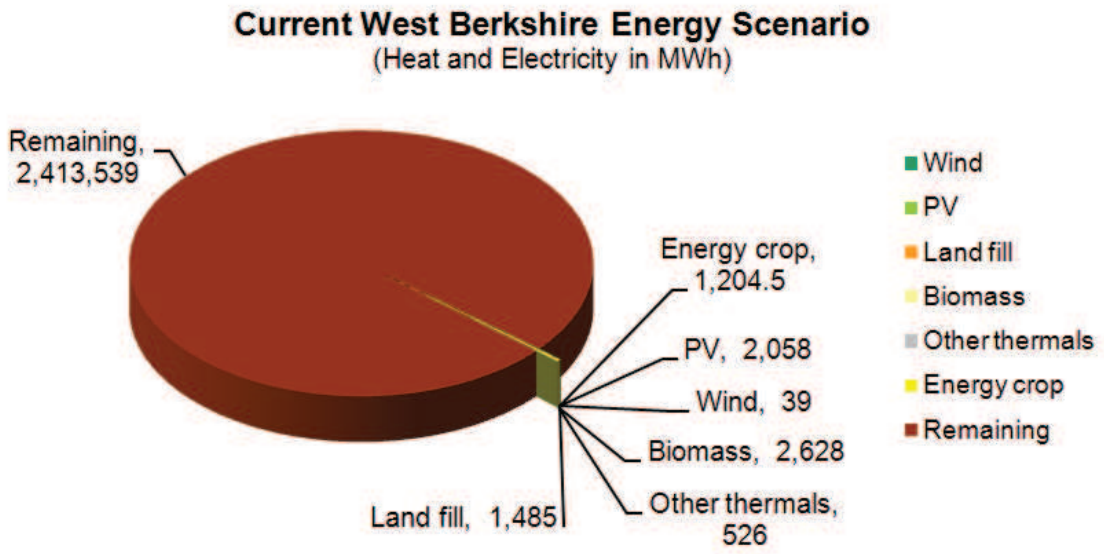

Figure 16, Current mix of the district pie chart

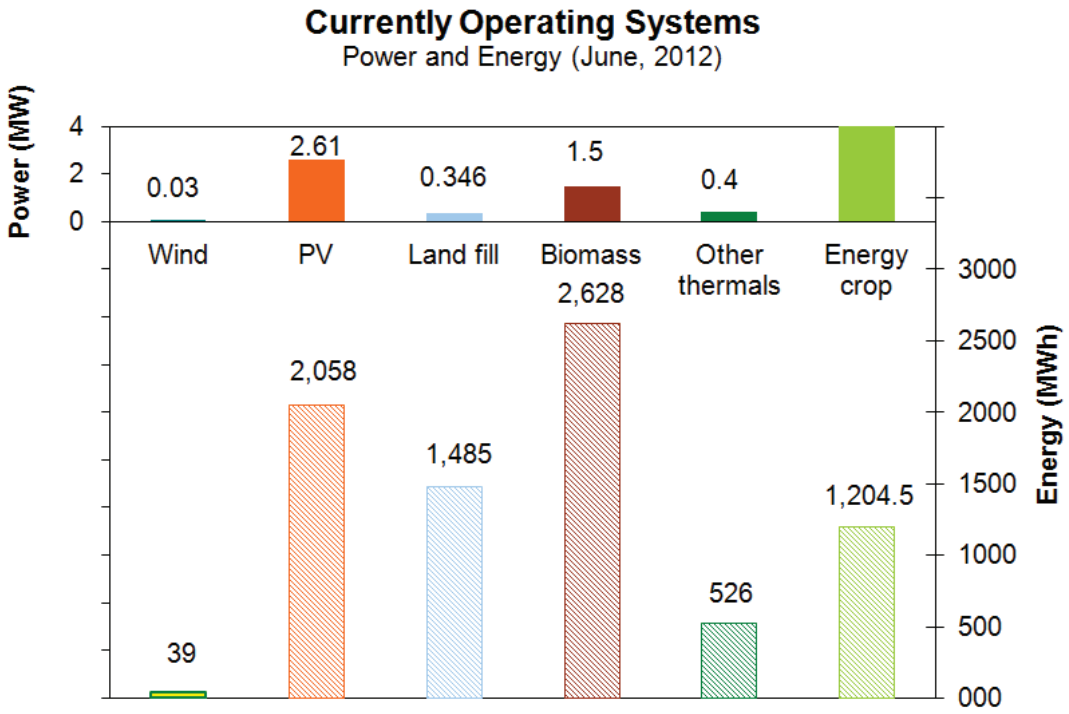

Figure 17, Current renewable energy capacity and associated energy generation with West Berks

However, renewable installations have increased in the past year, notably in the solar PV sector which has grown by a factor of three (Figure 17). Other technology seems to show little or no increase in capacity between the periods.

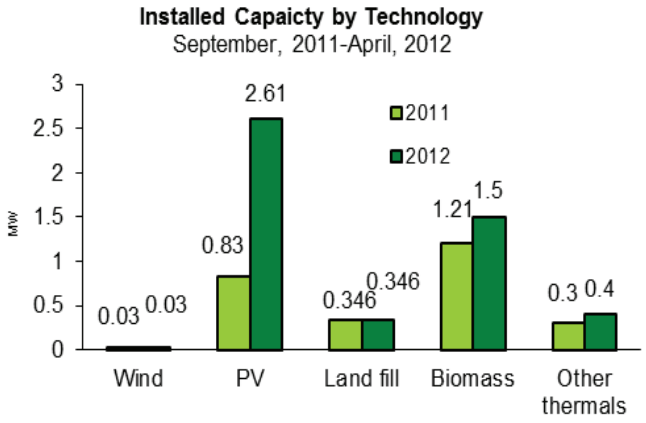

Figure 18, Installed capacity of various technologies in the district (2011-2012)

Figures 11 and 12 show WB's current consumption and compares it to current generation and relevant target the district can work towards.

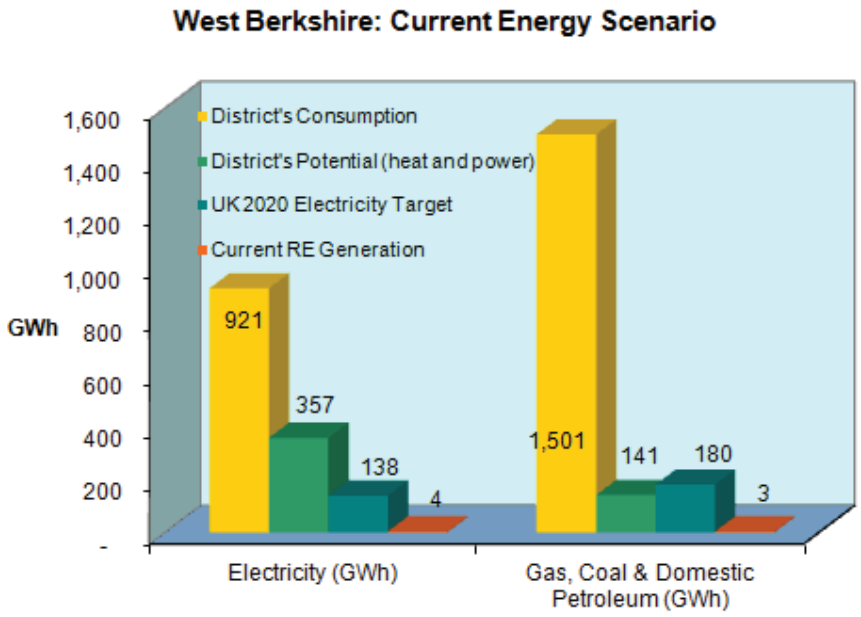

Figure 19, Current energy consumption of the district

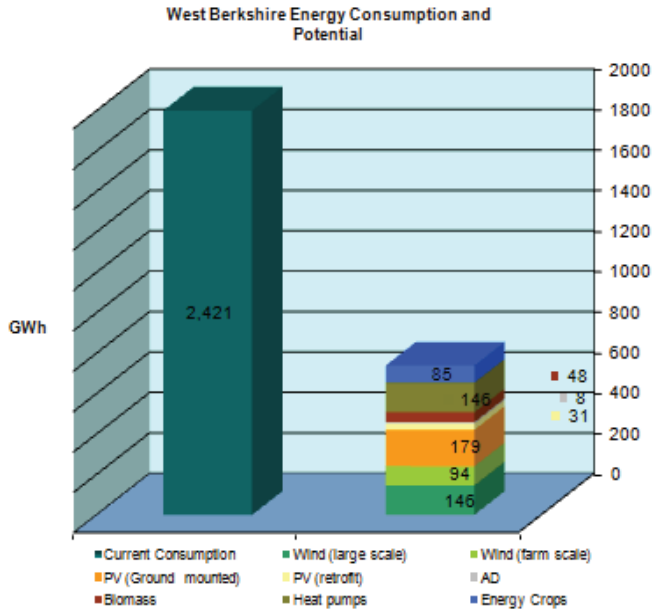

Figure 20, Current energy generation, consumptions and UK government targets. The potential capacities are subsequently discussed below.

3.3 Sustainable Transport

Sustainable transport encompasses a number of alternative transportation means (cycling, walking, public transport) that reduce consumption of transport fuels, mainly petrol and diesel. Figure 129 shows the consumption of petroleum in 2008. Electric propulsion i.e. the use of electric vehicles (EVs) is a method of environmentally friendly personal transportation. In this limited review it is not possible to consider transport in greater depth, however, to note that **currently, the district does not have any electric charging points which is the first step in promoting EV.**

4 THE RENEWABLE ENERGY RESOURCE

4.1 Methodology

To assess the potential of the renewable energy in West Berkshire, first the natural resource available was considered. The energy resource that is technically possible to extract was then calculated. The technical resource represents the maximum which the district can extract using existing commercial technology. Although this figure assumes covering entire district with RE systems, which is not practical, it indicates the upper limits of the district. DECC's recommended methodologies[34] (*the methodology hereafter*) were followed as much as possible to arrive at the technical potential. The availability of the materials and time limited the execution of the methodology strictly. The following flow diagram illustrates the method which was mostly adhered to in the desktop assessment.

The natural resource is reduced significantly by various factors as shown in Figure 21as reproduced from the methodology. The natural resource is what is theoretically available and also represents the absolute maximum that a site could produce. The Technical Resource is what is possible to generate by using existing and proven technologies. Further constraints are then considered that will reduce the technical potential. These constraints include the physical environment (e.g. towns, roads), planning and regulatory issues (e.g. the distance of a turbine from roads) and economics. A combination of these factors reduces the actual resource that can be exploited at a given site. Other designated sites and exclusion zones also affect the actual installed capacity at a site. Note that the economic viability is not considered here.

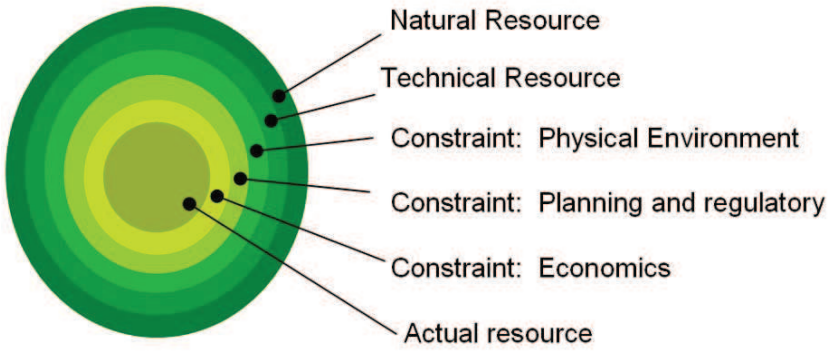

Figure 21, Resource availability

In this report, every effort has been made to quantify the technical resource and to identify opportunities for developing renewable energy in the district. Although the DECC methodology advises on technology specific constraints that are applicable, it is beyond the scope of this study to consider them in detail. Hence, it is necessary to perform further site specific assessments to identify the actual capacity that can likely be installed in the district.

[34] Renewable and Low-Carbon Energy Capacity Methodology, January 2010.

4.2 Resource

The following sections cover technologies that the district can deploy and illustrates approximate capacities. This desktop study does not indicate potential sites but merely indicates the potential capacities of the district.

4.2.1 Wind

In this report onshore wind is considered and the assessment is based on the NOABL data sets only. The maps included are based on NOABL data and hence should be used for indicative purposes only. In this section, both large commercial scale and small domestic scale turbines are considered.

Figure 23 and figure 23 show that the wind resource within the North Wessex Downs is significant. Although the windspeeds in the figures are less accurate than on-site measurement, it does give the general idea of the wind climate in the region. However, given the purpose of the AONB, large commercial scale wind farm development will have serious effect on its designation and as such are unlikely to be developed. Smaller scale developments e.g. single MW scale and sub 100 kW could be developed within the area without contravening designations in principle (and as seen in other AONBs).

For most scenarios, in order to reach a significant renewable energy contribution in WB wind energy will eventually need to be a major component of the energy resource mix. This has implications on how the AONB and planning authorities consider such developments.

Wind Energy: A brief note on wind climate assessment.

