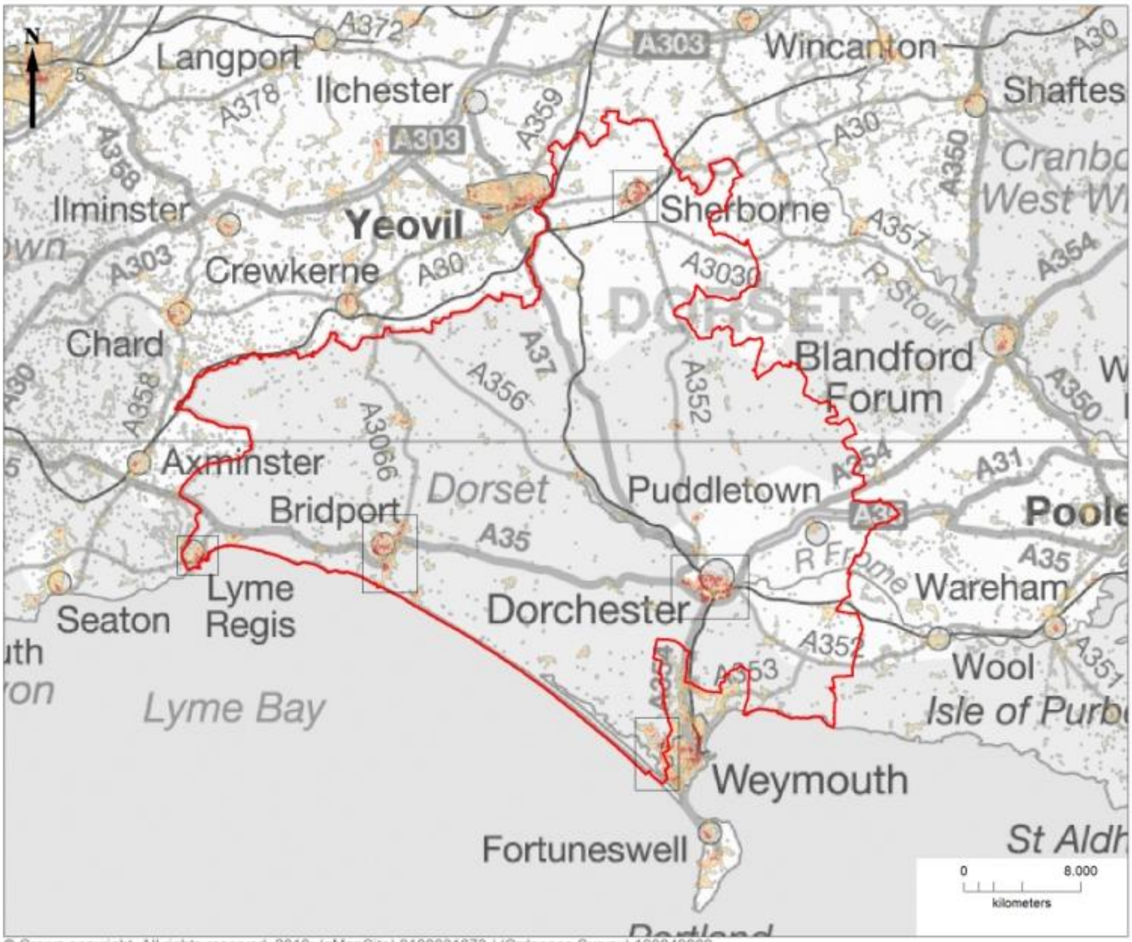
West Dorset Local Energy Plan

March 2011



Produced by Regen SW

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Abbreviations

The following abbreviations are used in this report. The links are to further information.

CRC Scheme	Carbon Reduction Commitment Energy Efficiency Scheme www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/crc/crc.aspx
DEC	Display Energy Certificate www.communities.gov.uk/publications/planningandbuilding/displayenergycertificates
DECC	Department of Energy and Climate Change www.decc.gov.uk
EU ETS	European Emissions Trading Scheme http://ec.europa.eu/clima/policies/ets/index_en.htm
GW, GWh	Gigawatt, Gigawatt hour[1]
HEED	Home Energy Efficiency Database http://www.energysavingtrust.org.uk/business/Business/Information/Homes-Energy-Efficiency-Database-HEED
kW, kWh	Kilowatt, Kilowatt hour[1]
LLSOA	Lower Level Super Output Area http://www.statistics.gov.uk/geography/beginners_guide.asp
MLSOA	Medium Level Super Output Area http://www.statistics.gov.uk/geography/beginners_guide.asp
MW, MWh	Megawatt, Megawatt hour[1]
NAEI	National Atmospheric Emissions Inventory http://www.naei.org.uk/
SAP	Standard Assessment Procedure http://www.decc.gov.uk/en/content/cms/what_we_do/consumers/saving_energy/std_assess/std_assess.aspx

[1] For an explanation of the relationship between installed capacity and energy generation, see Appendix A on capacity factors.

1 Executive summary

1.1 Targets

At present, Regen SW figures estimate that an annual total of 6.34GWh of renewable energy is produced from renewable sources in West Dorset. Whilst West Dorset does not have a target for renewable energy generation, it is committed through the West Dorset Partnership to the target of cutting carbon emissions by at least 30% from 2005 levels by 2020, a target based on the target in the Climate Change Act 2008. The West Dorset Partnership recognises that this will be delivered through local action and local support of national programmes. One of the actions in the West Dorset Climate Change Strategy is to create an appropriate planning policy framework, based on sound evidence.

Energy demand reduction and renewable energy generation will both have roles to play if the carbon target is to be achieved. If West Dorset were to try locally to replicate the national renewable energy target of 15% of energy consumed coming from renewable sources, it would need to generate between 283.5 and 353.2 GWh of renewable electricity and heat, depending on the proportion of transport energy that came from renewable sources and assuming significant reductions in heat and electricity consumption. To reach a more stretching 20% target, between 415.5 and 484.2 GWh of renewable electricity and heat would be needed.

To understand the contribution that renewable energy generation could make to meeting the 30% carbon reduction target in West Dorset would require significant further analysis and modelling. Carbon savings from renewable energy generation are dependent on the renewable energy technology mix employed and the type of fuel consumption that is replaced by renewables.

Recommendations:

1. The evidence in this Local Energy plan sets out the potential for energy savings from energy efficiency measures and renewable energy generation. It could be used in understanding the contribution that energy efficiency and renewable energy generation could make towards the district's carbon target.
2. The West Dorset Partnership and West Dorset District Council could consider setting a local renewable energy target using the information about available resources from this report.

1.2 Energy demand reduction

Analysis by the Energy Saving Trust of the 39,000 private homes in West Dorset identified that there are approximately 14,300 homes with the potential for cavity wall insulation, over 10,000 homes that could potentially have solid wall insulation, 6,550 homes with little or no loft insulation and a further 25,630 homes with the potential to top up insulation. Installing all potential private domestic cavity wall and loft measures would offer potential savings of 171GWh per year (approximately 18% of domestic energy demand). Wards with the highest numbers of empty cavities and lofts were identified; this information could be used to inform an area-based approach to the roll out of energy efficiency measures. Dorset County Council is investigating area-based approaches at present.

51 percent of total electricity consumption (250GWh) and 26 percent of gas consumption (155GWh) in West Dorset in 2008 was by non-domestic users. However, there is a lack of information available about the potential for energy efficiency in commercial sector buildings and a lack of drivers on the majority of businesses to prioritise investing in reducing their energy demand. It is highly likely that there is significant potential for demand reductions from the commercial sector to contribute towards West Dorset's carbon reduction target, but without further information about current and potential energy efficiency measures it is not possible to quantify this potential. Officers in West Dorset District Council have excellent links with businesses in their area and could use these to promote energy efficiency and renewable energy opportunities.

Energy consumption by the Council's properties equalled 0.1% of total building related (i.e. not transport) energy consumption in West Dorset in 2008. This is a very small proportion and the potential for energy savings that could have a significant impact on carbon emissions across West Dorset is therefore limited. However, West Dorset District Council can influence energy use from its own estate and has set a target of reducing carbon emissions from its own energy use by 35% from 2008/09 levels by 2014/15. West Dorset District Council plans to move to new, more energy efficient offices in 2012 which will reduce its energy demand.

Recommendations:

3. West Dorset District Council should explore opportunities for area based approaches to domestic energy efficiency measures with Dorset County Council

4. West Dorset District Council should investigate opportunities to use its links with businesses to provide them with support and information on energy demand reduction and renewable energy opportunities.

5. West Dorset District Council should continue to review and upgrade energy efficiency in its remaining properties, focussing on those with the highest energy consumption - particularly Thomas Hardy's leisure centre.

1.3 Renewable energy generation

West Dorset has considerable potential to generate renewable energy from resources from within its boundaries. Figure 1 shows a summary of the theoretical maximum renewable energy generation using West Dorset resources, and includes for comparison current renewable energy generation. The dotted lines show how much renewable energy would need to be generated to reach a 15% and 20% of energy consumption renewable target.

Figure 1: Theoretical maximum renewable energy generation potential from West Dorset resources and current renewable generation

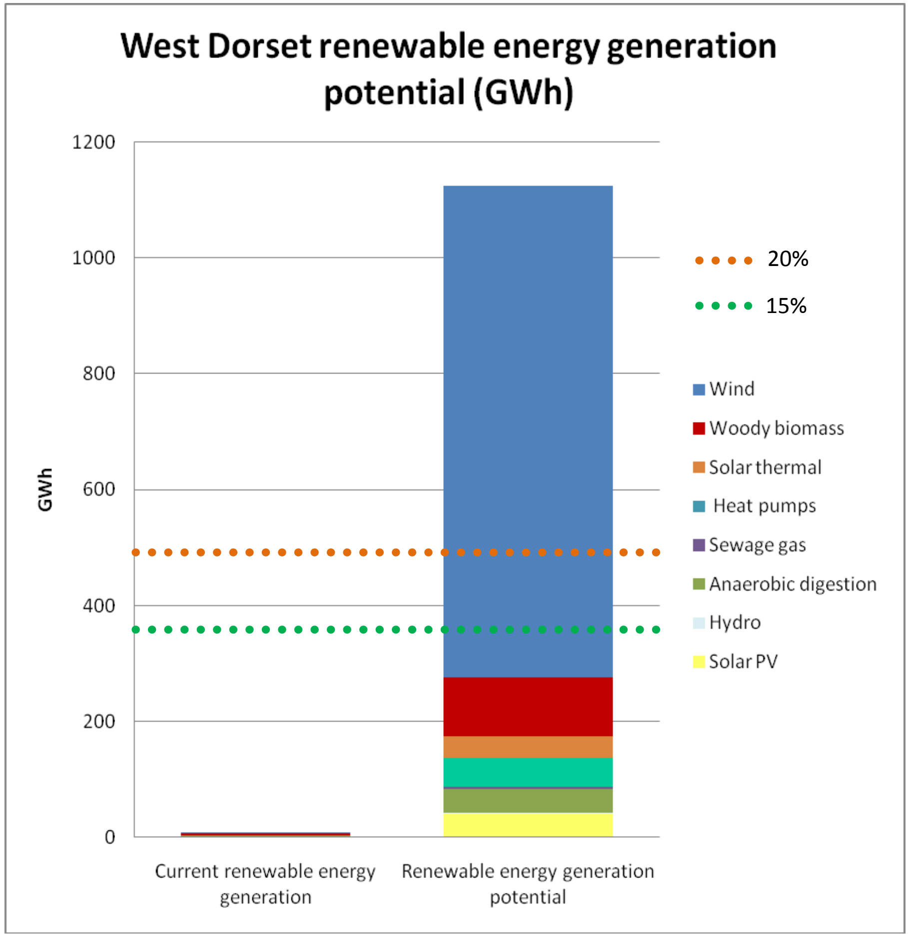


Table 1: Theoretical maximum renewable energy generation potential from West Dorset resources and current renewable generation

	Current renewable energy generation (GWh)	Renewable energy generation potential (GWh)[2]
Large wind	0.22	848.00
Woody biomass	1.89	101.76
Solar thermal	0.15	18.88
Heat pumps	0.32	49.69
Sewage gas	0.00	4.57
Wet bio-resource (AD)	3.36	39.82
Hydro	0.06	2.00
Solar PV	0.33	22.29
Total	6.34	1087.01

[2] Current renewable energy generation was calculated using the installed capacity figures gathered through Regen SW's annual survey 2010 and from the Central FIT register. The calculated figure of 6.34GWh is lower than the figure quoted from DECC in

Table 2 of 25GWh. It is unclear how DECC calculated the higher figure.

West Dorset has access to a range of renewable energy resources. The following paragraphs discuss the available resources and highlight opportunities to support uptake of those resources with significant potential to deliver renewable energy installations and carbon savings.

1.3.1 Renewable electricity resources and potential

West Dorset's wind resource is the largest renewable energy resource in the district. Achieving a 15% of energy consumption renewable target by 2020 in West Dorset would not be possible without at least 114GWh of wind energy[3]. This is equivalent to 19.3 large (2.5MW) turbines or 3771.7 small (15kW) turbines[4]. This minimum number of wind turbines is based on maximum exploitation of every other renewable electricity and heat resource, which in reality is unlikely, meaning that a greater number of wind installations would be required.

There are no large or medium scale wind turbines in the district at present. The fact that over 70% of the area is designated as an Area of Outstanding National Beauty is likely to have influenced this. West Dorset must consider whether it can meet its 30% carbon reduction target without wind energy and if not, how it can support the development of wind turbines in the right locations. Undertaking a landscape assessment for wind turbines can be a positive step forward if it is developed in consultation with wind developers and other stakeholders.

Building mounted solar PV could make a reasonable contribution towards renewable electricity generation in West Dorset. However, 16,930 solar PV panels would be needed to generate a maximum of 41.17GWh of renewable electricity[5]. This represents a large number of individual projects that would need to be installed, representing a significant capital cost. The feed-in tariff offers potential investment opportunities for PV. Opportunities for panels on West Dorset District Council owned properties have been identified and could be investigated further, alongside other renewable technologies. In addition, an assessment of commercial buildings' roofs in the district was undertaken and opportunities identified could be followed up through Economic Development officers' interactions with businesses or passed on to BusinessLinks.

Opportunities for solar parks have not been assessed as a method for identifying the extent of the potential resources is not available. In addition, solar parks offer a time-limited opportunity for deployment, due to the recently announced Feed-in Tariff fast-track review which if implemented as planned is set to slash the tariffs available to large scale projects from 1 August 2011. Any projects not "commissioned" – that is installed and generating electricity – by 1 August 2011 will receive a much lower Feed-in Tariff and as a result are

[3] If it is assumed that one 5 MW solar park is built in West Dorset and the generation is taken into account, this figure will be 109.61 GWh, equivalent to 18.5 large 2.5 MW turbines.

[4] Based on a 27% load factor for large wind and 23% capacity factor for small wind

[5] Based on 2kW domestic installations on one in every four existing homes and one in two new homes due to be built to 2020, 5kW commercial installations on 40% of commercial buildings and 10kW industrial installations on 80% of industrial buildings

unlikely to be financially viable. The minimum time to install a project once planning permission has been received is estimated as 3 months. As a result, any projects not currently in planning are unlikely to be installed. One large solar park is currently in planning in West Dorset at Crossways. If the planning application for the 5 MW solar farm site at Crossways is successful and the project goes ahead, it could generate an estimated 4.56 GWh of electricity, equivalent to the electricity consumption of approximately 930 homes in West Dorset.