The desktop study is generally based upon NOABL data. NOABL is a data set acquired from the simulation of air flow in the UK at three different heights, namely 10 metres, 25 metres and 45 metres (from the ground) at a resolution of 1 kilometre square Ordinance Survey grid. The system accounts for the topography at a larger scale but does not reflect the effects of local variations such as tall structures and local thermal affects, both of which can modify local wind climate significantly. Because of this limitation, an inherent discrepancy is built-in into the NOABL data at finer resolution viz. overestimation in lowlands[1]. However, it is capable of indicating potential candidate sites. For MW scale systems, the developer of a wind array at a site would almost always erect a met mast to measure actual windspeed. This is standard industry practice whereby desktop study using NOABL data is used to indicate potential sites and each site weather data is refined further by direct measurements.

Figure 22, 275kW Vergnet wind turbine (East Lothian, Scotland, panoramio.com)

For larger turbine installations, given the associated investment costs, the onsite windspeed measurement is ideally taken for a year to assess annual variation. This allows a more accurate estimation of likely annual energy generation. Large wind farms also use the concept of measure, correlate and predict (MCP) to make a reliable estimation of long term energy generation. Under MCP, the developer measures site windspeed, compares it with historical local met station data and predicts potential energy yield for the life of the windfarm in light of the correlation between the two data.

The cost associated with such detailed site specific windspeed measurement is generally deemed prohibitive for smaller turbines such as farm or residential sized turbines. There are alternative low cost windspeed measuring systems which are available for less than £500 and are enough to evaluate sites for wind microclimate.

Wind Potential

For assessing small scale wind turbine installations, sites with wind speeds of above 4.5 m/s are usually considered to be adequate to be economically viable. Figure 233 shows NOABL wind speeds at 10 metres height from ground level (relevant to small wind turbines) as they are usually installed at hub height of 10m - 20m.

The figure shows that there are very few location in WB that have a wind speed of less than that considered to be economical.

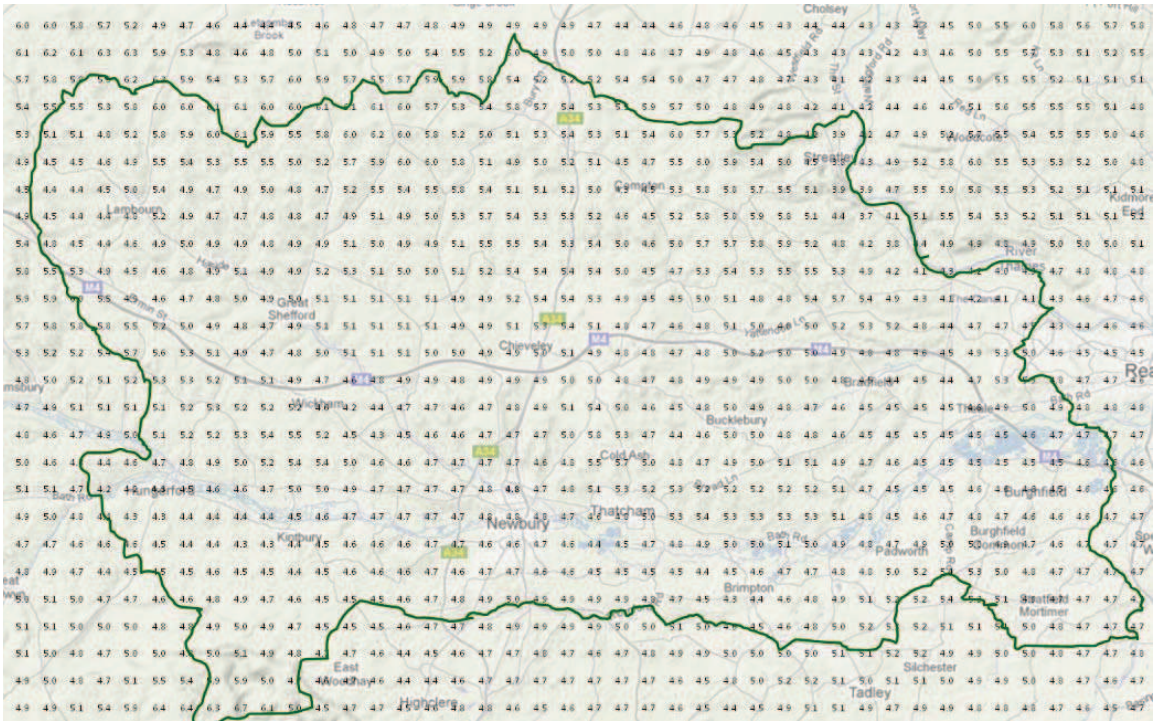

Figure 23, Wind speed in m/s at 10m height above ground level (agl)[35]

Some examples of small scale turbines are shown below. These turbines can have hub heights of 10m to 25m depending upon sites and planning conditions and are more likely to be acceptable than larger turbines.

Figure 24, Examples of 5kW to 11 kW systems

[35] Tolerance:+/- 0.7km

Larger turbines, rated in MWs, have hub heights of above 40 metres. Figure 255 is the map of NOABL windspeeds at 45m height (relevant to larger machines) rated at few hundred kW to MW scale turbines are shown below. For example, a 1MW turbine might have a 50m hub height i.e. height of hub from the ground.

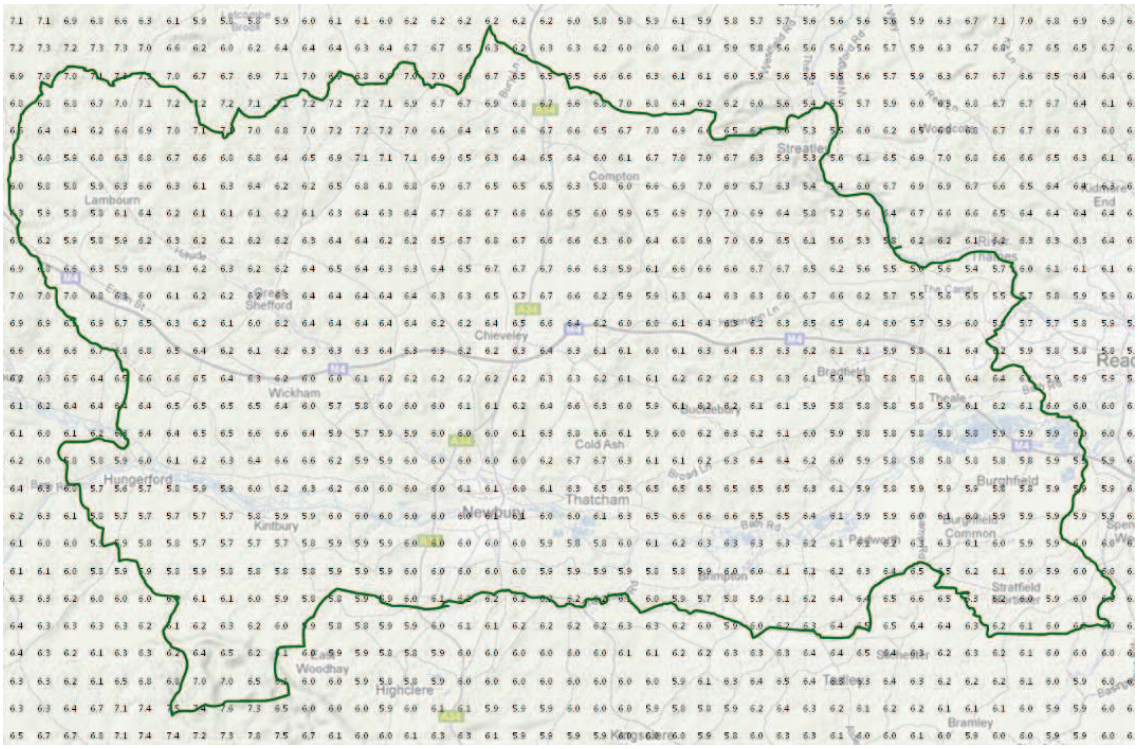

Figure 25, Windspeed in m/s at 45m height above ground level (at 1km resolution).[36]

Figure 23 indicates that the whole of West Berkshire experiences wind speeds of above 5m/s which is DECC's benchmark figure at and above which wind energy should be considered (although commercial wind developments occurs at sites with windspeeds of above 6m/s). **This implies that the wind *natural resource* at 45m hub height is available in the entire district of West Berkshire for potential utilisation.**

[36] Tolerance: +/- 0.7km

Figure 26, 2 MW Enercon wind turbine cluster at Bristol Port

After careful consideration of various major constraints to windfarm development, it is estimated that the district can accommodate 0.7GW of commercial scale wind turbines, assuming that wind turbines are erected in NWD AONB. On past track record, the NWD AONB is bound to object to any significant wind turbine development (see Annex 1). Hence, excluding the AONB, the district can accommodate 0.08GW of commercial grade wind turbines within its boundary.

In the UK, commercial wind turbines operate at a rated power of 20% to 30% of the year. Assuming a conservative capacity factor of 22%, the electricity generation from wind in WB can be estimated at about 146-1200GWh per annum, depending on the development within AONB boundary.

Wind Energy: Constraints

The estimation of wind energy potential in the district of West Berkshire was based on various constraints and factors. These factors include:

- Windspeeds
- Infrastructures e.g. road, rail, inhabited areas, power lines, microwave links.
- Conservation sites e.g. SSSI, AONB, national parks, scheduled monuments
- Other natural factors e.g. rivers, woodlands

The buffer zones for the infrastructures and natural factors were applied to reduce the area available for wind turbine development. DECC's recommended benchmark figure was then used to estimate the wind energy capacity based on the remaining area.

This method does not indicate potential sites but simply states what area of the district (or area under study) is suitable for the wind turbines which can then be used, in conjunction with benchmark figures (such as DECC;s) to estimate the potentials. Computerised software in using more accurate data (which have to be bought from organisations such Ordinance Survey) will help indicate potential sites and more accurate potential of the district.

These factors were not considered in the estimation of small wind capacity as they are less severe due to the small size. Also, the buffer zones (for noise and topple distance figures) are based on turbine parameters which reduces the exclusion zone around the turbine.

These figures are for indicative purposes only and are very conservative. This fact is indicated by the map in Figure 277 which shows a large area of the district to be suitable for windfarm development. The yellow coloured area represents an 'opportunity area' for commercial windfarm development. This map is the reproduced from the work completed jointly by Land Use Consultants and TV Energy in 2010. An important feature that this map highlights is that the majority of the sites are within the NWD AONB.

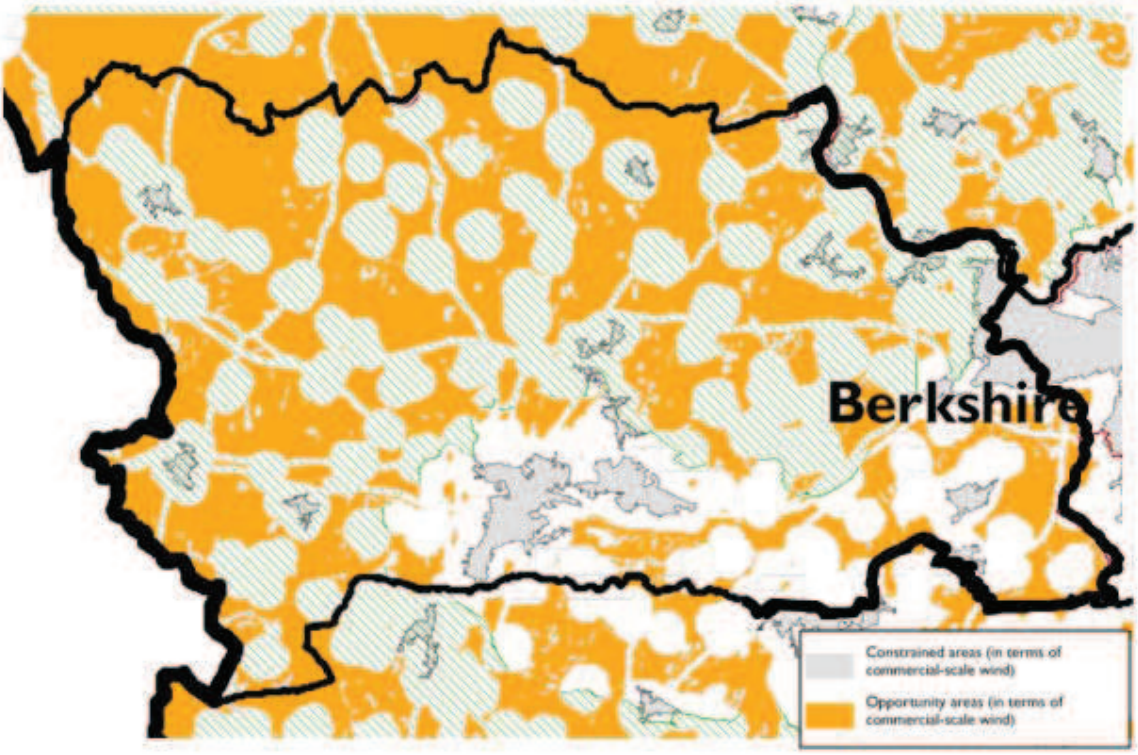

Figure 27, Potential commercial windfarm sites in West Berkshire (Land Use Consultant and TVE)

A separate study commissioned by AONB (2006)[37] classified the entire AONB, to be either moderately or highly sensitive to wind turbine erection. This is a major barrier to any commercial windfarm development in the district.

Figure 28, 1.3 MW Siemens (left) residential scale Proven turbine (right)

To put matters into perspective, an area the size of New Greenham Common Airfield (approx. 1.5 sq. km) could accommodate a 10MW commercial grade wind system with turbines sited 300m apart[38] in a single row.

Smaller systems are usually installed on farms but they have comparatively small system ratings and require a large number of them to make significant contribution to the district's overall energy use. On the positive side, these turbines can blend easily into the surroundings and would likely be more acceptable to the AONB (Figure 27).

[37] A study of Landscape Sensitivities and Constraints to Wind Turbine Development (March, 2006)
[38] An operational windfarm just outside NWD AONB has similar layout and has a capacity of 6.5MW

The estimation of the potential of small scale wind was based upon the population of rural residents as it was the only reliable publicly available data for the purpose. Also, urban properties are less likely to install kW-range wind turbines due to planning constraints. In the process, it was assumed that the each household comprised of three residents and the number of households deduced on this assumption. 70% of the properties were then assumed to have installed a 6kW wind turbine system (DECC's benchmark size).

This reasoning exercise showed that the district can potentially have 90MW of small scale wind turbine systems, generating around 94GWh of electricity.

This rationale does have drawbacks in that flats (which is a household and can be in a rural setting) are very unlikely to be able to install wind turbines. Planning issues in an urban area are also applicable in a villages (albeit less technically limiting) which is assumed to have no effect on the above estimation. However, wind turbines on farms are usually 10kW and upwards which should diminish the discrepancy in the rationale.

4.2.2 Solar

The energy from the sun received by West Berkshire is shown in Figure 299. This energy can be harnessed by either using a solar thermal system (SHW) or a photovoltaic system (PV). The map below represent the annual sum of global irradiation on an optimally inclined surface in kWh/m^2 along with the potential solar electricity generated by a unit kWp PV system (kWh/kWp). These figures assume that the PV is mounted at an optimum pitch and has a system performance ratio of 0.75[39]. Some PV modules can have performance ratio of as high as 0.8.

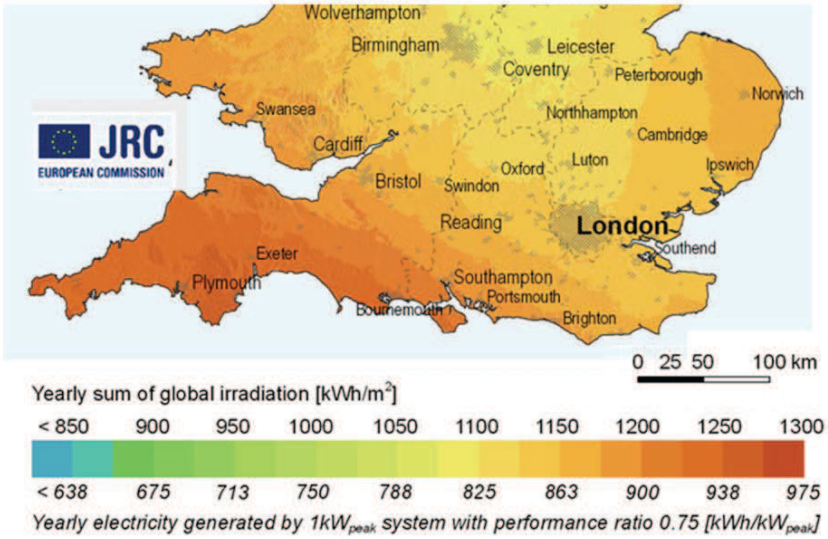

Figure 29, UK Irradiance level (source: PVGIS, JRC)

A PV system installed in West Berkshire can generate between 800 – 900 kWh of energy per installed kW annually.

[39] This is used by PVGIS software widely used in the desktop study for PV systems.

Solar Potential

For the purpose of assessing the potential solar power, DECC's methodology relies on the number of different types of properties in a region viz. residential, commercial and industrial properties and also assumes a certain percentage of that stock to be suitable for installing solar technology (e.g. orientation, construction, lack of shading). The numbers of commercial and industrial properties in West Berkshire are shown in Table 9.

Type of Business	No. of Premises	Percentage	Total floor-space (m2)
Offices	1,347	51	396,117
Miscellaneous/unclassified	4	0.2	15,876
Business units and workshops	647	24	204,675
Factory, Industrial, Mineral, Vehicle Repair	42	1.6	120,189
Warehouse, Storage	619	23.2	558,178
Totals	2,659	100	1,295,035

Table 9, Commercial and Industrial properties in West Berkshire [40]

The premises, presented in table 10, are grouped into commercial and industrial categories to estimate potential capacity. Based on these figures, and the total number of residential properties of 64,790 houses[41], the solar power potential can be estimated as shown in Table 10. Although some of the figures are slightly outdated, they are the most reliable source available at the time.

Property type		Number of properties	%	No. of suitable properties	Guidance Capacity (kW/property)	Potential Capacity (MW)	Energy (MWh/yr)
Residential		64,790	25%	16,198	2	32.4	26,959
Commercial							
	Offices	1,347					
	Miscellaneous	4					
	Business units	647					
	Warehouse & storages	619					
	Total	2,617	40%	1,047	5	5.234	4,356
Industrial	Factories, Industrial, mineral and vehicle repair	42	80%	34	5	0.168	140
Total				17,278		38	31,455

Table 10, PV technical capacity (retrofit)

Table 10 indicates that the district can potentially generate about 31GWh of energy annually if all the sites deemed suitable are developed. This represents around 3.5% of the district's net

[40] These figures are 2006 figures from Valuation Office Agency and can be found in Local Economic Assessment (2011), West Berkshire p23

[41] http://www.communities.gov.uk/housing/housingresearch

current electricity needs.

The above mentioned figures are only for retrofitted installation capacities and do not indicate potential ground mounted stand alone systems or systems on new built properties. Ground mounted systems are generally in MW scale and will easily distort the above mentioned figures. Ground mounted PV systems are low profile and can be developed in close proximity to other developments (e.g. wind farms). This allows sharing the grid connection substation and access to roads thereby reducing the cost of the overall project. Westmill Farm (Watchfield) is an example of such a combined development.

Figure 30, PV Farm A section of 5MW ground mounted PV systems at Westmill. (Picture: TV Energy)

The ground mounted PV capacity for the district was estimated at 220MW generating around 180GWh of electricity annually (see box titled 'Solar Power: Rational for ground mounted systems').

Solar PV systems are deployable with comparatively less expected opposition as compared to wind systems. The district can mass deploy the PV system on council owned properties including open parking spaces in canopy configuration. Such installation can also have integrated electric vehicle charging points which is essential to achieve *true zero emission* transportation systems.

Figure 31, Solar PV array over parking area
The Richard Stockton College of New Jersey parking array

Solar Thermal

Solar thermal systems mainly supply or supplement domestic hot water system (DHW). They are sized to meet only a portion of DHW requirements, usually around 50% as it cannot provide 100 of the entire DHW requirements. They are not suitable as the primary technology for space heating as the system's energy capture pattern varies with season and is opposite to space heating requirements i.e. generates the least amount of heat during the times of highest demand.

Resource wise, solar thermal and PV systems have similar requirements. Any site suitable for PV system is also suitable for a solar thermal installation. This is because they can occupy the same roof space and require a comparable area for a given power rating. Note that only the PV component is indicated in table 10 as the maximum solar power that can be harnessed from the district's rooftops is 38 MW (excluding ground mounted capacity). 38 MW can be a combination of PV and thermal system. The thermal system is not quantified here as it will be within the 38MW capacity and its installation will decrease the PV capacity to limit the total solar power at 38MW.

Solar Energy: Rational for ground mounted systems.

For the estimation of the ground mounted PV systems, similar approach to wind energy estimation was used apart from technology specific differences. As such, this undertaking does not indicate potential sites but rather indicates potential capacity of the district.

For this estimation exercise, factors such as roads, rivers, conservation sites etc. were excluded. As the PV systems are close to ground and emit virtually no noise during operation, very small buffer zones (5m wide) were used. Although even 5m could be thought of as being too large, it is site specific and depends upon factors such as proximity to residences and shadings due to, very common, treelines. The arable lands were also excluded completely for PV system installation. The 220MW capacity also assumes that no systems exist within NWD AONB.

The resulting remaining area was used to estimate the district's' PV capacity by comparing it against the existing solar farms figures (i.e. MW/km^2) which is around 40MW per square kilometres.

The aircrafts approaching/leaving Heathrow Airport will reach WB but the map released by the airport indicates that the aircrafts will be around 6000 feet above ground and are less likely to cause any visual interference.

4.2.3 Biomass

The term 'Biomass' covers a wide variety of products which are derived from living organisms. It includes animal waste, food waste, virgin woods from woodland management, arboriculture

activities, waste wood from wood processing or demolition and agricultural arising. The definition also includes dedicated plantation of energy crops such as elephant grass (*Miscanthus)* and willow (*Salix*) the latter generally being referred to as short rotation coppice (SRC).

In this desktop assessment, only the woodland management and SRC resource are considered as it is the most significant source. Although other sources also contribute to the total resource, not all of the wood from woodland management will go to wood fuel production. Some will be diverted to alternative uses such as wood industry, mulch etc. Thus the inaccuracy due the assumption of all woodland product going into wood fuel production is somewhat reduced by other sources left out in the study. Food waste is considered under the Waste section.

Figure 32, Woodland management (Pictures: TV Energy)

The output of woodland management and small tree surgeons is mostly converted into woodchips for use in small boilers. This chip, along with chip produced from dedicated crops, can also be used to fuel large scale centralised power plants (e.g. Slough Heat and Power, 35MWe). Agricultural arising such as straw bales can also be used in generation plants similar to the Elean Power Station (38MWe) in Cambridge. Waste from the wood industry, such as sawdust, is generally processed to form pellets and can be used in both small and large scale heat generation systems. .

Animal wastes, food wastes or Municipal Solid Wastes (MSW), which generally has higher moisture content, are usually treated using Anaerobic Digesters (ADs). Anaerobic Digesters can also use grass silage which is mixed with animal waste to generate biogas using AD systems.

The woodland management output is most likely to be used in boilers rather than in power stations. The type of biomass heating system installed will depend on the type of property, heat needs, access and a range of factors. Woodchip will mainly be used by larger heat users such as schools and offices due to space requirements. Logs and pellet systems are suitable for smaller applications such as in residential homes.

Figure 33, Typical biomass (heating) system.
Left: Large scale system. Centre: Residential Pellet boiler (height: 1.2m). Right: Residential log burner (height: ~1m)

The fossil fuel alternative heating option, electricity and oil, has a higher operational cost, approximately 15p/kWh and 7p/kWh respectively, as compared to 3p/kWh for a woodchip system. In addition, to these financial benefits, there are also other benefits that accrue from using biomass such as increasing local employment within an area (e.g. in fuel preparation, maintenance) and increasing fuel security, which ultimately means a less volatile fuel market.

Given this backdrop, local people in the district are more likely to be inclined towards using a biomass system. However, the council should lead the way by installing biomass systems in their properties (e.g. schools, offices). It will help build confidence within the area and will help the supply chain grow which in turn will drive down the cost and uncertainties of an ever growing local energy source.

Woodland Potential

This section details the potential resource which arises from the output of local woodlands destined for generating heat in small boiler operations. Only the output of the woodland is considered as the district does not have any significant wood processing sites which can produce a sizable raw material for wood pellet production i.e. sawdust. The district also has two energy crop plantations (willow) but as they are already used they do not contribute towards additional future resource.

The district has a significant amount of woodland coverage. However, as there is no data in the public domain about the extent of their management, some assumptions have been made to assess the district's resource. The woodland coverage data held by National Forest Inventory for West Berkshire is shown in the region's map in Figure 34. The output of woodland can be either woodchip or logs. As a consideration of both will result in double counting, only woodchip is used to quantify the resource.

Approximately 17% of the district is covered by woodland (Table 11). These woods can be managed to produce fuel (woodchip) for heating. Currently, only a small proportion of this resource is managed for woodfuel production.

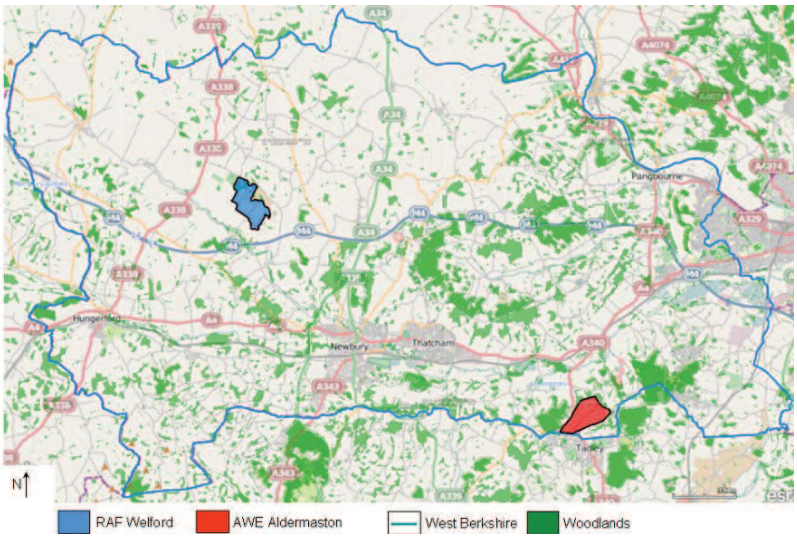

Figure 34, Woodlands in West Berkshire (woodland data taken from National Forest Inventory)

Total woodland	11,897	Hectares
	119	Sq km
District's area	704	Sq km
Woodland cover	17	%
Current heat generation	2,567	MWh (Approx generation by current biomass systems)
Current usage	484	tonnes
Operation efficiency	75%	
Net Current usage	646	tonnes

Table 11, West Berkshire's woodland and wood usage summary

Table **12** shows the potential output of the district's woodland and the amount of heat that could be supplied through chip. The 'higher' column shows an optimistic potential of the district whilst the 'lower' column indicates a more conservative figure. Either way it can be seen that there is a significant potential of wood fuel in the district with a potential to displace as much as 20% of the district's gas demand. The table assumes that each hectare of existing woodland can produce 2 tonnes of arising on a sustainable basis with energy content of 19GJ/tonne which is similar to DECC's recommended figure.