West Dorset's hydropower resource is very small and opportunities to exploit it are limited. Hydropower projects are most likely to be installed where there is a local enthusiast driving the project.

1.3.2 Renewable heat resources and potential

Woody biomass has the greatest potential to contribute to renewable heat generation in West Dorset, offering a total potential of 95.4GWh of renewable heat (and 6.4GWh of renewable electricity). A large proportion of the district is off-gas; biomass boilers using locally sourced clean wood-fuel could offer a viable alternative to other fossil fuels, particularly in these areas. The Dorset Energy Group has a biomass working group that is working to promote wood-fuel supply and installations across the county.

A relatively high potential for heat pumps was estimated for West Dorset, offering up to 50GWh of renewable energy, due to the high number of properties off the gas grid. At present, Energy Saving Trust research suggests that heat pumps are only suitable for off-gas or well insulated properties on the gas grid or in new developments with high thermal ratings. Regen SW considers that the potential for heat pumps estimated here (50GWh) to be an overestimate of realistic installation levels. Installation rates for heat pumps will depend largely on how building regulations relating to low carbon buildings are implemented and whether or not the Renewable Heat Incentive is made available for heat pumps and if so at what tariff level.

Solar thermal panels could offer a reasonable contribution towards renewable heat generation in West Dorset, up to a theoretical maximum of 37.8GWh. However, solar thermal panels are one of the most expensive renewable technologies in terms of cost per kWh of energy generated and are only capable of producing a proportion of a building's heat demand (hot water). The level of deployment for solar thermal will depend largely upon whether or not the Renewable Heat Incentive is made available for solar thermal panels and if so at what tariff level. Where roof space is limited, solar thermal panels will compete with solar PV for space.

There are only limited waste resources available in West Dorset for the generation of renewable energy. Wet bio-resource in anaerobic digestion offers a small potential resource for renewable energy generation, and given current installed and planned projects in the district and surrounding area opportunities for further installations are limited. Similarly, waste as a renewable resource stream does not currently offer significant potential opportunities for renewable energy generation in West Dorset, because of existing and planned waste contracts leading to waste being processed outside West Dorset. Sewage gas represents a very small resource in West Dorset and it will be exploited only when the water company considers it to be financially viable to do so.

Potential opportunities for district heating in Bridport, Chickerell, Dorchester and Sherborne were identified and explored. If viable, these networks could be fuelled by biomass, waste or gas. West Dorset District Council could consider developing planning policies that encourage and support the development of district heating networks in these and other areas. Without policies in place, developers are less likely to consider district heating schemes.

1.3.3 Low carbon development planning policies

In new developments, deployment rates for building-integrated renewable technologies (solar PV, biomass boilers, heat pumps and solar thermal panels) as well as district heating are largely dependent on building regulations relating to energy use in new developments. There are also potentially opportunities for new developments to fund investments in standalone renewables through developers being allowed to provide a proportion of carbon savings through offsite "allowable solutions".

However, at present it seems that government intends to water down national guidance on the definition of zero-carbon and the requirements for new developments to meet higher levels of the Code for Sustainable Homes. West Dorset District Council could consider producing local planning policies on low carbon development, aimed at reducing the energy demand from new developments and increasing on and off-site renewable energy generation. However, it is not clear at present how local planning policy can be developed and implemented once the Localism Bill is passed. West Dorset District Council will be piloting the new planning system and should consider its approach to low carbon development through the pilot.

Recommendations:

6. West Dorset District Council should consider its approach to wind energy, e.g. by undertaking a landscape assessment.
7. West Dorset District Council should lead by example through considering the opportunities identified for PV on its own estate and for other renewables
8. West Dorset District Council should consider developing an approach to promoting renewables to the commercial sector, making use of the PV roofs' assessment undertaken through this Local Energy Plan
9. West Dorset District Council should consider developing planning policy to support the delivery of district heating in Bridport, Chickerell, Dorchester and Sherborne.
10. West Dorset District Council should consider its approach to low carbon development planning policies through its pilot of the new planning system.

Contents

2 Introduction

The aim of the West Dorset Local Energy Plan is to bring together spatial evidence about energy demand and generation potential to identify priorities for action and to inform spatial planning policies.

The plan sets out West Dorset's current and projected energy demand and outlines the main opportunities for demand reduction from building energy use and for renewable and low carbon energy generation. Issues and actions relating to transport are not considered within the West Dorset Local Energy Plan.

The West Dorset Local Energy Plan is principally a set of spatial datasets. These have been developed collaboratively with West Dorset District Council's planning and GIS officers and are installed on the Council's computer network so that they can be used and built on by officers in the future. West Dorset is piloting the new planning system with CLG, including neighbourhood plans. The datasets gathered in the Local Energy Plan should provide evidence to support this process. This report sets out the method for gathering and producing the spatial datasets, as well as key findings identified by analysing them.

3 Local context

West Dorset District Council (West Dorset District Council) is a signatory to the Nottingham Declaration[6] and is committed to reducing carbon emissions from the district as a whole and from its own energy use.

The West Dorset Climate Change Strategy was adopted by the West Dorset Partnership in 2009. It sets a target for a 30% reduction in total carbon emissions across the district by 2020 (relative to 2005)[7]. The strategy states that the government expects that current national programmes, supported at a local level, should achieve a 20% reduction in CO_2 emissions by 2020, relative to 2005 and that this leaves West Dorset to achieve a 10% reduction in addition. The strategy includes milestones of 4% by 2010 and 17% by 2015.

To play its part in achieving the West Dorset Partnership's target, the District Council aims to reduce carbon emissions from its own energy use by 35% from 2008/09 levels by 2014/15.

To date, renewable energy installations in West Dorset have been limited – totalling 0.96MWe and 0.90MWth of installed capacity and generating an estimated 6.34 GWh of energy per year. There is currently no district target for renewable energy delivery. Through the REvision 2010 process, county level local authorities across the south west identified and agreed 2010 targets for renewable electricity installed capacity that were in line with the needs of the sub-region and the South West as a whole. The target for Dorset as a county was agreed as 64 to 84 MW. In Regen SW's annual survey 2010, 17.89MW of renewable electricity projects were recorded in Dorset (and 5.82MW of heat), meaning that Dorset as a county fell well short of its target.

[6] By signing the Nottingham Declaration councils and their partners pledge to systematically address the causes of climate change and to prepare their community for its impacts.

[7] From 840,000 tonnes of CO_2 in 2005 to 588,000 tonnes of CO_2 in 2020

West Dorset District Council has some planning policies adopted relating to sustainable energy: Policy SU1 on energy efficiency and Design Policy J.

Design Policy J: Achieve high standards of environmental performance states:

> *The council encourages owners and developers to attain the highest practical Code for Sustainable Homes levels (or equivalent BREEAM rating) in all new development.*

Further details are available at:
http://www.dorsetforyou.com/media.jsp?mediaid=135106&filetype=pdf

Policy SU1: Energy efficiency states:

> *In pursuit of sustainable construction practices and to achieve high levels of energy efficiency, new development and associated landscaping will be designed, laid out and orientated as far as is practicable to:*
>
> *i. optimise access to sunlight and passive solar heating of buildings and the spaces between them;*
> *ii. maximise natural lighting and ventilation to buildings;*
> *iii. minimise the amount of unnecessary overshadowing;*
> *iv. iminimise heat loss in buildings through wind chill;*
> *v. avoid the creation of wind tunnels and downdraughts in built-up areas; and*
> *vi. avoid the obstruction of cold air flows or the formation of cold air pockets.*

Further details are available at:
http://www.dorsetforyou.com/media.jsp?mediaid=116050&filetype=pdf

4 Baseline energy demand and energy projections

4.1 Current consumption and energy projections

4.1.1 Method

Energy consumption data for every local authority is available from the Department for Energy and Climate Change (DECC) website. This data breaks down energy consumption by fuel type and sector (industrial & commercial, transport and domestic). It can be used to get a clearer understanding of energy consumption in the district.

The UK is signed up to meet a national target that by 2020 15% of total energy consumed (including transport) will come from renewable sources. This target is to be achieved across the whole of the UK, rather than in each individual local authority area. Due to their urban nature, cities tend to have fewer renewable energy resources and higher energy demand and will find 15% a more stretching target than rural areas with lower total energy demand and more resource potential. To achieve the target across the UK, some areas will have to make contributions of greater than 15% to offset other areas.

The Road to 2020 was developed by Regen SW to understand the impact of the UK's 15% renewable energy target in the south west. Within the Technical Appendix, the Road to 2020 estimates that overall energy demand in the south west could decrease by approximately 4% from 2005 levels by 2020, with electricity consumption potentially decreasing by 12% and heat used by 10% due to energy efficiency measures. Transport use however was predicted to rise by 10%. These assumptions have been applied to estimate total energy consumption in West Dorset in 2020.

Whilst 15% is not West Dorset's target, it is useful to understand what achieving 15% would mean in the district. In addition, figures for a more ambitious 20% target have been calculated. Potential levels of renewable energy generation needed to meet a 15% or 20% target in West Dorset were calculated, based on the 2020 energy demand projections and an estimated 3.75% or 10% renewable contribution from transport.

Key points of method	1. Analysis of carbon emissions by sector from latest DECC statistics 2. Estimate of projected energy demand based on Road to 2020 estimates 3. Estimate of potential levels of renewable energy generation needed to meet a 15% or 20% target in West Dorset
Datasets used	• Energy consumption data by local authority available from DECC: http://www.decc.gov.uk/en/content/cms/statistics/regional/total_final/total_final.aspx • Road to 2020 assumptions from Regen SW's Road to 2020 Technical Appendix

4.1.2 Findings

Table 2 summarises energy consumption in West Dorset using DECC 2008 statistics.

Table 2: West Dorset final energy consumption 2008

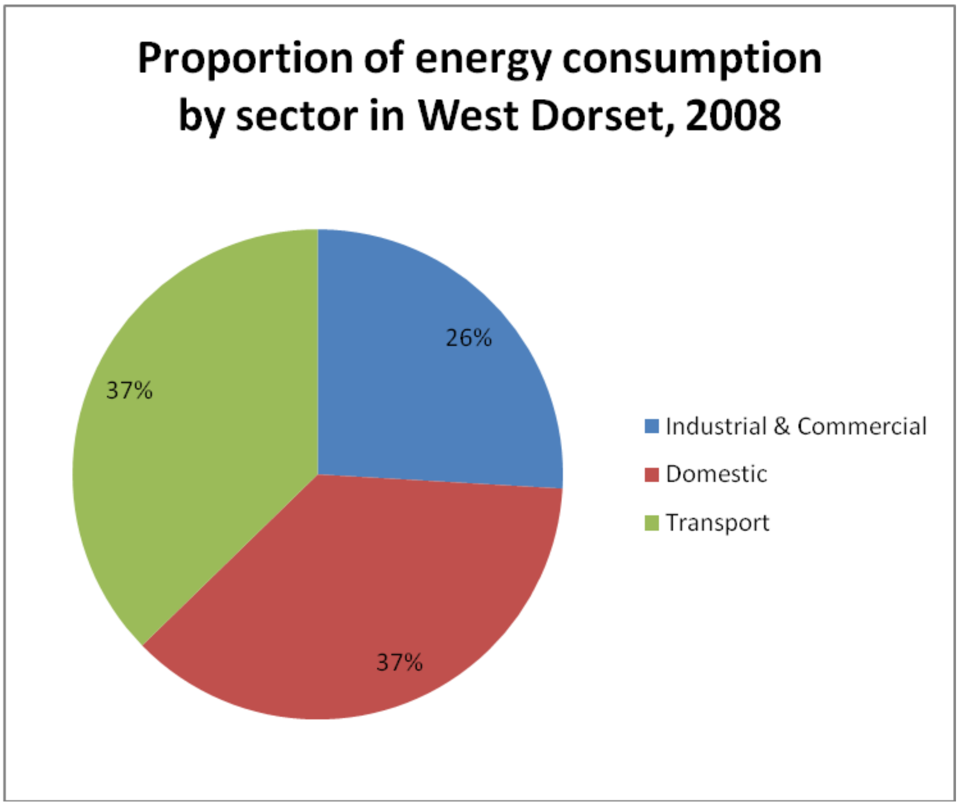
In GWh	**Industrial & Commercial**	**Domestic**	**Transport**	
Solid fuels and petroleum products	243	286	967	
Natural gas	155	429		
Electricity	250	239		
Renewables[8]	25			
Totals	672	955	967	2,594
As % of total	**Industrial & Commercial**	**Domestic**	**Transport**	
Solid fuels and petroleum products	9%	11%	37%	
Natural gas	6%	17%		
Electricity	10%	9%		
Renewables	1%			
Totals	26%	37%	37%	100%
Source DECC Publication URN: 10D/702 June 2010				

http://www.decc.gov.uk/en/content/cms/statistics/regional/total_final/total_final.aspx

Figure 2 shows the split of energy consumption by sector. Transport is the largest energy using sector in West Dorset, as might be expected in a largely rural district. The domestic sector is the next largest energy using sector, using 955 GWh of energy in 2008. A relatively high proportion of domestic energy consumption is fuelled by solid fuels and petroleum products (predominately coal and oil) compared to the national average. This is as a result of the rural nature of the district, meaning that a high proportion of properties are off the gas grid.

[8] DECC uses a different methodology to Regen SW to produce the estimates of renewable energy generation and as a result the figures are not comparable.

Figure 2: Proportion of energy consumption by sector in West Dorset, 2008



Energy consumption in West Dorset in 2020 has been estimated based on the assumptions used in Regen SW's Road to 2020. Ideally, to understand projected energy demand in West Dorset in more detail, further local analysis of potential changes is needed.

Whilst 15% is not West Dorset's target, it is useful to understand what achieving 15% would mean in the district. In addition, figures for a more ambitious 20% target have been calculated. Table 3 sets out the potential levels of renewable energy generation needed to meet a 15% or 20% target in West Dorset.

Table 3: Energy demand projections and potential 2020 renewable energy generation targets

	2005 energy demand	**Projected 2020 energy demand**	**Renewable generation needed for 15% renewables**	**Renewable generation needed for 20% renewables**
Energy (GWh)	2740	2631	395	526

These projections for 2020 are based on total energy demand and therefore include transport. This Local Energy Plan is only examining opportunities for non-transport renewable energy generation - that is renewable heat and electricity. Therefore it is useful to understand what a 2020 renewable energy target would be for electricity and heat sources, if transport renewable energy contributions are taken into account.

The Renewable Transport Fuel Obligation (RTFO) requires 5% of road transport fuel by volume to come from renewable sources by 2013. Whilst this was previously due to rise to 10% by 2020, this now seems unlikely in the face of the anti-biofuel lobby. Government is still committed to 10% of road transport use coming from renewables by 2020 but this is more likely to be in the form of electric vehicles than increased biofuels. For electric vehicles to offer a renewable solution as the government hopes, the electricity grid will need to be significantly decarbonised compared with the current levels of fossil fuel power.