	Maximum		% medium		% low	
% of woodland currently not managed for woodchips	100%		50%		25%	
District's total unmanaged woodland	11,897	Ha	5,949	Ha	2,974	Ha
% of woodland willing to produce woodchip	100%		100%		100%	
District's total potential woodland	11,897	ha	5,949	ha	2,974	ha
Av. ODT per hectare	2	t/ha				
District's output	23,794	t/year	11,897	t/year	5,949	t/year
Energy equivalent of potential production	126	GWh	63.05	GWh	31.53	GWh
Remaining Energy equivalent	123	GWh	60	GWh	28	GWh
Operational efficiency (DECC)	80%		80%		80%	
Net energy (heat) from district's woodland	**98.15**	**GWh**	**47.71**	**GWh**	**22.48**	**GWh**
District's total gas demand	1199	GWh				
Percentage of District's gas demand potentially met through woodland management	8	%	4	%	2	%
Availability (DECC)	80%		80%		80%	
cp/load factor	20%		20%		20%	
Equivalent power	**0.06**	**GW**	**0.03**	**GW**	**0.01**	**GW**

Table 12, Potential wood fuel usage at West Berkshire

As a source of energy, wood fuel can also be used to generate electricity. From DECC's approximation, around 6000 t/yr (oven dry) can power a plant rated at 1MW at 80% availability. In other words, the district can power about 2.4MW power station generating as much as 17GWh of electricity from woodland management arising if so desired. This is about 2% of the district's total electricity consumption.

Biomass heating systems are most attractive in the regions which are off the mains gas network. Figure 355 indicates the connectivity of various areas of the district to gas pipelines in 2001[42]. It indicates that a majority of the district was *not* connected to the gas network and is potentially suitable for biomass system installation. Although the data is from 2001, the rural nature of the majority of the district means that the picture would have changed very little over the time.

[42] http://www.ruralfuelpoverty.org.uk/rural2.php?mopt=1&pid=gas_areamap&step=3&county=9

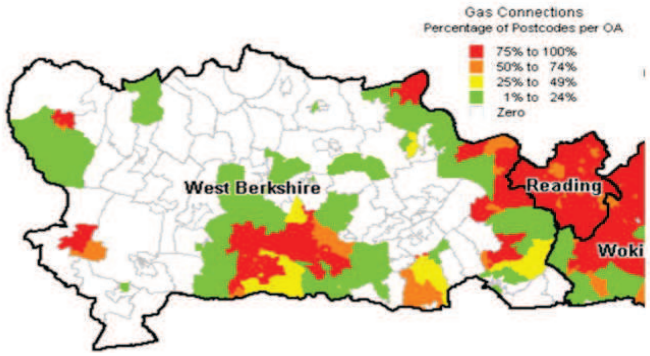

Figure 35, Mains gas connection of Output Areas of Wet Berkshire (source: Rural Fuel Poverty)

Although the land use map (Figure 36) indicates that the majority of off-gas grid areas are fields, they do give a general indication of potential sites which could benefit from biomass systems.

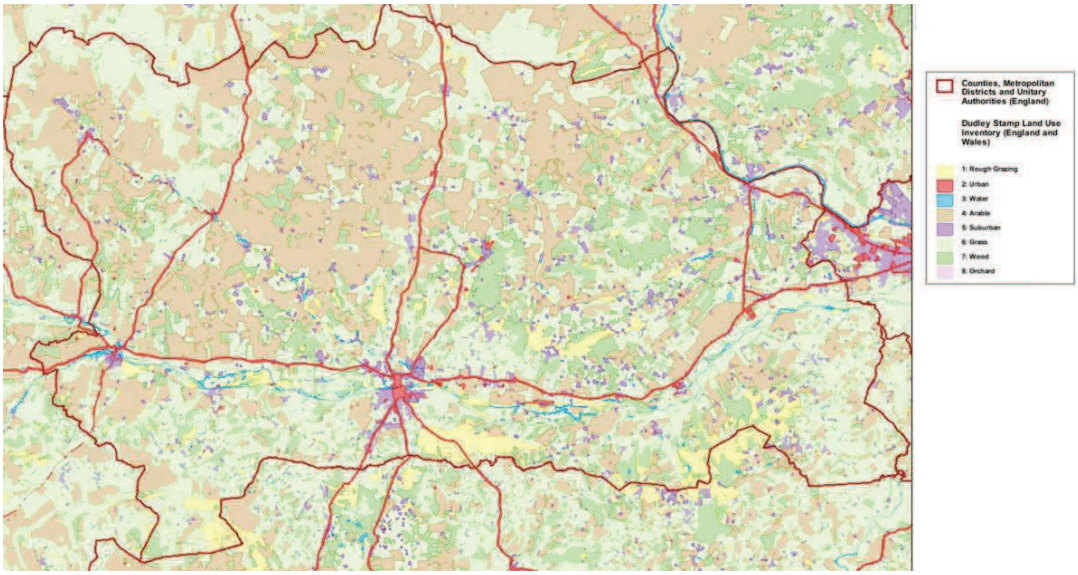

Figure 36, Land use map (Source: magic map)

Energy Crops Potential

WB is suitable for energy crops cultivation, mainly Willow and Miscanthus. The district currently has two energy crop plantations both of which are SRC and recently produced the first harvest producing around 1GWh of energy. The additional energy crop potential of the district was estimated at approximately 85GWh. This estimation is based on the 'set-aside' land percentage and the DECC's benchmark figures and is briefly explained below.

WB has around 49,500 hectares of agricultural land (source Defra). Until recently, farmers were required to set-aside certain portion of their land to limit food production in the EU region. In return, farmers were paid for the land that was set aside. For WB, this was 7% in 2007. Although change in policy means there is no longer a set aside land, it is safe to assume that some percentage of arable land can be 'set-aside' for energy crops plantation without producing the scarcity of food. Besides, although there is no set-aside land, farmers are still paid if their land is kept in an arable state. Hence, 5% of the agricultural land was assumed to be able to grow energy crop without reducing food production capacity. Based on this assumption along

with DECC's recommended figures in the methodology, the above mentioned potential was deduced.

85GWh represents about 7% of the district's gas demand, both domestic and non domestic.

4.2.4 Heat Pumps

Heat pumps 'recover' heat from air, water of ground and are correspondingly called air source, water source and ground source heat pump. They multiply energy input by a factor of around three. However, a very careful design and sizing is required to achieve such factors. Heat pumps are ideally suited for off gas grid properties and do need electricity for its operation.

Majority of the UK is suitable for heat pump installation. A separate report prepared by TV Energy (TVE198), also indicates that the district does have suitable geology for Heat Pumps installation. Heat Pumps can be installed either in residential or public properties such as village halls. Residential properties will require drilling bore holes unless it has large area in which case it can employ horizontal heat exchangers to extract heat from the ground. Heat Pumps requiring bore holes are comparatively more expensive.

This desktop study to assess the potential of the deployment of heat pumps is based on the number of houses in the rural area of the district. These properties are likely to be inaccessible by mains gas network and lend themselves to such deployment. Similar to small wind systems study, the number of properties in the district was estimated on the basis of the rural population. Furthermore, the types of properties are also considered for this purpose. This breakdown is based upon *West Berkshire: District Profile 2011* report which breaks down the type of properties in the district into detached, semi-detached, terraced and flats. It was assumed that the given proportion held true for *rural only* properties as well. Although in the DECC's methodology, 100% of the rural properties are said to be suitable for heat pumps, for this study 100% of detached and semi-detached properties, 50% of the terraced properties and 0% of flats were assumed to have installed a heat pump of some sort. This is because the flats are less likely to be able to install heat pumps including air source heat pumps. Despite air source heat pumps being able to be deployed for flats, noise issue during planning phase *may* prove to be prohibitive. Each installation is assumed to have a power rating of 5kW as recommended by DECC.

Under these assumptions, the total potential capacity was estimated at 83MW or 146GWh of energy (heat) displacing around 12% of district's mains gas demand.

4.2.5 Hydropower

Hydropower energy is the energy of water at heights due to gravity. The hydropower schemes in the district will be of the type generally known as run-of-the river. These schemes are usually developed in existing weirs and do not include any additional water impounding structures. The hydropower turbines for the district are most likely to use, like most of low head sites in the UK, an Archimedes's Screw turbine coupled to a generator (Figure 37). Other systems such as siphon systems also exists which require minimal amount of civil works but its usage is not as wide spread. Kaplan turbine is another system that could be used for low head systems but could

cost considerably more to install and operate.

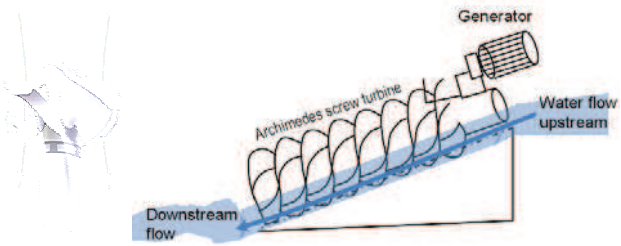

Figure 37, Low head hydro turbines. Kaplan (left) and Archimedes' turbine (right)

Wherever possible, it is best to exploit hydropower as they generate electricity at the rated power for more parts of the year than wind or solar system.

Figure 38 shows roughly, the amount of energy generated per installed kilowatt of hydro, wind, biomass and PV in the UK for system. Although hydro systems generate more energy than the others comparatively, hydropower is also generally more expensive per kilowatt to install. The factors affecting the cost of a hydro system include environmental requirements (e.g. fish-pass installation, flood risk study), civil works (e.g. strengthening of weirs, power house) and electrical works (e.g. strengthening the grid in the immediate vicinity).

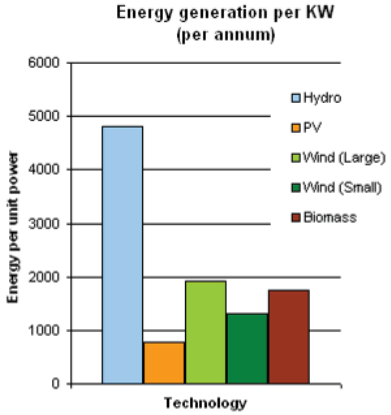

Figure 38, Comparative energy generation.

Another useful concept which allows comparison of different technologies' energy performance is *Energy Payback Ratio* which is defined as the total energy produced in the system's lifetime divided by the energy required for building, maintaining and fuelling it. It shows energy payback ratio for some technologies. The figures are based on Life Cycle Assessment (LCA) data. A higher payback ratio implies that the system uses as much power as it generates throughout its operational life. The higher the number, the more environmentally friendly the system is.

Brief note: Dauntsey Park Hydro, Wiltshire

Head: 1.25m

Flow: 1.5 cumec

Power: 12.5 kW

Expected energy: ~43MWh /yr

Energy Payback Ratio	
Hydro power	>170
Large wind turbines	~34
Biomass	3 to 27
CCGT	2.5 to 5
Coal	2.5 to 5.1

Table 13, Energy ratio[43]

Coal and gas figures are set to decline further as fossil fuel extraction becomes more difficult and sourced from further afield thereby increasing the hauling distance and hence the cost.

Hydropower Potential

In 2010/11, Sustainable Newbury did consider putting in hydro power in Newbury at Victoria Park and Lock Island in Newbury. A company called IT Power also carried out feasibility study for the same river stretch in mid 2000s but the site was never developed siting high cost associated. The cost was estimated at £8800/kW which is typical of low head hydro schemes but the system size was only around 20kW.

A 2010 study carried out by IT Power and British Hydro Association (BHA) states that within Thames Region, there is a potential of up to 30MW[44] of hydropower at 125 sites. Although this report, given the scale of maps in the report, does not indicate any potential site within West Berkshire, a report from Environmental Agency[45] (EA) does indicate a number of sites along River Kennet of various capacities (Figure 399) that can be developed. Interestingly, these sites are also classified as highly sensitive to hydropower development.

River Kennet is a part of Kennet & Avon canal route. This and along with various SSSI sites along the river will make it difficult to exploit the resource at River Kennet. However, it is crucial to develop any possible sites because of reasons indicated in figure 39.

The IT Power report also anticipates that any sites with less than 1m head is likely to be too expensive. Although they are expensive, they will help with emission in the long run. Besides, there are a number of micro hydropower systems manufacturers in the UK who can supply systems creating 'local' employment and income. Hydropower schemes can have an operational life of as much as 50 years which can be further extended by overhauling the site and machinery. Hence hydropower can be developed as an environmental project rather than one just aimed for financial gains.

A map from the EA study relevant to the district has been reproduced below. The EA report does not indicate any sites for River Lambourn, River Pang and their tributaries.