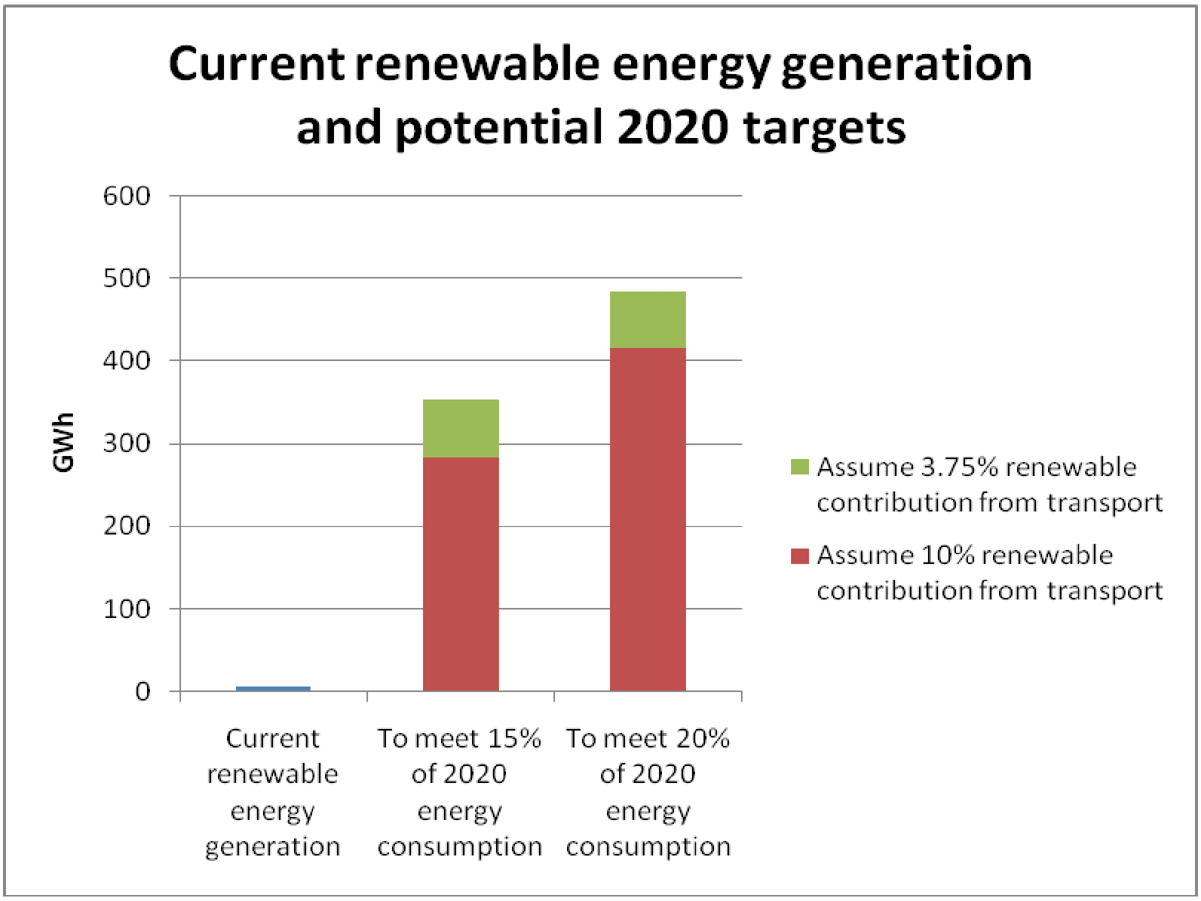
Regen SW's Road to 2020 predicted that the RTFO is likely to remain at 5% by volume to 2020, which is equivalent to 3.75% of energy use and used this to calculate the renewable contribution from transport. 3.75% is therefore used here as an estimate for the proportion of transport energy likely to come from renewable sources by 2020 in West Dorset. In addition, 10% of transport energy use from renewables has also been calculated to show the impact that this level of renewable transport energy could have.

Table 4: 2020 renewable energy heat and electricity targets once transport renewable contribution taken into account

	Assume 3.75% transport from renewable sources (GWh)	**Assume 10% transport from renewable sources (GWh)**
Renewable energy generated in 2020 by transport	41.8	111.5
Target heat and electricity generation to meet 15% if transport renewable contribution included	353.2 *(395 minus 41.8)*	283.5 *(395 minus 111.5)*
Target heat and electricity generation to meet 20% high if transport renewable contribution included	484.2 *(526 minus 41.8)*	415.5 *(526 minus 111.5)*

For West Dorset to reach a 15% of total consumption target, between 283.5 and 353.2 GWh of renewable energy would need to be generated in the district from electricity or heat installations. The level required will depend in part on the extent to which transport is fuelled from renewable sources. To reach a more stretching 20% target, between 414.5 and 484.2 GWh of renewable energy would be needed. At present, according to Regen SW estimates, renewable energy provides 6.34 GWh or 0.2% of energy used in West Dorset. Figure 3 shows these potential targets and current renewable energy generation for West Dorset.

Figure 3: Renewable energy generation - 2020 scenarios



It is worth noting that to achieve a 15% or 20% renewable energy generation target, considerable reductions in heat and electricity demand are required. The potential renewable energy generation targets are based on a 2020 energy demand projection that includes a presumed 10% reduction in heat consumption and a 12% reduction in electricity consumption on 2005 levels by 2020. As a result, significant energy demand reduction and energy efficiency measures will be required across West Dorset to ensure that these generation targets could be met without the need for even greater deployment of renewable energy technologies. Section 4 of this report discusses energy demand reduction, before section 5 moves onto the available renewable energy resources.

4.2 Domestic energy consumption analysis

4.2.1 Method

The Department for Energy and Climate Change (DECC) issues datasets on gas and electricity consumption by Medium Level Super Output Area (MLSOA) and since 2008 by Lower Level Super Output Area (LLSOA). Analysis of the MLSOA and LLSOA domestic consumption data can give a spatial indication of areas that have a lower proportion homes that connected to the gas grid and potentially also identify areas that are electrically heated.

As the datasets' names suggest, using the LLSOA data rather than MLSOA means that analysis can be performed down to smaller spatial areas. The analysis method can be used with both MLSOA and LLSOA data.

To gain an understanding of the proportion of homes that are connected to the gas grid, it is necessary to know the number of homes in each LLSOA. The number of homes by LLSOA according to 2008 council tax statistics can be downloaded from the Office of National Statistics. The number of gas meters in each LLSOA can be gained from DECC's gas consumption data and an approximate proportion of homes with gas in each LLSOA can be calculated.

It is useful also to understand the number of Economy 7 users in each LLSOA . Households using Economy 7 are more likely to be off-gas and more likely to be using electricity to some degree to provide heat to the home. The proportion of homes on Economy 7 in each LLSOA can be determined by dividing the number of Economy 7 meters by the number of dwellings in each area.

Key points of method	1. Use MLSOA or LLSOA electricity and gas datasets to calculate the proportion of gas connections per MLSOA or LLSOA 2. Use MLSOA or LLSOA electricity dataset to calculate proportion of Economy 7 users in each MLSOA or LLSOA
Datasets used	• MLSOA and LLSOA data from DECC available from www.decc.gov.uk/en/content/cms/statistics/regional/mlsoa_llsoa/mlsoa_llsoa.aspx • Number of dwellings by MLSOA and LLSOA available from www.neighbourhood.statistics.gov.uk

4.2.2 Findings

The calculations show that in West Dorset as a whole approximately 62% of homes are connected to the gas grid. 45% of the population of West Dorset live in the six towns in the district. The relatively low proportion of gas connected homes reflects the dispersed and rural nature of the majority of dwellings in the district.

Across West Dorset, 22% of homes have an Economy 7 meter. Due to the rural nature of West Dorset, this does not meant that 22% of homes are electrically heated, as other forms of heating are available in rural areas such as oil, wood or coal fires. However, it does imply that a relatively high proportion of homes in the district are using electricity for electrical heating or other non-standard uses.

Seven LLSOA areas (listed in Table 5) in West Dorset have less than 2.8% of homes with gas meters and at least 42% of homes using Economy 7.

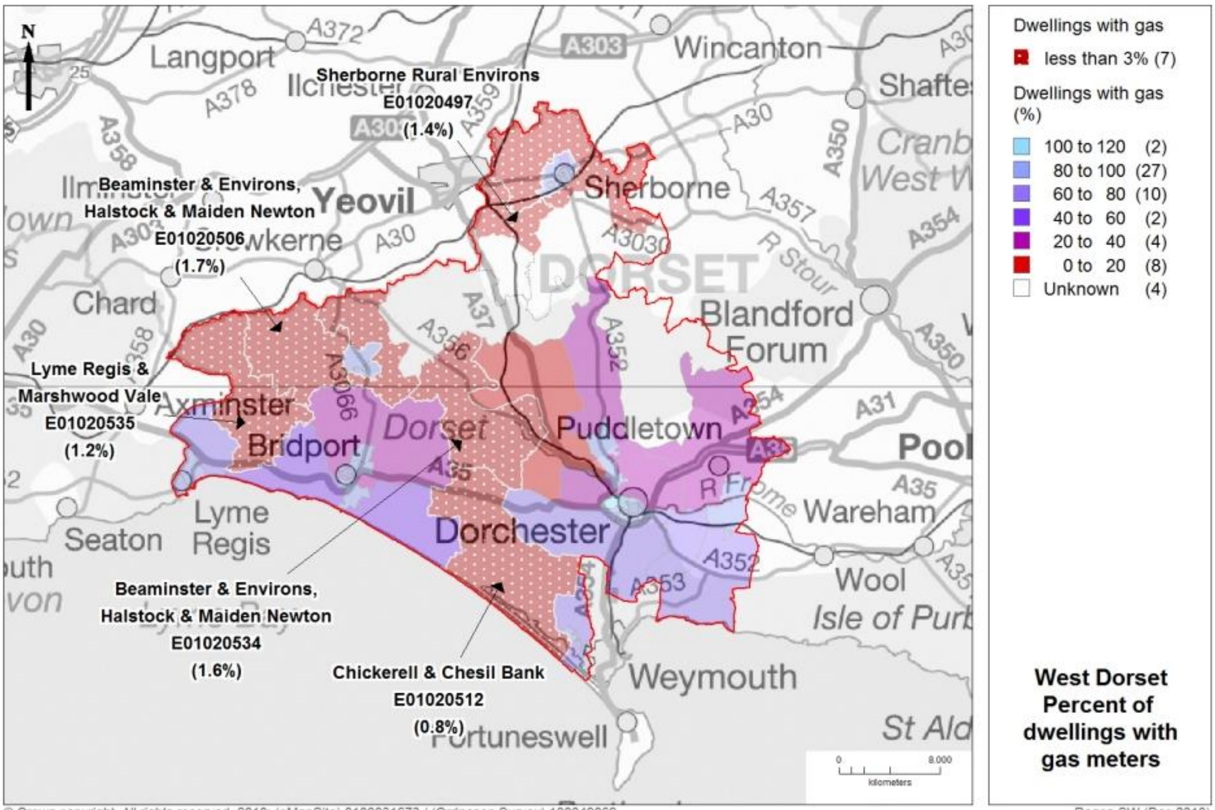
These figures are approximate only. There were 264 gas meters across West Dorset that were not allocated to a spatial area. As the location of these meters is not known, they could be attributed to any of the LLSOAs and so have an impact on the calculations. In addition, the datasets being used are proxies only for the number of homes (dwellings listed for council tax in 2008) and number of homes on gas (gas meters by LLSOA in 2008). There will be inaccuracies in the calculations as a result, for example, some properties may share a gas meter. A further four areas do not have the numbers of gas meters listed in the DECC statistics. DECC usually withholds the number of meters and associated consumption where the figures are low, as it prevents disclosure of gas consumption figures for individual properties. Therefore it can be assumed that these areas also have low proportions of homes on the gas grid.

Significant carbon reductions could be achieved by targeting households with electric, coal or oil heating for energy efficiency and demand reduction programmes and fuel use change projects such as biomass boilers. An area based approach could be used targeting those LLSOAs with the lowest proportions of gas meters and highest number of Economy 7 users in the first instance.

Table 5: LLSOAs with lowest or unknown proportions of homes with gas meters

MSOA code	LLSOA code	Number of dwellings (2008 council tax)	Percentage of homes on gas	Percentage of Economy 7 meters
Chickerell & Chesil Bank	E01020512	1069	0.8	66
Lyme Regis & Marshwood Vale	E01020535	860	1.2	48
Sherborne Rural Environs	E01020497	842	1.4	55
Beaminster & Environs, Halstock & Maiden Newton	E01020534	945	1.6	79
Beaminster & Environs, Halstock & Maiden Newton	E01020506	864	1.7	58
Sherborne Rural Environs	E01020541	927	2.3	43
Beaminster & Environs, Halstock & Maiden Newton	E01020494	539	2.8	74
Sherborne Rural Environs	E01020508	891	Unknown	24
Sherborne Rural Environs	E01020550	753	Unknown	33
Beaminster & Environs, Halstock & Maiden Newton	E01020530	875	Unknown	36
Piddle, Cerne & Frome Valleys	E01020539	956	Unknown	31

Figure 4: Percentage of dwellings with gas by LLSOA



Regen SW (Dec 2010)

4.3 Fuel poverty

4.3.1 Method

A fuel poor household is one that cannot afford to keep adequately warm at reasonable cost. The temperatures recommended by the World Health Organisation are 21ºC in the living room and 18ºC in the other occupied rooms, The definition of a fuel poor household is one that needs to spend more than 10% of its income on all fuels to heat the home to an adequate standard of warmth[9].

Fuel Poverty statistics for 2006 by Local Authority are available on DECC's website. More detailed Census Output Area statistics are available from DECC by emailing fuelpoverty@decc.gsi.gov.uk.

Key points of method	1. Map DECC fuel poverty statistics by Census Output Area
Datasets used	• Fuel poverty 2006 DECC statistics by Census Output Area, available by emailing fuelpoverty@decc.gsi.gov.uk.

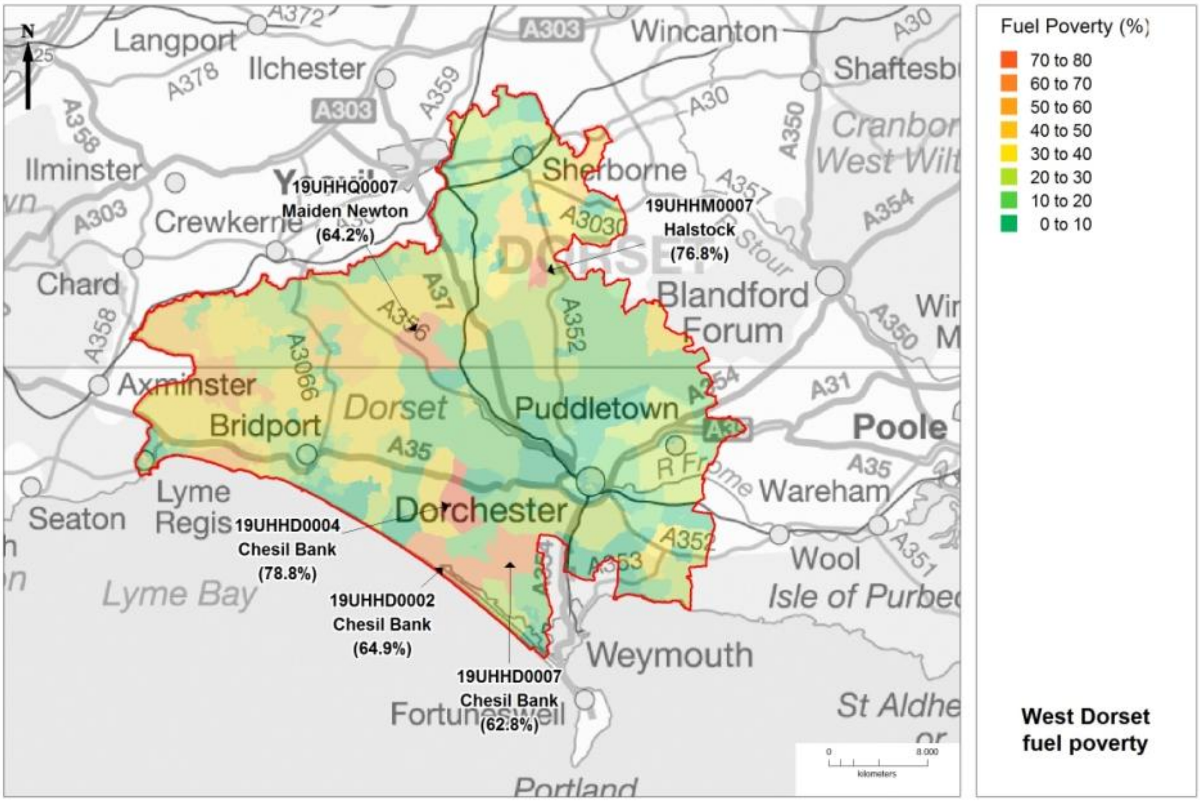
[9] Paragraph from BRE for DECC, *2006 Fuel Poverty Models*

4.3.2 Findings

In 2006 in West Dorset of an estimated 44,000 households, 6,491 were fuel poor – an average of 14.7%. The south west average is 12%.

The highest levels of fuel poverty are in census output areas in: Halstock (76.8%); Maiden Newton (64.2%); and three areas in Chesil Bank (78.8%, 64.9% & 62.8%). As might be expected, higher levels of fuel poverty are found in areas where the majority of homes are off-gas, as alternatives to gas heating tend to be more expensive.

Figure 5: Fuel poverty in West Dorset



Regen SW (Dec 2010)

5 Energy demand reduction

5.1 *Domestic energy demand reduction*

5.1.1 Method

34 percent of energy demand in West Dorset is from domestic energy use. There are significant opportunities to reduce energy use in homes in the UK by installing energy efficiency measures, as well as through behavioural change programmes.

The Energy Saving Trust performed an analysis for West Dorset of the energy efficiency of the private domestic stock. The results show for each ward the number of each type of measure that are already known to be in place and the potential for further installations of cavity wall and loft insulation.

The Energy Saving Trust used a two step process that analysed:

- The age of construction and property type of the housing stock in West Dorset at ward level.
- The areas where measures have already been installed.

The analysis used data held in the Home Energy Efficiency Database (HEED), in particular data collected through Home Energy Check (HEC) forms from householders, to construct an estimate for each ward of the number of properties by construction age and property type.

Using this baseline, the Energy Saving Trust applied English Housing Survey data to identify the likelihood that properties could benefit from particular energy efficiency measures - for example, whether or not properties in a particular category have lofts. The data was also used to establish whether or not the measure would have been installed prior to 2002. 2001 was selected as a baseline to reflect the start of the English Housing Survey, as well as the start of major installation programmes through the Energy Efficiency Commitment 1, which ran from 2002 – 2005.

The Energy Saving Trust then applied data on energy efficiency installations that have been installed since January 2002 to create a clear picture of where measures still need to be installed. This data, held in HEED, includes:

- data reported by energy suppliers through the Carbon Emissions Reduction Target (CERT) and its predecessor, the Energy Efficiency Commitment (EEC)
- Warm Front
- single measures data sets, such as the Cavity Insulation Guarantee Agency (CIGA) cavity wall insulations.

For more information on the Energy Saving Trust approach please contact, Will Rivers, Area Based Approach Support Manager on will.rivers@est.org.uk .

Key points of method	EST analysis that estimates energy efficiency measures currently installed and the potential for further installations through: 1. Analysis of property age and type for each ward 2. Model created to understand likely energy efficiency measures installed up to December 2001 3. Analysis of energy efficiency measures installed after January 2002
Datasets used	EST analysis available for local authorities from the EST. Analysis used HEED database, including: • Home Energy Checks • English Housing Survey • CERT • EEC • Warm Front • CIGA

5.1.2 Findings

5.1.2.1 Cavity wall insulation

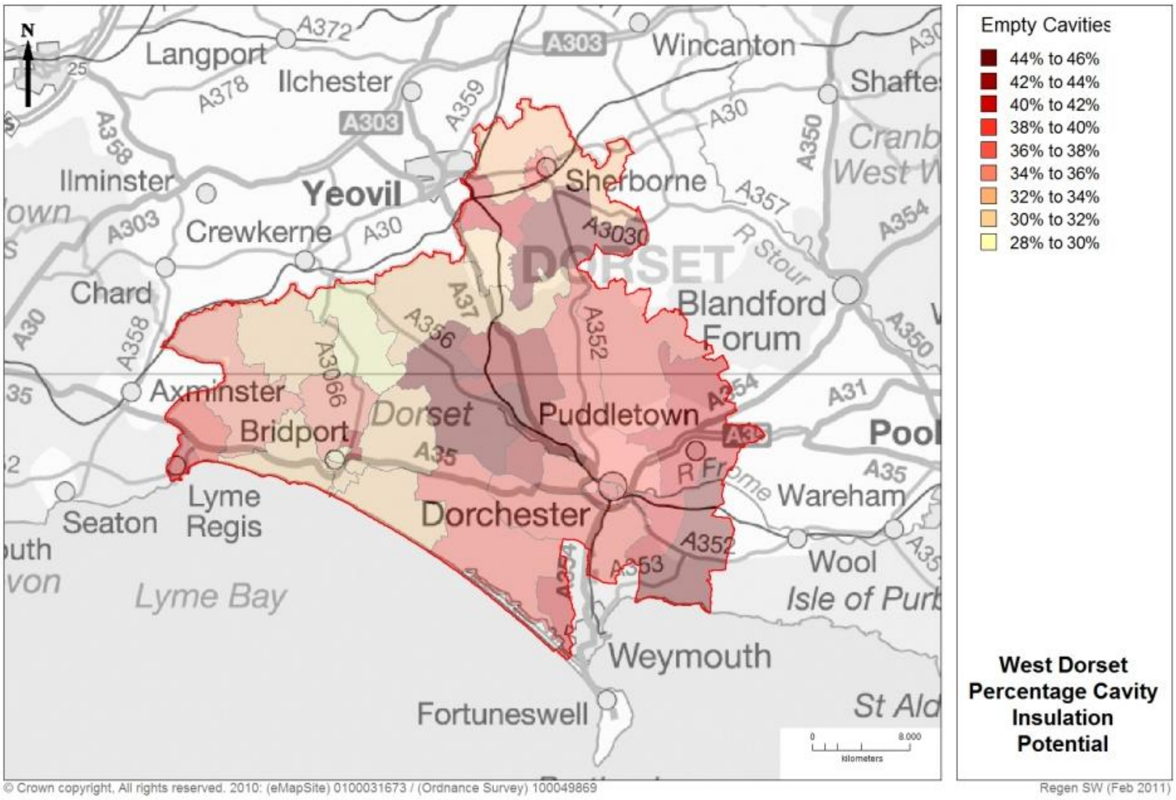
Across West Dorset, there are approximately 44,000 homes. 5,000 are social housing and 39,000 are privately owned homes. The EST analysis was only undertaken for privately owned homes. The analysis found that an estimated 26% of these have solid walls and so are not suitable for cavity wall insulation. A further 37% of homes have a cavity that has already been filled. This leaves approximately 37% or 14,300 homes with a cavity wall that could potentially be filled. However, not all of these will be suitable – for example, brick properties in very exposed sites may not be suitable for cavity wall filling.

On a ward by ward basis, the results ranged from 30% (Bridport North; Bridport South and Bothenhampton and Beaminster) to 44% (Owermoigne; Maiden Newton) of homes in need of cavity wall insulation. Ten wards had over 600 homes with potentially empty cavities, as shown in Table 6. Areas with the highest number of empty cavities could be targeted for an area based installation programme.

Table 6: Wards with over 600 homes with potentially unfilled cavities

	Number of private sector houses	Empty cavities	Empty cavities (%)
Chickerell	2,133	867	41%
Lyme Regis	1,920	806	42%
Bridport South and Bothenhampton	2,539	763	30%
Dorchester North	1,953	710	36%
Sherborne West	1,664	654	39%
Charminster and Cerne Valley	1,732	648	37%
Dorchester South	1,613	635	39%
Dorchester East	1,723	631	37%
Owermoigne	1,387	614	44%
Sherborne East	1,710	600	35%

Figure 6: Cavity wall insulation potential by ward



5.1.2.2 Loft insulation

Of the 39,000 private homes in West Dorset, approximately 4% have no loft.

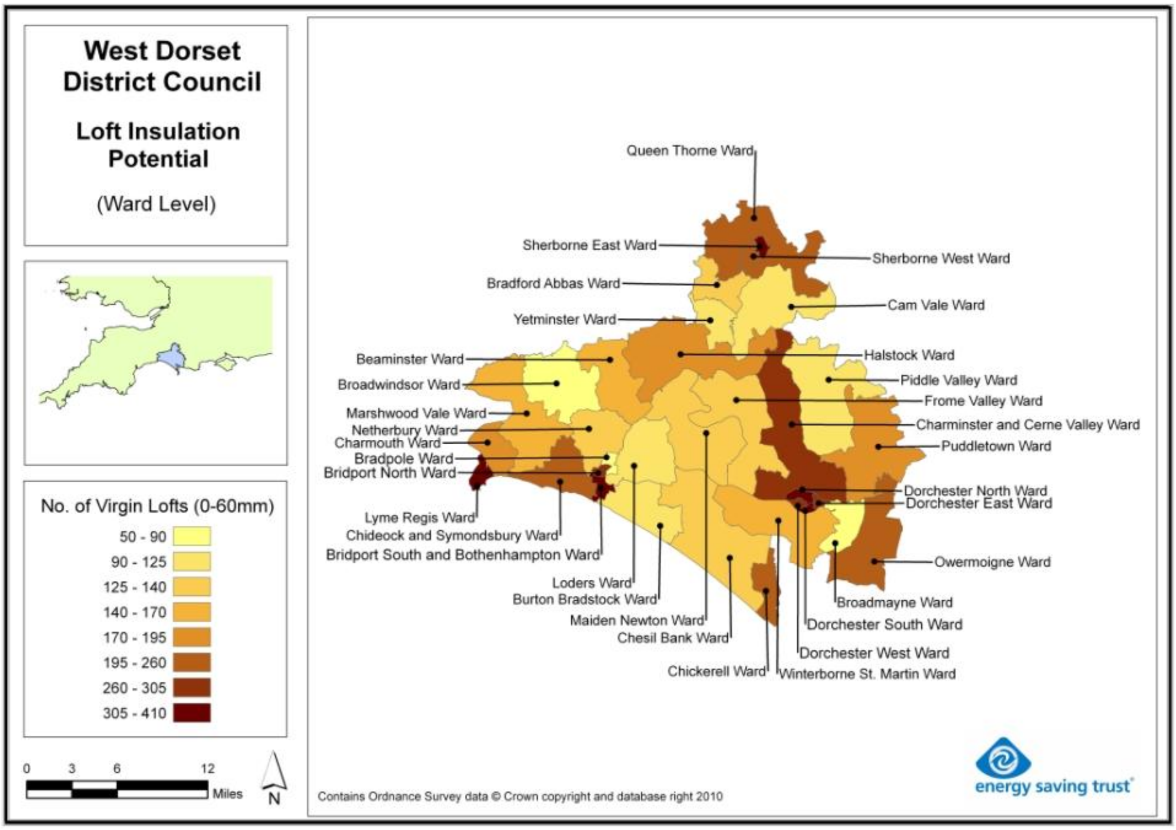
The Energy Saving Trust recommends that all homes with lofts have at least 270mm of loft insulation. In West Dorset, approximately 17% of homes have 0 to 60mm of insulation, 66% have 60 to 200mm and 14% have over 200mm. This means that there are potentially 6550 homes with lofts with very little or no insulation, 25,630 with the potential to top up their insulation and 5,360 which may need a small amount more insulation to achieve the full 270mm.

On a ward by ward basis, there are five wards with over 300 lofts with 0 to 60mm of loft insulation. These areas could be targeted for an area based approach to installation.

Figure 7: Wards with over 300 homes with little or no loft insulation

	Number of private homes with a loft	Lofts 0-60mm	Lofts 0-60mm (%)	Loft 60mm-200mm	Loft 60mm-200mm (%)	Loft >200mm	Loft >200mm (%)
Bridport South and Bothenhampton	**2,539**	407	16%	1,397	55%	416	16%
Lyme Regis	**1,920**	378	20%	1,144	60%	248	13%
Sherborne East	**1,710**	350	20%	1,138	67%	222	13%
Dorchester North	**1,953**	343	18%	1,232	63%	149	8%
Dorchester South	**1,613**	315	20%	1,040	64%	258	16%

Figure 8: Loft insulation potential by ward



5.1.2.3 Energy and carbon savings from installing insulation measures

The Energy Saving Trust's analysis estimates that all the lofts and cavities in West Dorset could be filled at a cost of £13 million. According to the model, this would save an estimated 35,331 tonnes of CO_2 and 171GWh of energy consumption per year, with average annual bill savings for householders of £198. If achieved, this would equate to a saving on domestic energy demand of 18% on 2008 consumption levels and would make a significant (4.2%

reduction on 2005 levels) contribution towards achieving West Dorset's carbon reduction target.

5.2 Social housing

5.2.1 Method

None of the social housing in West Dorset is owned or managed by West Dorset District Council. Magna Housing is the largest Registered Social Landlord in West Dorset with over 80% of the stock.

Magna housing supplied the Standard Assessment Procedure (SAP) ratings for its homes. SAP ratings represent a measure for the energy efficiency of a property. Higher SAP ratings indicate a more energy efficient property. To reduce fuel poverty and achieve carbon emission reductions, a target SAP rating of 80 for social stock is used in a number of recent studies[10].

Homes that are off the gas grid are more expensive to heat, due to the higher cost of non-gas fuels compared to gas. People living in social housing tend to be on low or supported incomes and therefore if their home is both off the gas grid and has a low SAP rating, they are likely to be classified as fuel poor – that is as spending over 10% of their income on heating their home. Heating fuel is a factor considered in the SAP process, with properties heated by coal and electric storage heaters receiving significantly lower SAP ratings than the same property heated by gas or oil, as shown by Table 7.