[43] Comparing Energy Option (July 2005) , Qubec hydro: http://www.hydroquebec.com/sustainable-development/documentation/pdf/options_energetiques/rendement_investissement.pdf]

[44] IT Power & BHA http://www.british-hydro.org/UK%20Hydro%20Resource/England%20and%20Wales%20Resource%20Study%20Oct%202010.pdf

[45] Opportunity and environmental sensitivity mapping for hydropower in England & Wales

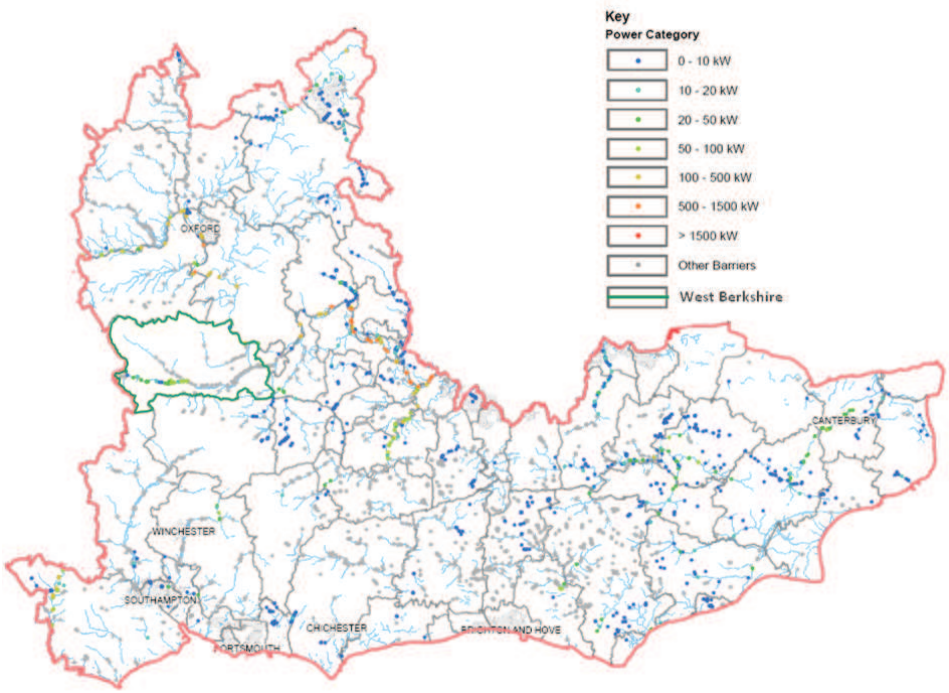

Figure 39, Potential hydro resource in South East Of England (compiled from EA report)

National River Flow Archieve (NRFA) indicates that for a gauging station in River Lambourn at Shaw, Newbury, the Q50[46] flow is 1.5 cubic meters (cumec). If 30% of this flow is used[47], any hydro schemes installed at head of 2m along River Lambourn can generate as much as 25MWh electricity annually displacing 13 tonnes of CO2. In comparison, River Kennet has larger Q50 flow of 3.84 cumec. Developing hydro schemes along River Kennet at 2m head will generate approximately 70MWh annually. Hence, schemes in River Kennet can potentially generate three times the energy than schemes at River Lambourn for similar site condition due to larger flow.

The power ratings of the hydro schemes in both the rivers will be less than 20kW. But, intrinsically, hydropower systems generate more energy per year than either wind or solar systems for a given power rating. For example, to generate similar energy stated above for River Kennet, wind and PV system will need to have a system rating of 32kW and 80kW respectively. It is the energy that is of more interest, both environmentally and economically, than power.

4.2.6 Waste

Waste collected by the councils, generally called Municipal Solid Waste (MSW), is one of the sources of energy and emission. In addition to the renewable targets there are international binding targets in the waste sectors as well. For example, EU Landfill Directive requires that the UK reduce its biodegradable MSW going to landfill by 35% as compared to that of 1995 level.]

Using waste as energy is made possible by technologies such as Anaerobic Digestion (AD), Waste Incineration and Pyrolysis & Gassification. AD involves breaking down the food waste component of the MSW by biological means and collecting the gas given off (biogas) during the

[46] Taken from Flow Duration Curve and is the flow that exceeds 50% of the time in a year in m^3
[47] How much water can a river give? Copestake and Young

process. Whilst gasification is the thermal degradation of the waste material to form a mixture of gases (normally referred to as synthetic gas), waste incineration is simply the burning of waste to generate heat which can be used for power generation using steam turbine. Waste incineration projects are difficult to realise due to strong public and environmental group oppositions to the concept. They have more stringent construction and operation requirement which tend to escalate the costs associated.

Figure 40, AD digester (Austria)

Only AD is quantified here as West Berkshire already collects kitchen food waste for composting and data is available to make the assessment. AD is also technically more mature and frequently deployed. This makes it possible for the district to realistically deploy AD in a relatively short period of time.

West Berkshire has a relatively high level of recycling with the following amount of waste collected in the years 2008/09 and 2008/10.

Year	2008/09	2009/2010
Total, in tonnes	82,077	79,854
Landfill in tonnes (%)	53,788 (65.5)	37,718 (47.2)
EfW in tonnes (%)	261 (0.3)	9,357 (11.7)
Recycling in tonnes (%)	28,015 (34)	32,780 (41)

Table 14, Waste Berkshire waste arising[48]

The majority of the food waste collected in the district is converted into compost and sold as fertiliser. Although composting is helpful in reducing waste, ADs are a better option because they not only reduce waste but also displaces fossil fuel and produce a fertiliser as a by-product. Composting also takes up a larger space than a well designed AD. Defra indicates that capturing the gas produced (e.g. through AD) by one tonne of food waste will save between 0.5 and 1 tonne of CO_2 equivalent. Composting is also said to create volatile organic compounds which are pre-cursor to smog formation[49].

AD utilisation overview

The gas produced by an AD plant is a mixture of different gases, mainly CO_2 and methane. The gas mixture (biogas) contains 55-70% of methane and require further processing before being

[48] Source: 2008/9, 2009/10 http://www.westberks.gov.uk/CHttpHandler.ashx?id=29273&p=0
[49] Anaerobic Digestion of Food Waste, US Environmental Protection Agency, 2008

used either in a local CHP unit or 'injected' into the mains gas. The percentages of different gases depend upon feedstock and plant operational parameters. The following diagram summarises the AD plant and associated potential processes.

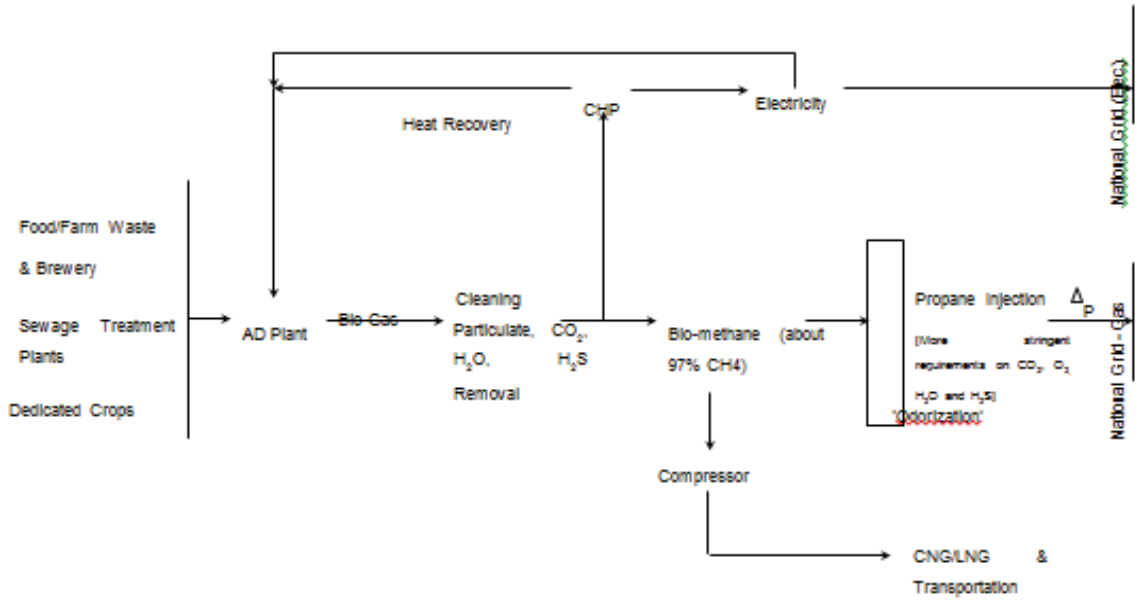

Figure 41, Process diagram of AD based systems

If a site has heat load in addition to parasitic heat load (heat used by the plant itself), it is best to use gas on site in CHP unit environmentally. This is because it displaces grid electricity that is more carbon intensive. Injecting methane to mains gas needs additional processing and consumes energy (e.g. pressurising), decreasing the net output energy.

Depending on what the biogas is used for, i.e. CHP or 'injected', the biogas requires various further processing such as cleaning, pressurising, upgrading (to increase energy content of the gas using additives such as propane) and odorizing (to give the gas the distinctive mains gas smell).

AD Potential

In 2011/12 the district sent 17,000 tonnes[50] of food waste collected through kitchen food collection services for composting. A tonne (dry) of food waste can potentially generate about 1200kWh equivalent of methane gas. If this gas is used to power CHP unit, it will generate about 241kWh of electricity and 725 kwh of heat, assuming 80% system efficiency. Compared to an existing plant's expectations, these figures are slightly optimistic but conservative as opposed to Defra approximation[51]. A laboratory test carried out in California by Environmental Protection Agency found that each dry ton of food waste can generate as much as 1300kWh energy.

[50] Westberkshire.gov.uk [email]
[51] http://www.defra.gov.uk/environment/waste/

AD Example: Westwood AD plant
BiogenGreenFinch, Northamptonshire

Processing capacity: 45,000 t/year
Feed type: Food waste
Electricity output: ~2 MW/ 9GWh[1]

The figures for West Berkshire are based on a number of assumptions and AD plant's output is affected by a multitude of factors some of which are discussed in the annex. Hence, diversion of 50% of the annual food waste collection to an AD plant can *potentially* generate around 2GWh of electricity and 6GWh of heat.

4.2.7 Others

Other renewable energy technologies which can potentially be deployed in the district include biomass and natural gas combined heat and power (CHP). Both of the options are *not* quantified here.

Combined Heat and Power (CHP) are best suited for properties with high heat load year round e.g. sports centres with swimming pool facilities. The system is sized based on the heat load. Although there are a number of such installations, they use natural gas from the grid. In this configuration, emission reduction will be achieved but energy security will not be addressed as UK is a net importer of gas. Small residential systems are also available for small properties. They are usually rated at 1-2 kW.

Biomass fired CHP (e.g. Waitrose, Bracknell) are an alternative approach which reduces emission and address energy security. A locally sourced biomass also increases local employment.

Both type of CHP employ reciprocating engines which require overhauling (i.e stripping down and rebuilding the engine, restoring it to almost new state) every few thousand hours. Overhauling can be quite expensive, especially if it has to be shipped out to its manufacturer overseas.

4.3 Potential Energy Mix

This section discusses what the district might achieve with a proactive policy on renewables. In essence, it is a snapshot of the previous resource section. The starting point is that the district currently generates less than 1% of its energy needs from renewable energy. By any measure – this is modest! The total could be increased to as much as 29% if the district makes maximum effort towards a progressive sustainability policy. Figure 42 indicates the mix of renewable energy technology capacity that the district can achieve in the near future. Figure 43 shows the equivalent power rating for each technology generating energy indicated in figure 42.

Note that the wind system actually generates more energy (per power rating) as compared to a solar energy system. Retrofit PV, biomass, AD, heat pumps and energy crops do not show variation as these are less affected by AONB. Although small scale wind systems are deemed to be affected by AONB, but the approximating method used here to estimate capacity means that it does not show variation.