Table 7: Average SAP ratings depending on heating fuel[11]

	Solid wall		Insulated wall	
	Single glazed	**Double glazed**	**Single glazed**	**Double glazed**
Old gas	47	51	67	72
New gas	65	69	83	91
Storage (new)	36	41	58	68
Coal	39	44	60	69
Oil	61	66	82	92

[10] This target SAP rating for social housing is used in: Consumer Focus 2010, *Raising the SAP*, Association for the Conservation of Energy & Centre for Sustainable Energy *and* Friends of the Earth 2009, *Home Truths*, Brenda Boardman

[11] Dr Bill Wilkinson, The Energy Audit Company and David Pickles OBE, Newark & Sherwood Energy Agency, SAP targets and affordability in social housing (http://carbonactionnetwork.org.uk/downloads/root/regions/london/documents/SAP_targets_and_affordability_in_social_housing.doc)

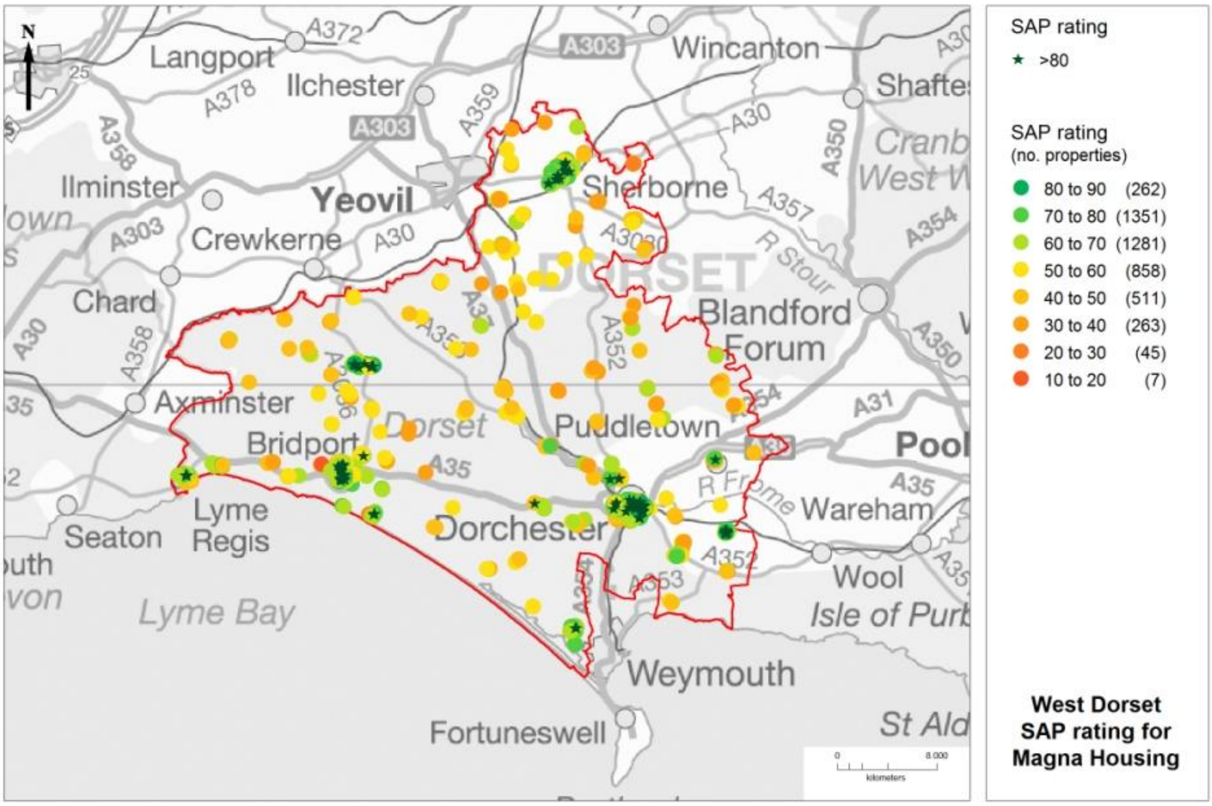
It is therefore likely that off-gas properties in West Dorset will consistently have a lower SAP rating than on-gas properties, unless a programme of energy efficiency measures has been targeted at off-gas properties. As a result, mapping the SAP ratings of social housing against areas off the gas grid enables a limited but spatial understanding of fuel poverty in West Dorset to be developed that can be used to complement the DECC fuel poverty statistics.

Key points of method	1. Determine Lower Super Output Areas with low numbers of gas connections to understand likely off grid areas (see Section 4.2 above). 2. Map social housing – using council datasets. Include locations, ownership. 3. Map what is known about energy efficiency – SAP ratings, stock analysis/energy efficiency programmes for council owned 4. Use the dataset created, alongside DECC COA data, to identify potentially fuel poor households
Datasets used	• Social housing locations from West Dorset District Council • SAP ratings from Magna • Fuel poverty by Census Output Area from DECC • LLSOA data from DECC available from: www.decc.gov.uk/en/content/cms/statistics/regional/mlsoa_llsoa/mlsoa_llsoa.aspx

5.2.2 Findings

SAP ratings were available for the 4578 houses managed by Magna Housing. The average SAP rating was 62.6 and 262 (5.7%) of Magna houses had a SAP rating of greater than 80. Figure 9 shows the location of Magna homes with their individual SAP ratings.

Figure 9: Location and SAP rating of Magna owned housing stock



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Average SAP ratings for each LLSOA across West Dorset were calculated. Nine LLSOAs had an average SAP rating of greater than 70. West Dorset 001G (Sherborne) and West Dorset 010C (Dorchester East) had the highest mean rating at 74.7.

The 12 LLSOAs with the lowest average SAP rating, of less than 50, are given below. These LLSOAs include 5 of the 7 areas which have less than 3% of dwelling on the gas grid. As discussed in Section 5.2.1, properties which are off-gas are more likely to have lower SAP ratings as fuel type is a factor in determining the rating. Whilst West Dorset does not have direct responsibility for improvements to the energy efficiency of RSL owned stock, it could use these findings to work with Magna on a programme of energy efficiency that targeted areas of housing with the lowest SAP ratings.

Table 8: LLSOAs with the lowest average SAP rating for Magna housing stock

LLSOA code	MSOA code	Average SAP rating	No. Magna houses	Percentage of dwellings with gas
West Dorset 010E	Dorchester East	43.4	40	82.20%
West Dorset 002B	Sherborne Rural Environs	44.1	46	Unknown
West Dorset 003E	Beaminster & Environs, Halstock & Maiden Newton	44.3	29	Unknown
West Dorset 005D	Lyme Regis & Marshwood Vale	44.6	40	1.20%
West Dorset 004C	Piddle, Cerne & Frome Valleys	44.6	76	17.90%
West Dorset 002C	Sherborne Rural Environs	46.1	83	2.30%
West Dorset 004A	Piddle, Cerne & Frome Valleys	47.4	34	24.50%
West Dorset 002A	Sherborne Rural Environs	48.1	50	1.40%
West Dorset 007C	Bridport Environs	48.8	24	35.30%
West Dorset 004D	Piddle, Cerne & Frome Valleys	48.9	79	Unknown
West Dorset 003A	Beaminster & Environs, Halstock & Maiden Newton	49	24	2.80%
West Dorset 012A	Chickerell & Chesil Bank	49.4	42	0.80%

5.3 Commercial buildings

5.3.1 Method

Whilst Economic Development officers at West Dorset District Council have an excellent understanding of the types and locations of businesses in the district, little data is available regarding the building energy efficiency or energy use of particular companies. Non-domestic energy consumption in 2008 included 250 GWh of electricity and 155 GWh of gas.

The South West Heat Map estimates commercial heat demand. It can be used to identify non-domestic potential high heat users (see section 7 on district heating below), and opportunities to link these users to district heat networks, as well as potential target users for energy efficiency programmes. However, the heat map data is modelled data only and so gives an indication only of high energy users. It is based on floor area and benchmarks of building uses and so does not take into account actual building fabric, any energy efficiency measures in place or any energy used in industrial processes. Access to this detailed information could be gained by contacting businesses individually.

Organisations with half hourly meters that use over 6,000MWh of electricity per year have to register for the Carbon Reduction Commitment Energy Efficiency Scheme (CRC scheme) – a government scheme to drive energy efficiency in the commercial sector. The list of organisations registered for the scheme is available from the Environment Agency.

Mapping the organisations within an area that fall into this scheme gives a good indication of high energy users in that locality. The European Emissions Trading Scheme (EU ETS) is a similar type of scheme for very high energy users. Finally, the National Atmospheric Emissions Inventory (NAEI) also gives a good proxy measure for industrial energy users as it details organisations emitting pollutants.

Key points of method	1. Look at CRC register, EU ETS, NAEI and search using postcode areas for organisations in your district 2. Map these and consider them against the renewable resources identified through other tasks
Datasets used	• CRC register: available from the Environment Agency at http://www.environment-agency.gov.uk/business/topics/pollution/117652.aspx • European Emissions Trading Scheme: available from Sandbag http://www.sandbag.org.uk/carbondata/data • National Atmospheric Emissions Inventory: available at http://www.naei.org.uk/mapping/mapping_2008/NAEIPointsSources2008_v2.xls

5.3.2 Findings

In West Dorset, to date only two organisations have registered for the full CRC scheme – Dorset County Hospital and Dorset County Council. Six further organisations are registered to declare their energy use information, but will not have to fully participate in the scheme.

Table 9: CRC participants and information declarers

Status	Company name	Location
CRC participant	Dorset County Hospital NHS Foundation Trust	DORCHESTER
CRC participant	Dorset County Council	DORCHESTER
CRC information declarer	HUNT'S FOODSERVICE LTD	SHERBORNE
CRC information declarer	F.G. PARKER & CO LIMITED	BRIDPORT

CRC information declarer	HENRY LING LIMITED	DORCHESTER
CRC information declarer	Dorset Primary Care Trust	DORCHESTER
CRC information declarer	LANGHAM INDUSTRIES LIMITED	DORCHESTER
CRC information declarer	DENHAY FARMS LIMITED	BRIDPORT

West Dorset District Council itself has relatively low energy consumption and so is not required to participate in the CRC scheme

The CRC scheme will also affect West Dorset branches of large organisations that have their head offices in other areas, e.g. national organisations such as supermarkets. It is difficult to identify CRC participants of this type that are operating in West Dorset from the dataset. In total there are 165 half-hourly meters in use in West Dorset in 2008, which metered a total of 127 GWh of electricity use in 2008[12]. DECC do not release details that would allow the owners of these meters to be identified from the dataset. This is equivalent to approximately half of all industrial and commercial electricity use in West Dorset, demonstrating that if the CRC is effective in reducing electricity demand from half-hourly metered users, it could have a significant impact on reducing non-domestic electricity demand.

There are no EU ETS registered participants or listings on the NAEI in West Dorset.

There are few drivers to reduce energy consumption for the vast majority of businesses that fall outside of the CRC and EUETS schemes. Central government assumes rational behaviour by businesses, meaning that they should seek to reduce energy consumption in order to cut their costs and invest in energy efficiency measures accordingly. However, lack of information and resources to devote to energy efficiency are likely to mean that the majority of businesses do not maximise their opportunities to reduce their energy consumption.

Business Link is working with businesses on reducing their energy consumption and has support and discount vouchers available. However, the discounts are only on 50% of the cost of a service or product and therefore match funding from the business is required for a project to go forwards.

As 51 percent of total electricity consumption and 26 percent of gas consumption in West Dorset in 2008 was by non-domestic users, actions to reduce demand from the commercial

[12] DECC (2008) MLSOA Non-Domestic Electricity Estimates
http://www.decc.gov.uk/en/content/cms/statistics/regional/mlsoa_llsoa/mlsoa_2008/mlsoa_2008.aspx

sector are likely to make a significant contribution towards meeting West Dorset's carbon reduction targets. Officers in West Dorset District Council have an excellent understanding of the opportunities and have links with businesses in their area. Opportunities for the Council to do more to support the commercial and industrial sector on this agenda could be investigated.

5.4 Council energy demand

5.4.1 Method

West Dorset District Council owns very little building stock. Its main holding is the central District Council offices that are spread over seven units in a central Dorchester location. In addition the Council owns 25 public toilets, four tourist information centres, three depots, habour masters offices, many car parks and a part share of Thomas Hardy's Leisure Centre. The energy consumption data for the Council collected for reporting on National Indicator 185 has been mapped. Display Energy Certificate ratings have not been mapped due to the small number of properties owned by the Council.

National Indicator 185 data for energy consumption from Dorset County Council owned property in West Dorset was supplied by Dorset County Council. This data is useful for the Council to use in conjunction with the heat map (see section 7 below) to identify opportunities for district heating.

Understanding the energy efficiency performance of county council owned stock in West Dorset is not necessary as the county council has responsibility for programmes to upgrade its stock and has Salix funding to undertake this. Information from the county council on energy efficiency measures has not been included in the District Council's energy plan.

Similarly, Dorset County Council is responsible for street lighting across the county. There is no benefit to West Dorset District Council to mapping energy consumption from street lighting in the district. Dorset County Council has a rolling programme to upgrade the energy efficiency of street lighting in the county.

Key points of method	1. Map NI 185 data for use in heat mapping (see below) 2. Review NI 185 data to identify high energy using buildings 3a. For authorities with more significant property holdings: i. Where a significant amount of data is known about building stock and energy efficiency measures map this with the NI 185 data. ii. Map Display Energy Certificate ratings 3b. For authorities with very small property portfolios: 1. If it hasn't already been developed, the local authority should consider developing a carbon management plan and reviewing building stock on a building by building basis for energy efficiency

	opportunities
Datasets used	• NI 185 data from West Dorset District Council • West Dorset District Council Carbon Management Plan

5.4.2 Findings

Energy consumption by West Dorset District Council property in 2008/9 equalled 1.41 GWh of electricity, 0.14 GWh natural gas and 0.05 GWh of gas oil. In total, this constitutes 0.1% of total building related (i.e. not transport) energy consumption in West Dorset in 2008. This is a very small proportion and the potential for energy savings that could have a significant impact on carbon emissions across West Dorset is therefore limited. However, West Dorset District Council has the greatest potential to influence energy use from its own estate.

The energy efficiency of the District Council's holdings (and District Council activities) has been evaluated through a Carbon Trust supported Carbon Management Plan. Some energy efficiency projects have already been carried out – such as replacing the building housing West Dorset Services; refurbishing the Bridec Depot; upgrading insulation of boiler room pipe work, loft insulation and adding solar film to south facing windows in Stratton House. There are ongoing programmes to replace old lighting units as part of maintenance programme and to upgrade car parks and public toilets with energy efficient lighting. The organisation has largely moved to thin client IT. West Dorset District Council was the first local authority in the country to achieve its 10:10 target of reducing its own estate carbon emissions by 10% by 2010.

A key planned project to reduce the energy consumption from District Council owned buildings is the relocation of the main District Council offices to new, more efficient premises. Due to this move and the very small number of buildings held by the Council, there is no benefit to mapping the energy efficiency projects planned or undertaken by West Dorset District Council on their own stock.

The highest energy use from West Dorset District Council owned buildings is from Thomas Hardy's Leisure Centre, which used over 0.34 GWh of electricity in 2008/9. Opportunities to reduce this use where possible should be explored if it continues to be part-owned by West Dorset District Council.