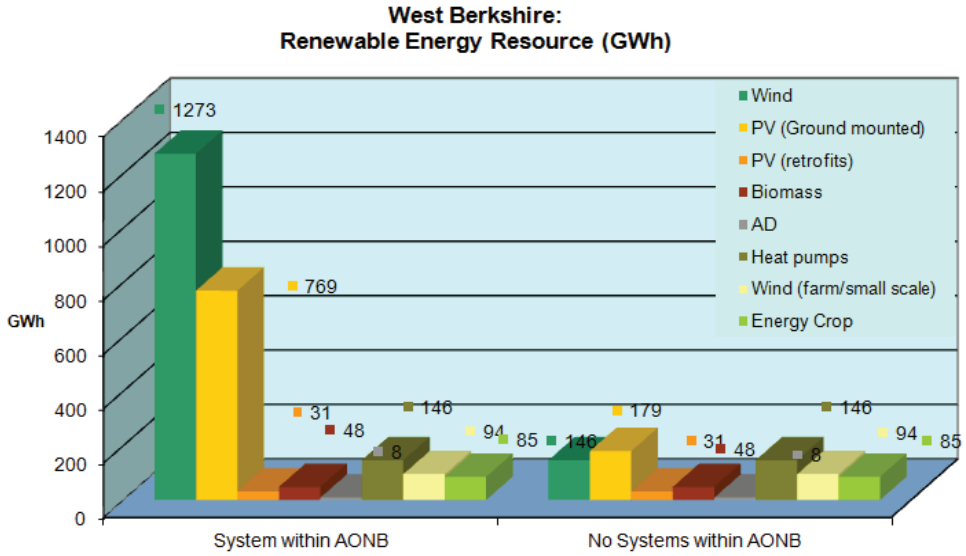

Figure 42, Renewable energy resource of West Berkshire

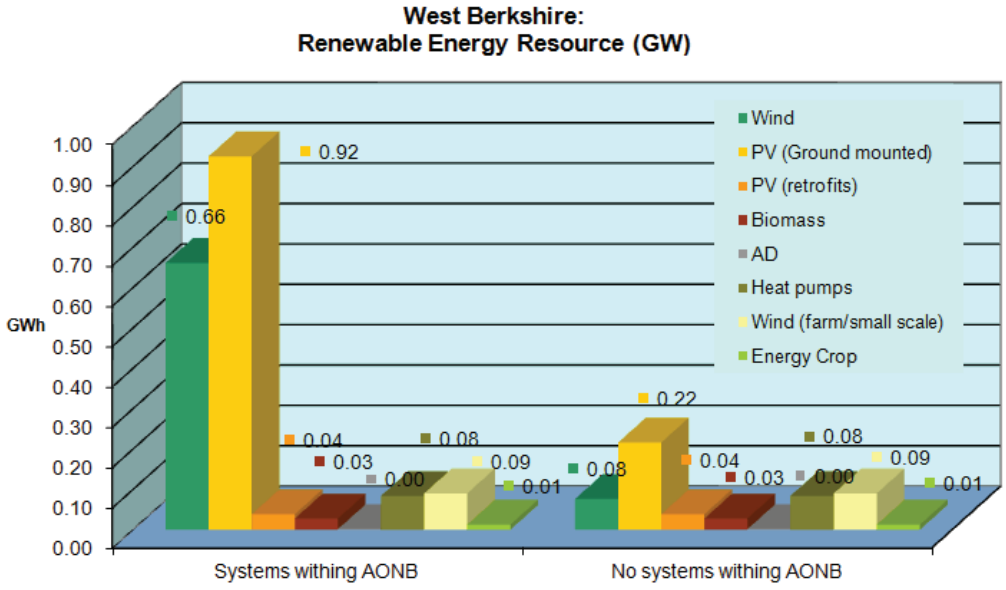

Figure 43, Equivalent power of the resource of the district

Figure 44 shows what the district's energy state if it is very committed to development of sustainable future. This does not come easily and it is absolutely necessary to have suitable policies and strategies to achieve this scenario. Compare with figure 19 which shows the current state of affairs.

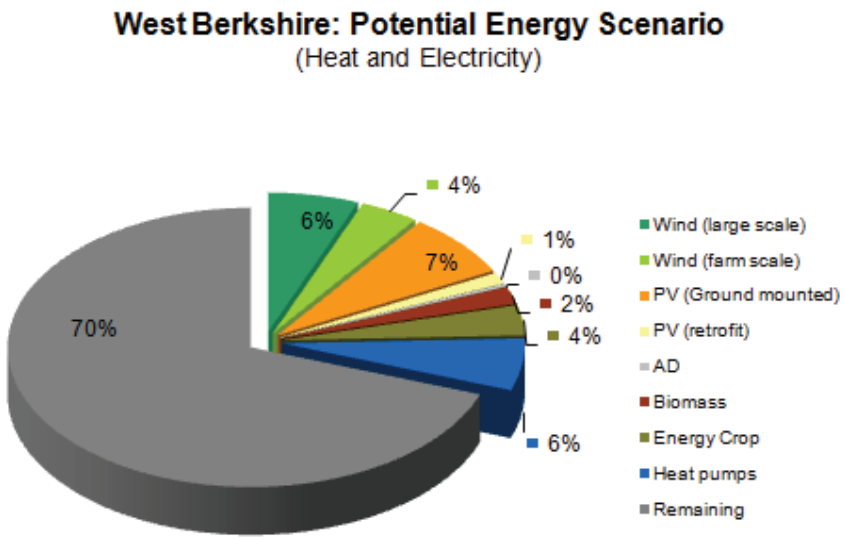

Figure 44, West Berkshire: Potential energy supply mix

4.4 Discussion of physical constraints

Physical constraints include infrastructures like roads, rivers, rail lines, power lines, microwave links, settlements, airports etc. These elements reduce the available land area, thus the resource, of an area. In addition to physically taking up space, these factors have exclusion zones around them which further diminish the potential sites. These limitations are specific to each of the technologies are discussed under respective headings below.

Generally, the physical constraints are considered using a computerised system and will show potential sites. However, this desktop assessment is not intended for scouting for potential sites but rather to ascertain the potential of the district. The method used here is sufficient to achieve that objective i.e. the district's potential.

Wind

Modern turbines are quite tall and because exclusion zones are based on turbine height and blade diameters, wind turbines are particularly affected by physical factors. For instance, turbines cannot be closer than the topple distance of the turbine from any public roads, rivers or railway line.

Figure 45, Wind Turbine and animals 50kW Endurance, East Lothian Farm. (greenenergynet.com)

Another factor which imposes a significant exclusion zone around itself is the residential areas. This is mainly due to the potential issues with noise and shadow flicker. Residential properties generally have around 600 metres (for commercial scale turbines) of exclusion zones. To put it into perspective, a single house at a candidate site can remove around 1km^2 area which, according to the methodology, could accommodate almost a 9MW wind system. Hence,, with majority of the population concentrated in the south-east of the district, a significant area of this part of the district is unsuitable for wind farm development. However, the part of the district within AONB is scarcely populated and will in principle present more opportunity within the AONB than outside it. These facts are reflected in Figure 27 prepared by LUC and TVE jointly.

Another effect of built up areas upon wind project is the modification of the local wind flow regime. This results in reduced windspeeds. Sites with windspeeds below 6m/s are less likely to attract any commercial developers. However, smaller turbines such as the 11kW Gaia and 50kW Endurance turbines can be considered at the outer perimeter of built-up areas like towns and farms even if the windspeed is as low as 4.5m/s. Turbines rated at 100kW are also available in the market (100kW Northwind).

Airports, airfield and military installations can also be an issue. Apart from protrusion into the skyline by tall structures, they are also concerned with potential turbines' effect on radar system. A busy airport may require more than 5km wide exclusion zones within which no turbine may be erected. The Atomic Weapons Establishment (AWE) present in the district, in its Energy Strategy (2006), does indicate that the establishment is not opposed to renewable energy including wind and solar systems.

Photovoltaics

Most of the PV systems currently being installed in the UK are installed on residential properties. These are mostly small systems and do not generate much opposition. However, there are limited available properties and the capacity stated under '*PV (retrofit)*' is likely to be the one that the district can install. The infrastructures have little effect on such deployment if at all.

Airports and airfields may be concerned with PV systems in general if located near the airport. They are usually concerned about PV system's potential to distract and dazzle the pilots and also incorrect identification of them as navigational lights during approach and takeoff at certain times of the day. This should not be an issue with installations in the district because although the flight path of aircrafts from Heathrow International Airport does cross WB, the aircraft are above 6000ft[52] and the concerns are unlikely to materialise.

Comparatively, ground mounted systems require more rigorous consideration both in terms of technical and planning appraisals. Some physical structures such as microwave links and powerlines have minimal effects in ground mounted PV systems. However, roads, rail and rivers will require some exclusion zone for safety reasons. e.g. PV systems too close to a road may dazzle drivers.

[52] http://www.heathrowairport.com/noise/noise-in-your-area/aircraft-tracking-maps

Examples of current ground mounted systems include Westmill Farm with 5MW capacity situated on about 0.12km^2 and Wheal Jane Solar Park with 1.4MW capacity at approximately 0.03 km^2 land. Wheal Jane Solar Park is actually situated on contaminated land and demonstrates the potential of PV systems.

Biomass

Biomass encompasses a variety of resource and each has a different set of limitations. Generally, biomass systems are less likely to be opposed on the basis of visual impacts, noise issues and safety to general public. However, they are affected by various other concerns such as potential smoke emission, stack size, displacement of arable crop land, heavy vehicle movement etc.

The energy crop potential of the district is based on a 'set-aside' land area and will not compete for land with food. The food waste usage is also based on current setup (i.e. food wastes are already collected) and will not cause any issues with increased vehicle movement. Biomass for heating (e.g. woodchips and pellets) has to deal with possible smoke issues. Although, usage of correct moisture content fuel is enough to avoid smoky condition, some smoke free areas will require the use of approved equipment. Design of smoke stack of biomass heating systems is also a crucial factor in smoke creation. More importantly, it affects the efficiency of a plant.

Another set of limitations for biomass heating system is, they intrinsically require comparatively a larger space than oil fired boilers or gas boilers. Also, a biomass system is more hands on as compared to oil and gas. However, this aspect of biomass system has the potential to create local jobs and benefit the community.

Table 122 is the maximum resource of the district. A portion of woodland output will go to *alternate use* and not all of the woodland's output is available for wood fuel production. Also, some of the sites may be uneconomical to use for wood fuel production. Unlike other forms of renewable energy, the economic case of the production of biomass will depend on the distance of production site from the 'consumption' site as transporting for longer distance raises cost and reduce environmental benefits. This will bring down the capacity of a region. As the number of installations and wood fuel production sites increases in the region, the wood fuel hauling distance will decrease which, in turn, brings down the cost and also increase the level of emissions averted due to displacement of fossil fuel such as heating oil.

Woody biomass can also be used for electricity generation using a combination of gasification and CHP plant. However, this is not a widespread practice and woody biomass are generally limited to heat production. Co-firing is currently unavailable to the district.

Agricultural arisings are also not assessed here.

Hydropower

The main objections with any hydropower development are the danger to fishes and potential flooding. This could increase the cost of the hydropower development significantly. Usually, the EA would ask for a fish study for that particular stretch of river to be carried out and

depending upon the outcome, installation of fish-pass may be required. Fish passes are expensive both in terms of cost and the available resource as the flow is diverted to the fish pass. The amount of water flow that can be used for hydropower is determined by the EA and indicated in the abstraction licence. The EA will also dictate when the installation can extract energy by specifying residual flow level that has to be in the river. Generation has to be stopped when the flow is less than residual flow. Increased risk of flooding could also be of concern at some sites. EA has identified the entire Kennet Valley as high flood risk area. As such, any hydropower development in the district will have to address the potential flooding issue. The two major rivers of the district are covered with SSSI (figure 46) and will limit the installation of hydropower.

Figure 46, SSSI in West Berkshire

Development of hydropower has to be carried out in close cooperation with EA. Local users like rowing/canoeing clubs also have to be consulted from the outset.

AD and Landfill

AD plants are limited by the availability of resource only. Although they cannot be developed in built-up areas. However, it is essential to plan carefully to reduce hauling distance.

The organic material going to the landfill sites will decline increasingly as more house/kitchen waste is diverted to AD and composting. With decreasing organic material going to the landfill, this landfill resource will decrease. As such energy from landfill sites has not been quantified. Although EA webpage indicates historical and authorised sites, no detail about the site's fill-material, date of closure etc. is included which is essential. The knowledge of duration of the site closure is needed to assess a site's potential. (See separate 2012 study by TVE on the decline in landfill gas production as a part of the evidence base review).

Also it is best to divert resource (i.e. organic waste) to sites where its use can be controlled actively. Therefore, councils should rely on purpose build AD plants rather than AD process in landfill sites.

Heat pumps

Deployment of heat pumps is dependent upon the local ground conditions. Air source heat pumps require less work as they lack outdoor exchanger coils. Ground source types are generally more efficient but do require additional work of lying down or drilling into the ground to extract heat. This could be costly depending upon ground conditions. Air source heat pumps

are inherently less efficient than ground/water source system. This fact is supported by the field trial carried out by the Carbon Trust. The study found that ground source system could have a COP of more than 3 while the air source system had less than 2.5. The lower operational achievement is due to the fluctuation of mean air temperature and the requirement for defrosting of the external coil.

A more challenging barrier to heat pump deployment is the availability of cheaper mains gas. The gas system also has a smaller capital cost and is more easily installed as compared to heat pumps.

4.5 Economic Limitations

This desktop study does not consider the economic limitations as they are very project and site specific. More detailed and focused work is required to assess the economic viability of any site. However, an effort has been made to discuss its implications to any project.

The proximity of a site, be it PV, hydro or biomass, to National Electricity Grid (National Grid) and to national road networks is an important factor in determining the economic viability of a scheme. Long cable runs are expensive. Likewise upgrading lines to receive power is also expensive and can lead to project delays.

Current large wind turbines are rated at around MW scale. These turbines connect to National Grid at 33kV to transport extracted energy to keep electrical losses to the minimum. It is essential to have such a highly rated electricity grid close by. If it is not available, the scheme developer must install necessary equipment to 'strengthen' the grid. Even small wind turbines are generally rated at higher power than residential PV systems. This may requires a site, e.g. farms, to strengthen their electricity supply before incorporating wind turbines at a cost.

In the case of biomass system heating, a site (depending on power rating) may require upgrading the electricity supply to three phase system as motors in the system are relatively high powered. If such projects are located in a 'weak' part of the distribution network, it will introduce voltage fluctuation in the grid. Fluctuations in supply voltage also tend to cause the system to shut down temporarily.

The proximity of the site to the national road network is also an important factor in economics of wind farms. Modern day wind turbines, especially the blades, are shipped as a single unit and require wide roads for delivery. If the roads are not wide enough, they have to be widened at the expense of the developer and this could be a very significant cost depending on the distance involved. Even if the sites are well served by the road network, it is still necessary to construct site access roads which, sometimes, may be required to be taken apart once the construction is finished. For example, whilst transporting wind turbines for re-powering Goonhilly in Cornwall, some traffic lights had to be taken off to allow lorries to navigate the roads.

A combined project, wind and ground mounted PV, also increases the economic viability of a site as some infrastructure e.g. grid connection, security and accessibility, may be shared.

The incentives provided by the government do increases the economic viability of a site. The installations in the district will mostly benefit from Feed-in-Tariff and Renewable Heat Incentive but some projects such as AD and large wind systems will benefit from the Renewable Obligation. Residents can also benefit from the Green Heat Scheme once it is introduced. The incentives will bring in finance to the district which would otherwise be distributed to other areas. However, given the changing nature of these policies, it is imperative that the council act fast and decisively if they are to benefit to any significant degree.

4.6 Conservation area and AONB

Wind energy is a major source of renewable energy available in the district. Ironically, wind energy is also heavily opposed by AONBs and in the context of WB, NWD AONB covers almost 3/4 of the district and is set to play an important part in the district's ability to develop into a sustainable region. Although AONBs cannot stop a development within their boundary, they are an important stakeholder consultees. The land use within the AONB is also the local authority's responsibility[53]. Additional complications may arise as the AONB overlaps different authorities. Figure 426 and figure 47 indicate the extent of NWD's affect in the total wind and PV resource.

However, not all AONBs are opposed to development of large commercial scale wind farms within its boundary e.g. Goonhilly Windfarm located within Cornwall AONB in the Lizard Peninsula (Cornwall) has six 2MW turbines. It is also surrounded by various conservation areas[54].

A study commissioned by the NWD AONB has identified the entire district to be moderately to highly sensitive to wind farm development. As such, it is highly unlikely that WB will see any wind farm development at the large scale and density. The most likely scenario of wind system deployment is going to be in a cluster of 1-3 turbines and placed at large distances apart.

West Berkshire has around 51 other conservation sites.

[53] http://www.malvernhillsaonb.org.uk/faqs.html
[54] http://www.cornwall-aonb.gov.uk/documents/aonb_lizard.pdf

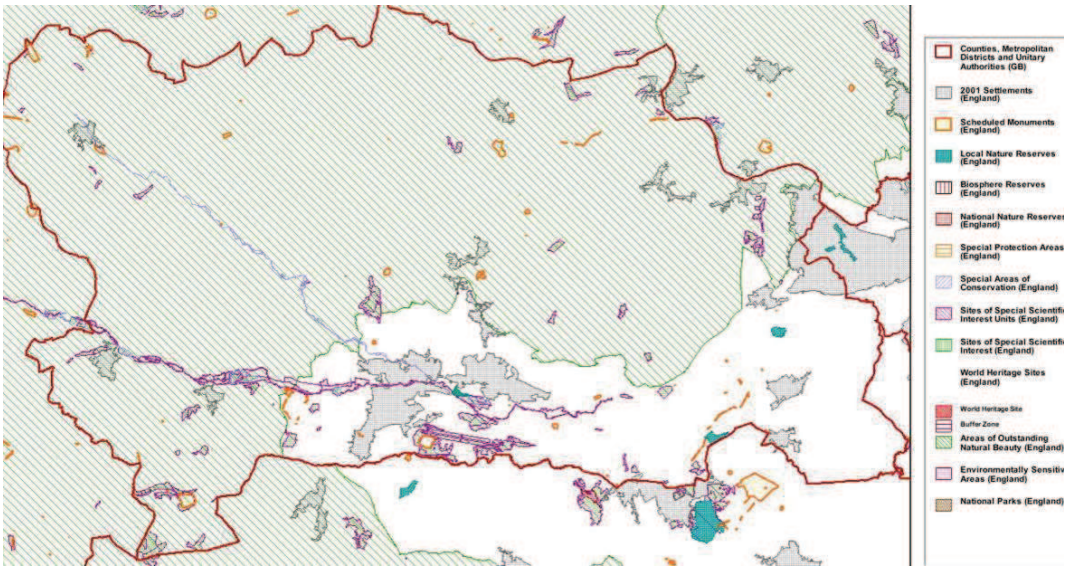

Figure 47, Conservation sites in West Berkshire. (Source: magic map)

The portion of the district outside NWD AONB is covered by major towns such as Newbury, Thatcham and Theale. With almost half[55] of the population based around the south-east of the district, a large part of the area is unavailable for wind energy projects. The area within the AONB is sparsely populated and could potentially offer more sites for turbine erections than south-east of the district.

Natural England, during the formulation of the methodology, has advised that the conservation areas and AONBs are *not* completely out of bounds for renewable energy exploitation. The methodology also provides 5-step guidelines for the assessment of a site within a conservation boundary which is reproduced here from the methodology:

Step1: Identify purpose of designation e.g. AONB, SSSI
Step2: Identify technology that affects the purpose of designation.
Step3: Identify how they affect e.g. habitat, view
Step4: Identify the level of renewable energy projects that can be developed without compromising the designation purpose.
Step4: Prepare guidance on how renewable energy projects can be developed without compromising the purpose.

A mid 2000 study commission by NWD AONB concluded that all landscapes within the AONB have medium to high constraints to turbine with hub height of 25m and above, including single and multiple cluster turbines. A chapter on sustainability in its Management Plant does indicate that the AONB recognises Climate Change and believes that it can be mitigated through reliance on 'appropriately scaled renewable energy generation'. An independent study may be necessary to ascertain the true impact of the turbines as the appearance of turbines in a landscape is completely subjective.

[55] http://www.westberks.gov.uk/media/pdf/l/c/2_-_People_and_Place.pdf

Another AONB (High Weal) in the South East also commissioned a study of wind energy resource within their boundary. The study found that, after allowing for various constrains, the AONB is not suitable for large commercial scale wind farm but suggested that an installation of a single or cluster of up to 3 turbines with rated capacity of around 2MW each is a possibility[56].

Turbines designed to be installed at less than 25m hub height are rated at less than 50kW some of which are shown in figure 24. It must be noted while considering proposals for larger turbines that although small height system may have less effect in the landscape, it would take a considerable number of them to generate the equivalent amount of electricity as would be generated by a single MW-scale turbine. A report published in Environmental Science and Technology shows that the bigger the wind turbine the more environmentally friendly they are[57].

AONB's and conservation sites are less likely to oppose other forms of renewable energy systems. However, these systems do have smaller potential as compared to wind and ground mounted PV systems.

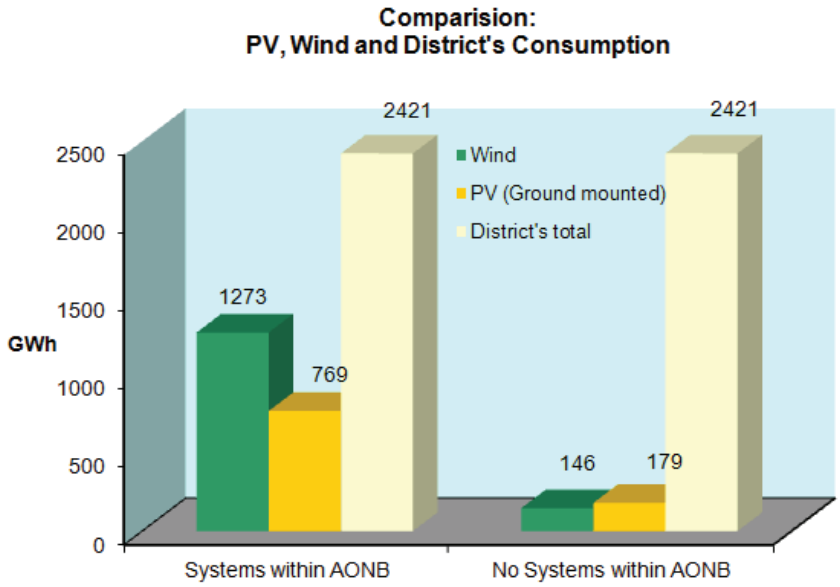

Figure 48, NWD AONB and its effect

5 REALISING FUTURE PROJECTS

Policy & Targets

Setting up targets is an important step in developing West Berkshire into a sustainable future. Having a goal can also motivate people to do more to move towards its achievements. It gives something to aim at and develop tactics to reach the goal.

The planning policies are an important form of tactics. The type of planning policy implemented will be pivotal in any renewable energy project development, especially wind. The

[56] Digital Landscape Co-operative. Wind Energy Regional Assessment for High Weald AONB, 2009. [Accessed on 26/06/2012]
[57] http://pubs.acs.org/doi/pdf/10.1021/es204108n

government's Planning for a Low Carbon Future in a Changing Climate, which is to consolidate Planning Policy Statement (PPS)1 and PPS22 will help the council in formulating future policies.

Addressing Issues: Heat and Electricity

From the discussions in the above sections, it is clear that exploiting wind energy is vital for the district. The main issue with deployment of wind turbine in the district is the AONB coverage. Hence, the district must address this issue for any kind of wind energy development. The majority of the area not covered by the AONB is densely populated rendering wind power unsuitable for larger turbines.

The retrofitted PV systems are mainly for residential houses. To make a dent in the district's electricity consumption, ground mounted systems have to be considered. Ground mounted systems do attract opposition, though not as much as wind. Installing PV system in highly visible place such as parking spaces and public building will help to increase PV profile and may increase PV uptake.

TV Energy is active in the district and also has a trading arm, TV Bioenergy, which works in biomass procurement and supply. TV Bioenergy, which has its own SRC, is also active in the energy crops cultivation and management. Involvement of such a company along with the Forestry Commission will be important in efficient management of the woodland resource. In terms of supply and demand, demand dictates what can be accessed economically. Hence, if the biomass heating installation increases in the district it will create demand and sources which are currently not being used will be brought to market which in turn will drive the cost down.

In terms of AD, acquiring segregated feedstock is important as feedstock contaminated with inorganic material will decrease the AD's performance. The district already has kitchen waste collection service in place. Although currently being diverted to composting sites, some of it should be diverted towards AD for heat and power. The gas obtained from AD can also be injected into the mains gas grid but will require extensive cleaning, upgrading and pressurisation which in itself are an energy intensive procedure. Adnams Brewery has such project in operation. Composting is an environmentally friendly way of disposing of waste, ADs are better due to their potential to displace fossil fuel.

Promoting small wind system and hydropower has the benefit of generating more local employment as the UK has the capability to manufacture them. Heat pump is another technology which is manufactured in the UK. As such, adopting their use will help the UK economy as well.

Addressing Issues: Alternative Transportation

Reduction of fuel consumption (efficiency) can also be achieved in transportation. The fuel saving measure will mainly be in the form of change in the way we drive. This can be brought about by making the public aware of the methods to run vehicle efficiently and clearing misconceptions. For instance, modern vehicles do not require 'warming up'. It is also widely believed that driving at constant speed is an efficient form of driving. This is only true while driving on a level road. Cruise controls waste fuel if the road is undulating.

Internal Combustion Engines (ICEs) are inefficient machines. Although fuel consumption is reduced by alternative modes of transportation (cycling, walking, car-share, public transportation), careful planning of their deployment is required. For instance, inappropriately placed pedestrian crossing at a busy road could cause more emissions as vehicles decelerate, idle and accelerate to allow for a single pedestrian to cross the road. There is also an increased level of emission at low gears as ICEs use more fuel to travel the same distance. A badly planned bus service will also result in inefficient use of fuel, man and machine as they travel around near empty.

Alternate means of powered transport include hydrogen fuelled, pure EV and Hybrid vehicles and are available in the market (e.g. Nissan leaf, Mitsubishi IMiEV). However they are only as green as the electricity they use. Unless the district installs renewable energy powered charging station (figure 49). The EVs will have emission through national electricity grid which currently is around 0.5kg/kWh. Hybrid vehicles such as Toyota Prius and Honda Insight are also available and give better fuel mileage.

Figure 49, Left: Hydrogen refuelling station (Honda, Swindon). Right: Solar powered EV charging station (Mitsubishi)

Developing EV charging infrastructure will not only help West Berkshire but will also help nationally in the mass deployment of EV. The government, through Office of Low Emission Vehicle, provides grants to consortium undertaking EV charging point installation in the form of match-funding. Although at first glance EV may be perceived as impractical to the district, that perception is likely to change when one considers the fact that the majority of the 154 thousand residents reside within 26% of the district, mainly in the south east of the district and that the modern EVs have as much as 100 miles per charge range.

ANNEX 2: BAYDON WIND TURBINE APPEAL DECISION

Site visit made on 31st July 2012

by T. Cookson MRTPI DipTP FRGS

An Inspector appointed by the Secretary of State for Communities and Local Government
Decision date: 6 September 2012

Appeal Reference: APP/W0340/A/12/2174074
Baydon Meadow, Baydon Road, Lambourn, Berkshire, RG17 7TR

- The appeal is made under Section 78 of the Town and Country Planning Act 1990 against a refusal to grant planning permission.
- The appeal is made by Mr. Matt Partridge against the decision of West Berkshire Council.
- The application (reference: 11/01918/FUL), dated 2nd September, 2011, was refused by notice dated 22nd March, 2012.
- The development proposed is "***erection of a wind turbine up to 35 m. tip-height above existing ground level for a period of 25 years and erection of an anemometry mast of up to 35 m. height above existing ground level for a period of 18 months***".

Decision

1. In exercise of the powers transferred to me I dismiss the appeal.

Main Issue

2. From my inspection of the site and surroundings and from my consideration of all the representations I find that there are three main issues in this appeal. The first is the effect of the proposed development on the character and appearance on the landscape and surrounding countryside. The second is the effect of the proposal on the safe operation of Membury Airfield. And the third issue is if there is any identified harm caused by the development, whether or not such harm would be outweighed by the national objective of promoting renewable energy generation.