6 Renewable energy

6.1 *Existing renewable energy installations*

6.1.1 Method

Regen SW produces an Annual Survey of Renewable Electricity and Heat projects in South West England. In 2010, data on new installations was collected from renewables installers, the Energy Saving Trust (for projects funded under the now closed Low Carbon Buildings Programme) and local authorities. This was added to the existing Regen SW database on renewables installations that has been built up since 2004. Local authorities can request a spreadsheet of installations in their area from Regen SW. The type, size and location of projects are given (although only the first half of the postcodes for domestic projects can be distributed). This dataset was mapped for West Dorset.

The Feed in Tariff (FIT) was launched on 1 April 2010. Government has made a limited amount of the data collected by the FIT Register available via the internet at the Ofgem website. The available data is categorised by whether the project is domestic, commercial, industrial or community and the technology type, giving total numbers and the total installed capacity for each category and technology type. Locations and the sizes of individual projects are not given. It is not clear where the FIT register records public sector projects.

Key points of method	1. Data on installed projects gathered and mapped through Regen SW Annual Survey and FIT register.
Datasets used	• Dataset on installed projects available from Regen SW - • Data on new installations claiming the FIT available from Ofgem https://www.renewablesandchp.ofgem.gov.uk/Public/ReportViewer.aspx?ReportPath=/Fit/FIT%20Installations%20Statistical%20Report_ExtPriv&ReportVisibility=1&ReportCategory=9

6.1.2 Findings

6.1.2.1 Renewable electricity installations

The Regen SW 2010 Annual Survey identified 41 renewable electricity and 69 renewable heat projects in West Dorset. The largest renewable electricity project in West Dorset was the 0.48MW anaerobic digestion plant at Melbury Dairy.

The feed in tariff provides added financial incentives for installing renewable electricity and a dramatic increase in small-scale renewable energy projects in West Dorset has been noted, with 115 projects listed on the Central FIT register since the feed in tariff was introduced in

April 2010. Of these, 112 are domestic projects, with 107 of those PV panels and 5 small scale wind turbines. Other installations are one small commercial PV installation , one small community hydro scheme and one small community wind turbine.

The installed renewable electricity capacity identified through the Regen SW 2010 Annual Survey and the Central FIT register totals 0.964MW.

6.1.2.2 Renewable heat

In West Dorset, the Regen SW annual survey 2010 identified a total of 68 renewable heat projects, with the vast majority of these (43) solar thermal installations. In addition, there were 13 biomass projects across the district, with three of these in public sector buildings, including a 70kW biomass boiler in Kingston Maurward College. Installed capacity of renewable heat identified by the Regen SW annual survey 2010 totalled 0.898MW.

The Renewable Heat Incentive is due to come into operation from June 2011 and is expected to cause a rise in the number of renewable heat installations. However, the tariff levels are as yet unknown.

6.1.2.3 Current generation

It is estimated that the current installed capacity in West Dorset could generate 6.34 GWh of renewable energy. Appendix A gives details of the capacity factors used to calculate the renewable energy generated by the current installed capacity.

Table 10: Renewable electricity installations in West Dorset from Regen SW annual survey 2010 and FIT register

Tech	Domestic		Commercial		Community		Public sector		Total	
	Projects	Installed capacity (MW)	Projects	Installed capacity (MW)	Projects	Installed capacity (MW)	Projects	Installed capacity (MW)	Projects	Installed capacity (MW)
AD	-	-	1	0.480	-	-	-	-	1	0.480
Hydro	-	-	-	-	2	0.013	-	-	2	0.013
PV	122	0.333	2	0.007	3	0.010	8	0.028	135	0.378
Wind	11	0.066	-	-	3	0.011	4	0.016	18	0.093
Total Installed Capacity (MW)	133	0.399	3	0.487	8	0.034	12	0.044	156	0.964

Table 11: Renewable heat installations in West Dorset from Regen SW annual survey 2010

Tech	Domestic		Commercial		Community		Public sector		Total	
	Projects	Installed capacity (MW)	Projects	Installed capacity (MW)	Projects	Installed capacity (MW)	Projects	Installed capacity (MW)	Projects	Installed capacity (MW)
ASHPs	2	0.018	-	-	-	-	1	0.023	3	0.041
GSHPs	9	0.142	-	-	-	-	-	-	9	0.142
Biomass	5	0.149	2	0.095	3	0.15	3	0.145	13	0.539
Solar thermal	40	0.170	1	0.002	2	0.0045	-	-	43	0.176
Total Installed Capacity (MW)	56	0.479	3	0.097	5	0.155	4	0.168	68	0.898

6.2 *Mapping planning applications*

6.2.1 Method

For local authorities to maintain an up to date understanding of renewable energy in their area, it is important that they record renewable energy planning applications. There is no guidance at present for local authorities on how to do this. One simple method would be for planning officers to flag up to a central person any planning application involving renewable energy installations. This should include both stand alone renewable energy and new developments with renewable energy installations integrated into the development. These can then be collated in a database, with progress recorded as the application progresses through the planning system. A GIS layer recording renewable energy planning applications can be mapped and made available to all planning officers, assisting with judging cumulative impact and helping officers to share learning on particular issues that arise in assessing renewable energy applications.

DECC collects information on large renewable energy planning applications through the Renewable Energy Planning Database (REPD). Collecting this information at a local authority level should improve the accuracy of this database.

Key points of method	1. Data on planned projects gathered by West Dorset District Council planning officers and mapped by GIS officer
Datasets used	• Data on planned projects from planning applications

6.2.2 Findings

West Dorset's recent renewable energy planning applications were collected in a spreadsheet and mapped in West Dorset District Council's GIS system.

The majority of renewable energy projects approved in 2010 or awaiting decisions in West Dorset are solar PV projects that require planning permission because they are non-domestic buildings, in a conservation area or on a listed building. In addition, one small wind turbine (24 meters) and one micro-wind turbine were approved, as well as a biomass boiler and solar thermal panels.

In addition, there are two larger scale projects in planning/ approved in West Dorset:

- A decision is pending on an 1.4MW anaerobic digestion plant at Poundbury, which could power around 3,000 homes and businesses.
- A 0.7MW anaerobic digestion plant at Piddlehinton was approved by Dorset County Council in March 2009 and is due to be built next year.

6.3 *Wind resource*

6.3.1 Method

Regen SW was funded by DECC to produce an updated wind energy resource assessment for the south west. Wardell Armstrong were commissioned to undertake the assessment.

This assessment applied a number of spatial criteria to the available wind energy resource to produce an estimate of the available resource across the south west. The assessment can be broken down spatially to local authority areas or further to 1 km squares. The large-scale assessment has been modelled using a 2.5MW turbine.

The criteria applied by the DECC funded wind energy resource assessment excluded areas with:

- Wind speeds of less than 5m/s at 45m above ground level – in reality a minimum of 6m/s at hub height is required for large turbines, with smaller turbines requiring higher wind speeds
- Roads (motorway, primary, A and B) with 150m buffer, railways with 150m buffer, rivers with 50m buffer, other waterways with smaller buffers depending on their size, airports with a 5km exclusion zone. These buffers are for analysing total resource only and should not be applied to individual sites, where circumstances might mean a smaller buffer is appropriate.
- Sites of historic interest (Scheduled Monuments, Listed Buildings, Registered Historic battlefields, Registered Parks and Gardens, World Heritage Sites)
- Settlements including a 600m buffer. Settlements do not include individual properties outside of built up areas or smaller villages.
- Environmental designations including SPAs, SACs, NNRs, SSSIs and Ramsars. Again this exclusion is the purposes of broad brush resource assessment only and in some cases a wind turbine could be sited within a designated site.
- Landscape designations including National Parks, Areas of Outstanding Natural Beauty and Heritage Coasts. Again, this exclusion is only for the assessment of the resource for large-scale wind turbines and should not be applied to individual applications. In particular, smaller wind turbines may be appropriate in certain areas of designated landscapes.

In addition, to these nationally proscribed criteria, Regen SW's resource assessment also applied a 600m buffer to every individual residential address point. This buffer was applied to allow for potential noise impacts from the turbines on individual properties. However, in assessing wind turbine applications local knowledge should be applied; turbines can be placed closer than 600m to homes where there are higher levels of background noise or if the property owner is in favour of the scheme. Also, some residential address points identified by the data may be unoccupied or commercial buildings and so the buffer would not be relevant.

There are other factors reducing the potential number of developable sites including:

- MoD and civil radar
- Visual impact outside of landscape designations
- Setting - proximity to scheduled monuments and listed buildings
- Access (for turbine blades to reach the site)
- Grid connection
- Effects of shadow flicker on local receptors
- Cumulative impact

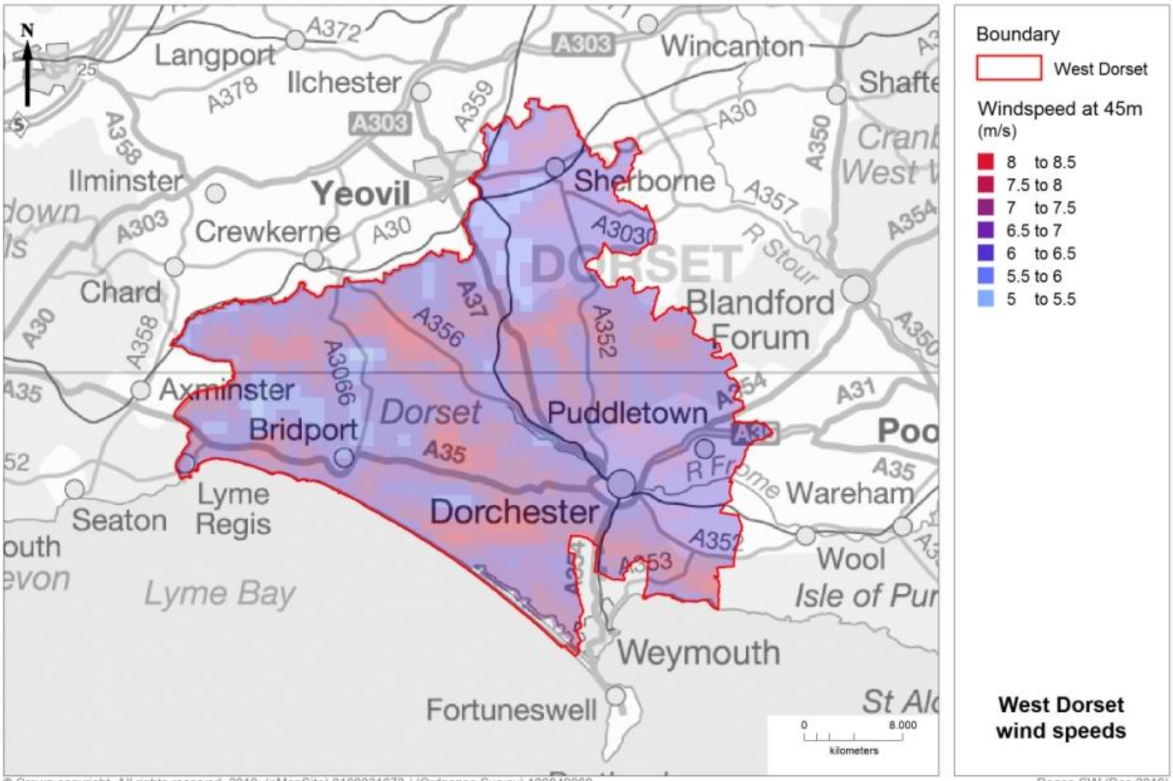
The West Dorset dataset was extracted from the south west assessment and the resource assessment data layers have been installed on West Dorset District Council's GIS system.

Key points of method	1. Local analysis of south west wind resource assessment which applied constraints to identify potential areas for large wind deployment
Datasets used	Wind resource assessment available from Regen SW. Wind resource assessment built on these datasets: • NOABL wind speeds. Available here: http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/explained/wind/windsp_databas/windsp_databas.aspx • Ordnance Survey Strategi • Environmental and landscape constraints available from Multi-Agency Geographic Information for the Countryside – www.magic.gov.uk • Ordnance Survey Address Point

6.3.2 Findings

Figure 10 shows average wind speeds in West Dorset at 45m above ground level on a 1km grid square basis. It can be seen that there are relatively high average wind speeds across West Dorset, particularly in hilly areas. Large turbines in current use need speeds of at least 6m/s on average. However, the assessment included all areas with speeds over 5m/s as in the future the technology may become more efficient and able to operate at lower wind speeds.

Figure 10: Average wind speeds at 45m above ground level



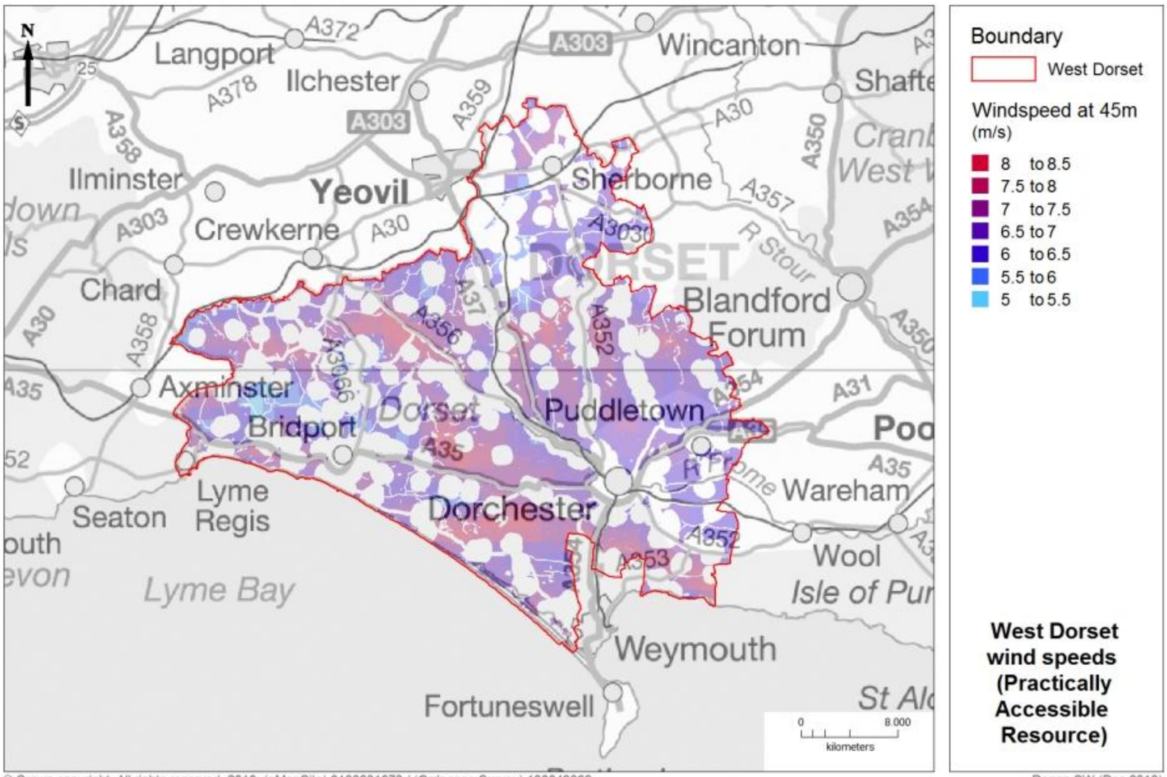
Regen SW (Dec 2010)

Figure 11 shows the wind resource in West Dorset with the following constraints removed:

- Settlements, roads and rivers with a buffer around them
- areas with wind speed less than 5m/s at 45m
- Environmental designations – SPAs, SACs, NNRs, SSSIs and Ramsars

Areas that are red have the highest wind speeds.