Reasoning

3. The appeal site is a field some 1.2ha. in size located between the M4 motorway to the south-west and Ermin Street linking Woodland St. Mary to Baydon to the north-east. There are hedgerows on the boundaries with the roads, whilst the other boundaries are open. The site lies within the North Wessex Downs Area of Outstanding Natural Beauty (AONB).

4. The scheme involves erecting an anemometry mast some 35m. high about 60m. into the field from Ermin Street. The mast would be replaced after 18 months with a wind turbine of the same overall height, the hub height being some 25m. above ground level. No details of the model of turbine are provided. The electricity generated would be fed into the National Grid. In Appeal Decision APP/W0340/A/12/2174074

www.planningportal.gov.uk/planninginspectorate 2 addition to the turbine there would be a small, single-storey building and an access track.

Planning Policies

5. The National Planning Policy Framework (NPPF) states that planning plays a key rôle in helping shape places to secure radical reductions in greenhouse gas emissions and supporting the delivery of renewable and low carbon energy and associated infrastructure. Paragraph 98 of the Framework recognises that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions.

6. The South East Plan (SEP) provides the adopted regional spatial strategy for the region. It currently remains part of the development plan and is a material consideration notwithstanding the Government's stated intention to abolish regional spatial strategies. Policies NRM13 and NRM14 of the SEP establish regional and sub-regional renewable energy targets and Policy NRM15 deals with the location of renewable energy. The supporting text indicates that small-scale renewable energy development should not necessarily be precluded in AONBs. It cites as an example proposals of between 1 and 4 turbines generating not more than 5MW. And Policy NRM16 details renewable energy criteria.

7. Paragraph 109 of the NPPF requires the planning system to contribute to and enhance the natural and local environment by, inter alia, protecting and enhancing valued landscapes. And paragraph 115 states that great weight should be given to conserving landscape and scenic beauty in AONBs which have the highest status of protection in relation to landscape and scenic beauty.

8. Policy C3 of the SEP gives high priority to conservation and enhancement of natural beauty in the region's AONBs, and indicates that planning decisions should have regard to their setting. The policy states that in considering proposals for development the emphasis should be on small-scale proposals that are sustainably located and designed.

9. Since the decision by the local planning authority the West Berkshire Core Strategy has been adopted. The development plan now constitutes the Core Strategy and certain specific policies. Those detailed in the decision notice have been deleted. In the Core Strategy, Area Delivery Plan Policy 5: North Wessex Downs Area of Outstanding Natural Beauty, amongst other things, recognises the AONB as a national landscape designation and states that development will conserve and enhance the local distinctiveness and the sense of place and setting, whilst preserving the strong sense of remoteness. It states also that opportunities for appropriate small-scale renewable energy schemes which use local resources will be encouraged if they can be accommodated within the landscape of the North Wessex Downs. Appeal Decision APP/W0340/A/12/2174074 www.planningportal.gov.uk/planninginspectorate 3

10. Policy CS 14 and CS 15 of the Core Strategy relate to design principles for new development, including minimising carbon dioxide emissions. And Policy CS 19 seeks to ensure that the diversity and local distinctiveness of the landscape character is conserved and enhanced.

Visual and Landscape Impact

11. The landscaping proposed on site would help screen the access track, the switchgear building and the base of the tower, although the proposed mounding would not help screen the mast and turbine to any worthwhile degree because of its low height and design.

12. Beyond 5km. owing to the size of the mast and turbine there would not be a significant adverse visual effect. The turbine would, however, be mainly visible in near views, that is, up to 1km. away, even allowing for the screening effect of areas of woodland. These near views would be obtained from points along the B4001 from the entrance to Lodge Farm in the west to Great West Wood in the east. Also, views would be obtained from the public right of way over the M4 motorway and along paths immediately north and south of the bridge, and from a footpath north-east of the site and from adjacent properties.

13. Between the more wooded downs to the south and east and the more open downland to the west and north there would be clear views of the turbine. Up to 2km. away owing to the woodland around the site, views would be more limited, although the turbine would be evident from the east. In views between 2-5km. distant there is unlikely to be a significant visual impact on views from south of the motorway. However, north of the M4 there would be a significant visual effect on the wider landscape. The turbine would be visible above the wooded skyline in a number of locations within the open downland, especially between Lambourn and the site, on rising ground north-east from
Lambourn, and from paths and roads at Bailey Hill to the north-west.

14. Altogether, I find that views of the turbine from public viewpoints in the AONB would display high sensitivity. The turbine would introduce a highly visible, vertical, alien moving structure above the wooded skyline. As such I find that it would detract markedly from the special qualities of this part of the AONB. In particular the development would have a major significant adverse impact on the more sensitive open downland. I acknowledge the visual impact of the M4, its service areas and the telecommunications mast. However, I agree with the findings of an Inspector in an earlier appeal who concluded that such impact is limited in extent and does not erode the sense of visual seclusion and remoteness of the area.

Membury Airfield

15. Membury is an unlicensed airfield and its usage is limited to a maximum of 120 flights per month, with no more than 20 a day and no flights on Sundays and Bank Holidays. It has 5 runways, two of which are tarmacadamed, the Appeal Decision APP/W0340/A/12/2174074 www.planningportal.gov.uk/planninginspectorate 4 others being grass. The local planning authority is concerned that the turbine has the potential to have a combined psychological and physical impact on pilots using the airfield, especially in poor weather conditions. This is understood to be the distraction caused to pilots by the combination of the turbine and the motorway on take-off and landing. The

Membury television and telecommunications mast adds to the potential hazards.

16. The appellant has produced a report that details the landing and take-off flight paths necessary in order to avoid existing distractions, including model aircraft flying that takes place at the airfield. It concludes that considerable distances would exist between the approach and take-off paths used by pilots operating at the airfield and the proposed turbine and that it would have a negligible impact on the likelihood of pilot distraction. I attach considerable weight to this evidence.

17. In an appeal1 into an earlier proposal for a wind turbine on this site, the Inspector found that the proposal would result in wake turbulence that could affect aircraft taking-off and landing. This conclusion was based on a turbine some 81m. high. The present scheme is for a considerably smaller turbine. Evidence produced by the appellant shows that the effect of wake turbulence of this turbine in respect of baseline turbulence would be insignificant. I find this evidence persuasive in the light of the size of the turbine and the distances involved between the turbine and the runways. Accordingly, on the question of the effect on the operation of Membury Airfield I find that the proposed scheme would not be a potential risk.

Other Matters

18. A number of representations have been made concerning the potential impact of the proposal on the local horse racing industry and general equine safety. 19. In the earlier appeal1 for the 81m. high tower the Inspector concluded that the proposed turbine would not have an unacceptable effect on the operation of nearby stables or the future of equestrian activity in the area. I have considered his reasoning and I find it to be comprehensive and sound. Taking account of his findings, the representations in this case, and the fact that it is a notably smaller turbine, I find that what is proposed here would equally not have an adverse effect on equestrian activity.

Conclusions

20. I accept that however small in scale, the scheme would result in savings in emissions. In this regard national policies are such that the landscape and visual effects of a scheme are capable of being outweighed by the environmental benefits a renewable energy scheme would bring. However, on balance, after considering the representations and assessed the details of the 1 APP/W0340/A/08/2077166 Appeal Decision APP/W0340/A/12/2174074 www.planningportal.gov.uk/planninginspectorate 5 scheme, especially its siting, I judge that the harm this scheme would cause on this part of the landscape of the AONB would be sufficiently substantial to clearly outweigh the benefits it would bring.

21. Notwithstanding that I find that the proposal is acceptable in terms of the effects on Membury Airfield and equestrian activity, I conclude that the appeal should be dismissed. In doing so I have had regard to the report: *Study of Landscape Sensitivities and Constraints to Wind Turbine Development*. It is necessary, however, to assess each proposal on its own merits, and in this case I find that the proposal is unacceptable for the reasons given. I have had regard also to all other matters raised in the

representations, but none is sufficient to outweigh the considerations I deem to be paramount.

T Cookson
INSPECTOR

ANNEX 3: RENEWABLE ENERGY PROJECTS IN SENSITIVE LOCATIONS

1. **The Charterhouse Centre *(small scale wind)***

The Charterhouse Centre sits within the Mendip Hills AONB. They have a single, small wind turbine to produce clean renewable electricity for the centre and its guests. The wind turbine harnesses the power of the wind to produce clean renewable electricity for the Centre and its guests.

Over a single year it will produce enough electricity to power four houses without polluting the environment. It reduces the centre's production of CO_2 - the main greenhouse gas - by 5.5 tonnes per year.

March 2011: Total energy generated since being switched on 16,405 kWh
Total carbon dioxide saved by not using electricity from power stations 7,054 kg

2. **Faccombe estate *(small scale wind)***

Planning permission was granted for a small wind turbine on the Faccombe estate, to the south of Newbury in 1993. The estate is located 260m above sea level and in an Area of Outstanding nation beauty (AONB). The turbine is a Vestas V39 with a 39m rotor and 35m tower and is expected to deliver 800MWh of electricity a year. The electricity produced is used on the estate and any surplus goes back to the grid and is consumed by houses within the village

3. **12m wind turbine erected within Conservation Area & World Heritage Site**

http://www.urbanandruralplanning.co.uk/sub_category.php?cat_id=4&sub_id=31

Planning permission was gained for a 12m turbine at Minions on Bodmin Moor which has now been erected. This is within a heavily designated part of the countryside but it is seen not to be obtrusive.

The owners prepared a supporting statement and acted as agent for the proposal. This included a Heritage Baseline Appraisal to help to demonstrate why the development would be suitable. Reference was made to Planning Policy Statement 22 "Renewable Energy" and the accompanying guide.

Initial concerns from the Council's Environmental Health officers were also overcome.

4. **Solar in a Conservation Area *(PV)***

System size: 3.3 kWp
Annual system electricity generation: 2805 units (kWh)
Annual income from the Feed-in Tariff: £1,215 per year
Annual electricity savings: £219 per year
Annual income from exporting electricity: £34 per year
Total benefit over 25 years: £36,675
CO_2 savings per annum: 1,403 kg

The Scilly Isles installation is an excellent domestic case study showcasing Solarcentury's new C21e solar slates on a new building within a conservation area.

In early 2011, a resident of the Scilly Isles decided to power their home with a 3.3kW array of Solarcentury's award winning C21e solar slate. This photovoltaic (PV) array covers 36m2 of roof space, blending seamlessly with the existing slates on their south facing home.

The Challenge: The new property is ideal for a solar installation, but the owners were concerned that the aesthetic of their home would be affected by micro generation. The house is located in an Area of Outstanding Natural Beauty (AONB), in a Conservation Area, next to an ancient monument, and the isles form part of the Duchy of Cornwall estate.

The Solution: It was essential to find a solar solution that was compatible with the slates already on the roof. Solarcentury's C21e slate was ideal since it fits with all conventional roof slates and can be supported by lower pitched roofs. C21e slates are straight forward and fast to install with simple components. They fit directly to the roof battens, taking the place of the conventional slates, and give a sympathetic finish in an area of aesthetic sensitivity.

5. **Shooters Bottom Farm, Chewton Mendip *(large scale wind)***

http://www.ecotricity.co.uk/our-green-energy/our-green-electricity/from-the-wind/wind-parks-gallery/shooters-bottom-somerset

Running Since: **June 2008**
Number of turbines: **1**
Rotor diameter: **70m**
Hub height: **65m**
Capacity: **2MW**
Green electricity per year: **5.26 million units**
Homes powered (equiv.): **1,269**
Tonnes of CO_2 saved p.a.: **2,265**

This is just one turbine but it will provide enough power for 3% of homes in the Mendip District. Quoted as stating "So just another nineteen then and all the homes in this part of Somerset could be powered by a clean, (endless) local power source. We're working towards that goal right now. But why on earth did it take four years to get permission for this one? Since it's been up, we've been inundated with e-mails and calls from local people – who just love it. Another classic example of the two truisms of wind energy in the UK. Local people think it's a good idea, they want to see more, but local councils stand in the way."

6. **Hughenden Manor- (*Biomass)***

Hughenden Manor is a Grade I listed building on the edge of High Wycombe. The mansion is located on top of a steep, wooded hill within the Chilterns Area of Outstanding Natural Beauty (AONB).

To satisfy planning and to sit unobtrusively within the Hughenden estate and within the AONB the new fuel store was faced with brick and flint panels, a style common to the Chilterns. The bricks used were handmade using Chilterns clay and were supplied by one of the few remaining Chilterns brick makers.

Fröling 220kW turbomat boiler , 4,500l thermal store
Rotary out feeder, Top loading

7. Goonhilly wind farm- *(wind)*

The Goonhilly Wind Farm has been a feature of the Lizard Peninsula since 1993. It has made its own quiet contribution by generating clean, renewable electricity equivalent to the usage of some 2000 homes annually. The wind farm is located in an Area of Outstanding Natural Beauty (AONB) and minimising the impact on the landscape was a key aspect of the design process

Six new wind turbines replaced the 14 old models at Goonhilly Wind Farm with the new turbines rated five times as powerful as the previous ones. In 2010 the final new wind turbine was installed and in full production, Goonhilly is forecast to power around 5,500 homes with green electricity from wind and estimated savings of over 12,000 tonnes of carbon dioxide (CO2) a year. That's the equivalent of 70,000 lorry loads of CO2, the main greenhouse gas, saved every year and will provide a carbon-free future for homes on the Lizard.

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The Goonhilly Greenpower Project has attracted strong local interest and support and a visit programme for local groups including schools, Scouts and community groups began this month to enable visitors to see the new turbines first hand and to learn more about wind energy

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