Figure 11: Potential wind resource with some constraints applied



Regen SW (Dec 2010)

GIS maps of the areas with potential for wind power once further constraints have been applied have been uploaded to West Dorset District Council's GIS for internal use but are not reproduced in this document.

In West Dorset, 71% of the total land area is designated as an Area of Outstanding Natural Beauty. Therefore, applying the AONB exclusion criteria to the wind resource assessment reduces the number of potential areas for large-scale wind development by almost 75%. Whilst applications for large-scale (2.5MW) turbines are unlikely to come forward for sites in the AONB, smaller turbines may be appropriate in some locations with the AONB and should not be ruled out.

An additional 600m buffer was been applied to individual residential buildings. The areas that have potential once this criteria has been applied are those where applications for large scale wind turbines are most likely to come forward. Applications may be submitted in other areas that have been excluded from the resource assessment by one of the criteria. These applications should not be ruled out by planning policy. For example, sites may be identified that are closer than 600m to homes, where there are higher levels of background noise or where the property owner is in favour of the scheme.

The large-scale resource assessment found that West Dorset could have 143 turbines, constituting 358 MW of installed capacity. This would generate an estimated 848 GWh/yr and save 455KT Carbon/yr.

The resource assessment does not allow for issues relating to:

- MoD and civil radar
- Visual impact outside of landscape designations
- Setting - proximity to scheduled monuments and listed buildings
- Effects of shadow flicker on local receptors
- Cumulative impact

These issues need to be considered on a site by site basis through the planning process and so were not included in the resource assessment.

In addition, developers will need to consider access for turbine blades reaching the site. These blades are very long and as a result cannot be transported along some winding roads. The developer will also make a decision about the proximity of a site to the grid connection; this is a decision based on the economic viability of the project. More profitable projects can afford to be a greater distance from the grid as the cost of connection will be recouped.

As a result of these additional factors, in reality West Dorset is highly unlikely to be able to accommodate 143 large wind turbines. However, it is useful to understand that this is the theoretical maximum number that could be deployed under present conditions. If planning guidance changed and, for example, large wind turbines were deemed appropriate in designated areas this “theoretical maximum” could increase.

In addition to large scale wind, there are significant opportunities for medium and small scale wind across West Dorset. Larger scale turbines have a disproportionately larger generating potential than smaller turbines, but smaller turbines can be deployed in areas where large turbines may be deemed to be unacceptable. In particular, smaller turbines could be more readily accommodated in some locations within the AONB. West Dorset District Council plan to build on the constraints layers provided by Regen SW to undertake a resource assessment for other scales of turbine in order to understand their potential.

6.4 Hydropower potential

6.4.1 Method

The Environment Agency has undertaken an assessment of the hydropower resource in England and Wales: Opportunity and environmental sensitivity mapping for hydropower in England and Wales (2010).

Regen SW has obtained the data produced by the Environment Agency for the south west of England. Assessment of this data has shown some significant anomalies with the resource known to local experts. For rural districts in Dorset, Regen SW has commissioned Keith Wheaton-Green, a local hydro expert, to assess the data against his existing knowledge and to review any opportunities identified by the Environment Agency that he was not aware of.

As a result, an improved dataset for the hydropower opportunities for rural authorities in Dorset exists. Authorities outside of rural Dorset, but within the south west, can obtain the

Environment Agency’s data from Regen SW and use local knowledge to assess its validity in their area. Key points to consider in assessing a potential site are:

- Is the head 0.9 m or greater?
- Is the mean flow 35 litres a second or greater?
- Is 10% of the mean flow seen for 75% of the year or more?
- Is the “hands of flow” required by the Environment Agency not so great as to make the scheme unviable?
- Is there a site owner or community interest group who would take an interest in the site, make a financial investment and be the beneficiary?
- Will a fish pass be required?
- Is a grid connection possible and does the capacity of the local grid limit the size of the scheme?
- Does the investment required give an adequate return?

Key points of method	1. Map hydro opportunities identified by Environment Agency dataset 2. Assess against local knowledge
Datasets used	• Environment Agency hydro dataset for south west, available from Regen SW

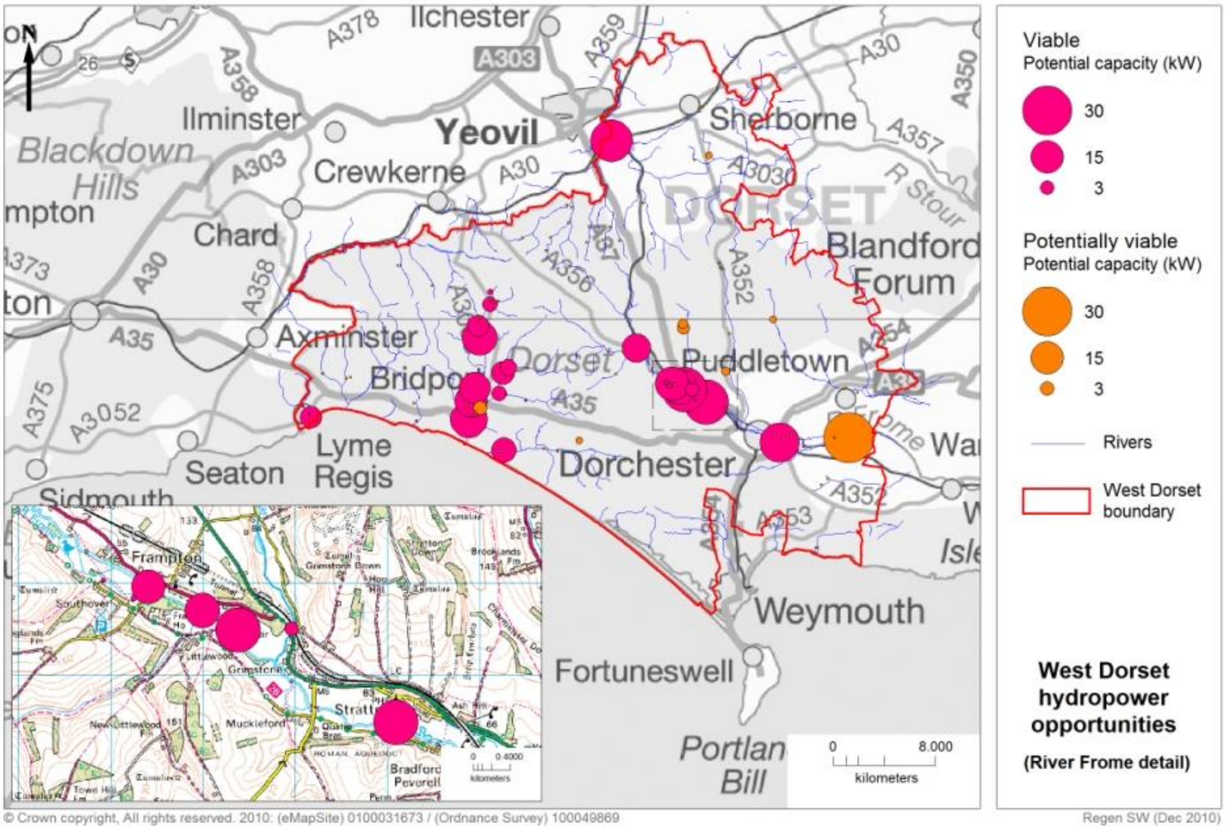
6.4.2 Findings

To date, West Dorset has been less thoroughly investigated for hydropower potential than for example, neighbouring North Dorset.

The Environment Agency’s data identified 124 potential sites in West Dorset. Local analysis identified a further 19 potential sites. Many of the sites detailed have not had head or flow measured, although in most cases the flow can be estimated by comparison with known sites in the same catchment.

Further initial investigation of the sites using local knowledge showed that 41 sites were potentially viable. These sites have an estimated total potential installed capacity of 457 kW. If a capacity factor of 50% is assumed, these sites could generate up to 2 GWh/year, which is equivalent to the electricity consumed by 407 households. Figure 12 shows the location of the potential sites, with zoomed detail on the sites on the River Frome.

Figure 12: Hydro opportunities in West Dorset, including detail of River Frome



6.5 Solar potential

6.5.1 Solar microgeneration potential

6.5.1.1 Method

DECC funded Regen SW to produce an analysis of the potential for microgeneration in the south west, in accordance with the methodology developed by SQW[13]. Regen SW commissioned AEA Technology to produce the microgeneration assessment for the south west, with an estimate of the solar (PV and solar thermal) and heat pump potential produced for every ward.

This analysis makes coarse assumptions about the number of roofs within an area that are suitable for solar thermal or PV technologies. As the data is based on theoretical assumptions, it only gives an indication of the total theoretical maximum potential for microgeneration deployment.

The following tables give the assumptions applied in the microgeneration assessment:

[13] SQW (2010) *Renewable & Low-Carbon Energy Capacity Methodology for the English Regions*, funded by DECC

Table 12: Assumptions applied in solar assessment

Type of property	System size	Percentage of properties suitable for solar PV or solar thermal
Domestic	2kW	25% of all properties including flats
Commercial	5kW	40% of all properties or solar PV, 0 for solar thermal
Industrial	10kW	80% of the stock

Key points of method	1. Local analysis of south west microgeneration assessment which used assumptions to identify potential scale of solar potential in south west
Datasets used	Microgeneration assessment dataset is available from Regen SW. Microgeneration assessment built on these datasets: • ONS 2008 Household Spaces and Accommodation Type • VAO statistics

6.5.1.2 Findings

The data is useful for understanding the maximum potential contribution of microgeneration technologies. For solar, a total installed capacity of 47 MW of PV (43.1 MW solar thermal) could be achieved by 2020 in West Dorset, if one in every four domestic properties and 40% of commercial and 80% of industrial properties installed solar panels, along with 50% of new houses built between now and 2020. This is equivalent to 16,930 solar PV or 16,150 solar thermal installations. Using a capacity factor of 0.1, a total of 41.17 GWh of electricity or 37.76 GWh of heat could be generated if this maximum potential were realised.

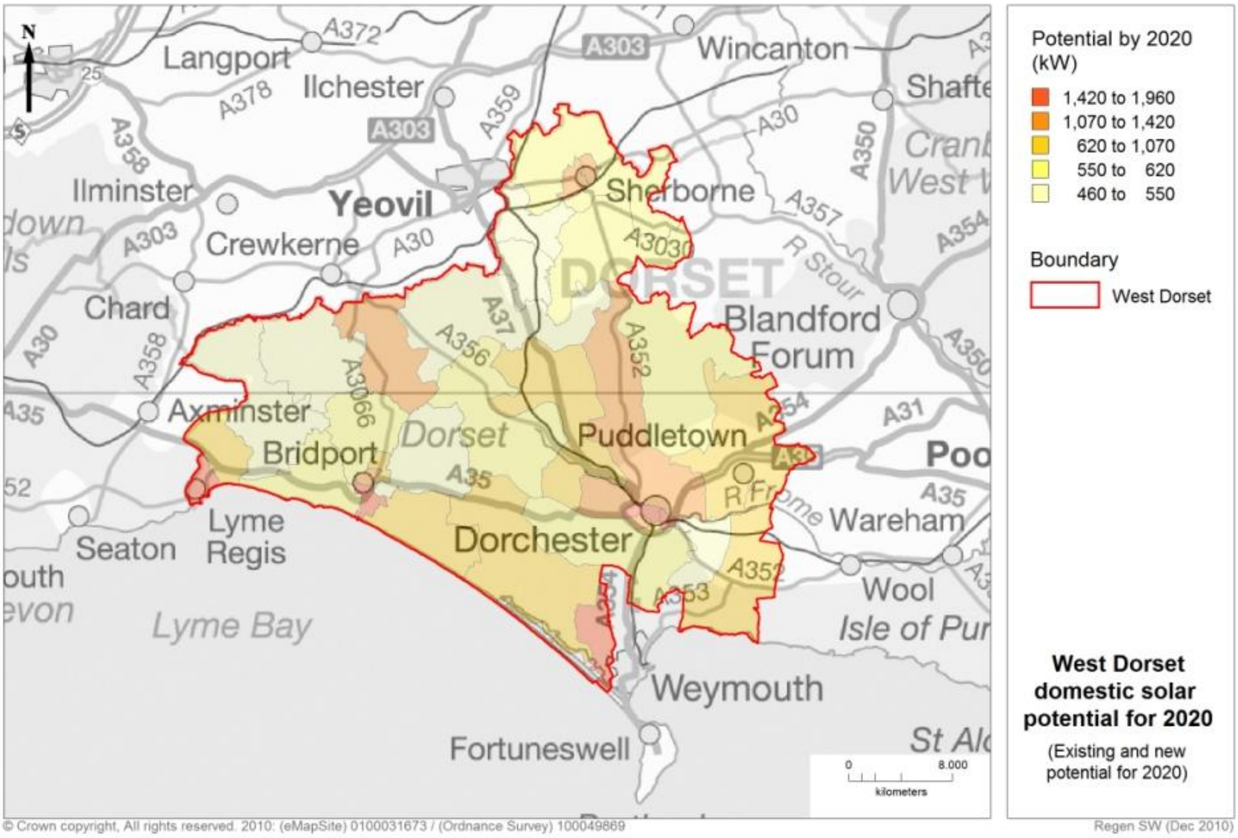
If it is assumed that 50% of domestic and industrial panels installed are solar PV and 50% are solar thermal and 100% of commercial panels are solar PV, then a maximum of 18.88 GWh of renewable heat would be generated from solar thermal panels and 22.29 GWh of renewable electricity would be generated from solar PV panels.

Table 13: Building mounted solar potential to 2020

	Domestic Solar Capacity		Non-Domestic Solar		Total - PV	Total - solar thermal
	Existing housing	New housing to 2020	Commercial (PV only)	Industrial		
Installed capacity (MW)	23.9	5.7	3.9	13.5	47	43.1
Number of installations	11950	2850	780	1350	16930	16150
Potential energy generation (GWh)	20.94	4.99	3.42	11.83	41.17	37.76

The potential for solar PV and solar thermal have been provided here as a single figure as the limitation used was the available roof spaces – so it is assumed that a property will have either solar PV or solar thermal panels but not both. In some cases, both solar PV and solar thermal panels may be fitted to a property with a larger roof space. Where the space is available, there is no reason not to have both technologies installed on one property.

Figure 13: Domestic solar potential to 2020



6.5.2 Solar assessment of roofs

6.5.2.1 Method

To create a more useful dataset of the potential for solar PV/solar thermal deployment, the local energy plan examined a number of roofs in West Dorset using aerial photography.

This assessment looked at the roofs of West Dorset District Council owned properties – though as noted above there are not many of these. In addition, the Valuation Office Authority data was used to map non-domestic properties in West Dorset by the size of their floor footprint. This footprint is a proxy measure for roof area – as those buildings with the largest floorspaces in the majority of cases will have the largest roof areas. The roofs of the 50 largest buildings (with a floor space of over 999m^2) were examined.

Key criteria for the assessment were:

- Roof pitch – Solar panels are best positioned at an angle of 30 to 40 degrees. Roofs with pitches steeper than 40 degrees are not suitable for panels as the panels do not capture enough energy from the sun at steeper angles. Flat roofs are often very suitable for panels as panels can be propped on frames to the right angle and direction.

- Building orientation – buildings with pitched roofs need an orientation of between south west and south east to ensure that panels can capture enough energy. Orientation of buildings with flat roofs is not an issue.

- Overshadowing – panels are less suitable for placing where roofs are overshadowed by neighbouring buildings or foliage. The efficiency of solar panels is reduced dramatically by any shading on them.

- Roof access – access to a roof for cleaning solar panels is desirable though not essential for solar panels.

- Conservation areas and listed buildings – in conservation areas and for listed buildings planning permission is required for solar panels. This does not mean that buildings in these areas or that are listed are always unsuitable for panels, but in assessing opportunities for panels it is a useful factor to note.

A rule of thumb drawn from the Centre for Sustainable Energy's work with Regen SW for Bristol City Council was then applied. This rule estimates that for a suitable roof area, 90% of the roof is likely to be productively used and that each m2 could accommodate 0.125 kWp of high efficiency PV panel. The formula applied is 0.9 x 0.125 x suitable roof area in m^2.

Key points of method	1. Map council properties 2. Use VOA data to identify commercial property with highest floor space 3. Map conservation areas and listed buildings 4. Use aerial photography (where available looking at oblique angles rather than direct overhead view) to assess the roofs for suitable pitch, orientation, access and for whether they are located in the conservation area or are a listed building. 5. Where possible measure the roof space that appears suitable for panels 6. Record findings in spreadsheet and map results 7. Use dataset to identify opportunities for council projects and to publicise to commercial sector the opportunities for solar
Datasets used	• West Dorset District Council council owned properties • VOA data • Listed buildings • Conservation areas • Aerial photography or Google Earth

6.5.2.2 Findings

The solar assessment of West Dorset District Councils roofs produced a spreadsheet of the potential opportunities. Of the 45 roofs that were assessed using aerial photography, 21 were found to be potentially capable of hosting solar panels, based on their orientation, lack of shading, and pitch. Additional information about whether the buildings were listed, in a conservation area or had access to the roof was also collected so that potential opportunities can be compared. Some potential sites were in isolated locations, which could mean that panels would be at risk of being stolen. These sites have been rated as potentially viable, but a note of their isolated location made.

A further 6 roofs were rated as uncertain opportunities, either because the quality of the aerial image was too poor, the orientation was potentially not viable and would need to be checked or overshadowing from surrounding buildings or foliage appeared to present a significant issue.

1548m^2 of roof space that is potentially capable of hosting panels was identified, with a further 374.5m^2 falling into the uncertain category. If the rule of thumb is applied that 90% of this area is useable and that 0.125kWp can be installed per m^2, an estimated 147kW of solar panels could be installed on West Dorset District Council roofs. These could generate an estimated 0.138GWh of renewable energy. A further 42kW of solar panels could potentially be installed on those roofs classified as uncertain. These opportunities would need to be assessed in more detail on a roof-by-roof basis, by visiting the sites, to determine which are viable. The spreadsheet created will be useful in determining which roofs to start investigating first.

The large-scale commercial roofs analysis has identified some potentially very large opportunities for roof mounted solar PV. Making building owners aware of the opportunity is the key issue with commercial roof projects. The spreadsheet created will be useful to identify landlords or owners with potentially viable roofs. BusinessLink could be the organisation to approach commercial building owners to raise their awareness of the opportunity.

6.5.3 Solar parks

There has been a surge in interest since the launch of the Feed-in Tariff in solar parks (large free-standing arrays of solar panels). The AEA microgeneration assessment did not take into account the potential for this application of PV technology and neither has the West Dorset Local Energy Plan. Opportunities for solar parks have not been assessed as a method for identifying the extent of the potential resources is not available.

In addition, solar parks offer a time-limited opportunity for deployment, due to the recently announced Feed-in Tariff fast-track review which if implemented as planned is set to slash the tariffs available to large scale projects from 1 August 2011. Any projects not “commissioned” – that is installed and generating electricity – by 1 August 2011 will receive a much lower Feed-in Tariff and as a result are unlikely to be financially viable. The minimum time to install a project once planning permission has been received is estimated as 3 months. As a result, any projects not currently in planning are unlikely to be installed.

One large solar park is currently in planning in West Dorset at Crossways. If the planning application for the 5 MW solar farm site at Crossways is successful and the project goes ahead, it would generate an estimated 4.56 GWh of electricity, equivalent to the electricity consumption of approximately 930 homes in West Dorset. A 5 MW solar farm will generate less energy than two well-sited 2.5MW wind turbines because solar PV has a lower capacity factor than wind. Appendix A contains more information about capacity factors and the capacity factors used to estimate generation in this report.

6.6 Heat pumps potential

Heat pumps extract heat from the ground, air or bodies of water. This technology is used for heating or cooling buildings and take up rates are mostly driven by new development and the likely technology mix chosen by developers in meeting building regulations.

Heat pumps use electricity. The carbon savings they achieve are a function of heat pump performance and the emissions factor (kg CO2 per kWh) of the electricity they use. A 2010 study by the Energy Saving Trust of 83 air and ground source heat pump installations in the UK found that 80% failed to achieve a coefficient of performance of greater than 2.6 – that is for every unit of electricity used by a pump, it gives out at least 2.6 units of heat. A coefficient of performance of at least 2.6 is required under EU rules for a heat pump to be considered as producing renewable energy. The Energy Saving Trust recommends that, with the current grid electricity emissions factor, heat pumps are only installed in well insulated domestic properties that are off the gas grid or in new developments with high thermal ratings.

If the electricity grid is decarbonised in the future, heat pumps may offer a low carbon alternative to buildings on the gas grid. However, there are considerable challenges. The widespread uptake of heat pumps will significantly raise electricity demand and potentially create a situation where space heating is increasingly competing for a resource that has more essential uses (e.g. electronics, motors and lighting). Electricity transmission infrastructure will also need to be upgraded at all voltage levels to cope with widespread decentralised generation. The extent of network upgrades needed, especially at lower voltage levels, is not yet fully understood and may be a significant constraint on deployment of heat pump technology if a significant number are installed.

Physical constraints include the availability of space around buildings for ground loop installations comprising either boreholes or trenches. Installations on existing buildings are very limited as the technology works best in highly insulated buildings with low temperature heat distribution systems. Although potentially an efficient technology, heat pumps have high capital costs and are powered by electricity which will impact running costs and emissions (where grid electricity is used). Emission savings will vary depending on type of building and the proportion of total heat demand supplied.

DECC funded Regen SW to produce an analysis of the potential for microgeneration in the south west, in accordance with the methodology developed by SQW[14]. Regen SW

[14] SQW (2010) *Renewable & Low-Carbon Energy Capacity Methodology for the English Regions*, funded by DECC

commissioned AEA Technology to produce the microgeneration assessment for the south west, with an estimate of the solar (PV and solar thermal) and heat pump potential produced for every ward in the south west. This analysis makes coarse assumptions regarding the number of buildings that are suitable for ground source or air source heat pumps. As the data is based on theoretical assumptions, it only gives an indication of the total theoretical maximum potential for heat pump deployment.

Taking into account the Energy Saving Trust's findings, Regen SW has amended the assumptions used by AEA in their calculations to exclude all existing on-gas properties and to reduce the number of off-gas properties suitable for heat pumps. Developers may choose to use heat pumps in new housing developments to meet Code for Sustainable Homes requirements and new properties should meet high thermal efficiency standards; so it was assumed (as in the AEA methodology) that 50% of new development could be suitable for a heat pump. For commercial sized heat pumps, there is a lack of evidence to support changing the 10% figure used by AEA and so that figure was also used by Regen SW. Field trials on the efficiency of large scale heat pumps are needed to determine their suitability. Table 14 below sets out the assumptions used by AEA and the additional assumptions applied by Regen SW.

Table 14: Assumptions used by AEA and Regen SW for heat pump assessment

Type of property		**Percentage of properties suitable for heat pumps: AEA assumption**	**Percentage of properties suitable for heat pumps: Regen SW assumption**
Domestic	5kW	100% of all off-grid properties 50% new build 75% of detached and semi-detached properties 50% of terraced properties 25% of flats	75% of all off-grid properties 50% new build 0% of on-gas properties
Commercial	100kW	10% of all properties	10% of all properties
Industrial	0	Assumed not applicable	Assumed not applicable

Key points of method	1. Further constraints applied to south west microgeneration assessment which used assumptions to identify potential scale of heat pump potential in south west
Datasets used	Microgeneration assessment dataset is available from Regen SW. Microgeneration assessment built on these datasets: • ONS 2008 Household Spaces and Accommodation Type • VAO statistics

Table 15: Technical potential for heat pumps

	Existing Off-grid	New 2020	Commercial	Total
Potential installed capacity (MW)	31.38	5.74	19.6	56.72
Potential number of installations	6277	1148	196	7,621
Potential energy generation (GWh) Based on 10% capacity factor	27.492	5.02	17.17	49.69

For heat pumps, a total potential installed capacity of 56.72MW through over 7,600 installations is estimated. Based on a capacity factor of 10%, heat pumps could generate 49.69 GWh of heat in West Dorset.

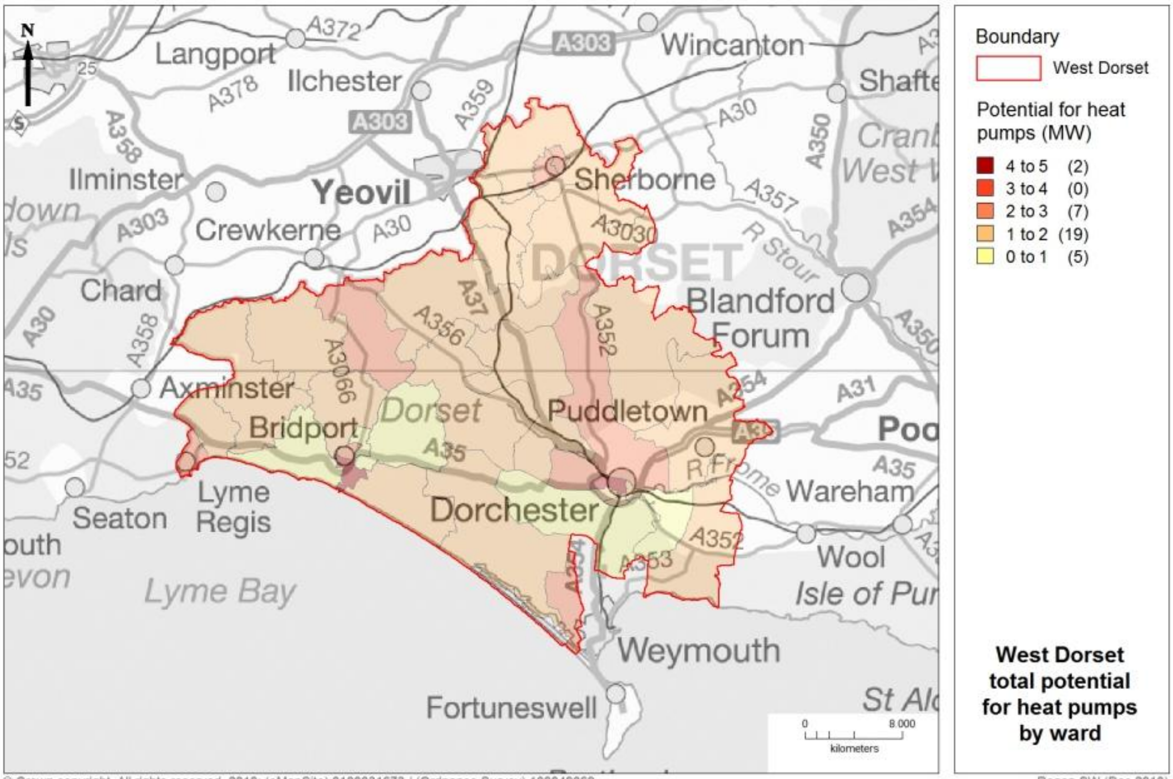
Figure 14 shows the estimated figure for each ward. Dorchester North Ward and Bridport South & Bothenhampton Ward were estimated to have the highest potentials (4.574MW and 4.186MW), due to having a combination of high numbers of off-gas properties, commercial properties and planned new housing.

It should be remembered that the figures for heat pump potential are an estimate based on assumptions about technical potential. In reality, a number of other factors are likely to affect uptake, including for example:

- Changes in the capital cost of heat pumps and the availability of financial incentives, e.g. whether the Renewable Heat Incentive is available for heat pumps and whether the tariff is at a level that encourages uptake
- Changes in users perceptions of heat pumps and the hassle factor involved in installing them (e.g. the need to install a low temperature distribution system such as underfloor heating)

- Changes to building regulations. Government policy on building regulations relating to low carbon development will determine whether there is widespread uptake of heat pumps in new developments.

Figure 14: Heat pump potential by ward



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6.7 Biomass resources

In 2009, the Environment Agency commissioned AEA to produce a south west resource assessment for biomass – *The regional potential for sustainable renewable energy: biomass in the south west*. The assessment included forestry, waste wood, organic waste within municipal, commercial and industrial waste streams and agricultural waste. To make the results more useful, Regen SW asked for the results to be broken down to local authority area to give local authorities some understanding of their biomass resource. These results are available in the report *Addendum: Disaggregated analysis of the south west biomass resource by Local Authority* and as GIS datasets for south west local authorities from Regen SW on payment of an admin fee. Details of the methodology used by AEA are given in Appendix A.

6.7.1 Forestry and clean waste wood

6.7.1.1 Method

Clean wood includes forestry, arboricultural arisings and clean waste wood, such as untreated waste from sawmills. AEA calculated the size of resource in oven dried tonnes (odt). This includes woodfuel from currently unmanaged forestry and does not allow for competing uses of the resource such as the timber industry. In reality, therefore only a proportion of the total available resource will be available for use as woodfuel.

The available clean wood resource has been assumed to be converted to wood chip and wood pellet fuel for commercial and residential biomass boilers. The assumed energy conversion is 5.3 MWh per odt with 85% boiler efficiency. Capacity has been derived using a 20% load factor.

<table>
<tr><td>Key points of method</td><td>1. Figures on oven dried tonnes of each resource stream obtained from AEA's Addendum: Disaggregated analysis of the south west biomass resource by Local Authority

2. Calculated potential energy content and installed capacity based on available resource using the following assumptions:

• energy conversion of 5.3 MWh per odt
• clean wood used in heat only boilers with 85% boiler efficiency.
• capacity derived using a 20% load factor.</td></tr>
<tr><td>Datasets used</td><td>AEA Addendum: Disaggregated analysis of the south west biomass resource by Local Authority available from Regen SW. AEA study used:

• National Inventory of Woodland and Trees from the Forestry Commission
• Forestry Commission's Woodfuel Resource Tool used in AEA's study of south west biomass resource
• Figures from WRAP's Wood Waste Market in the UK</td></tr>
</table>

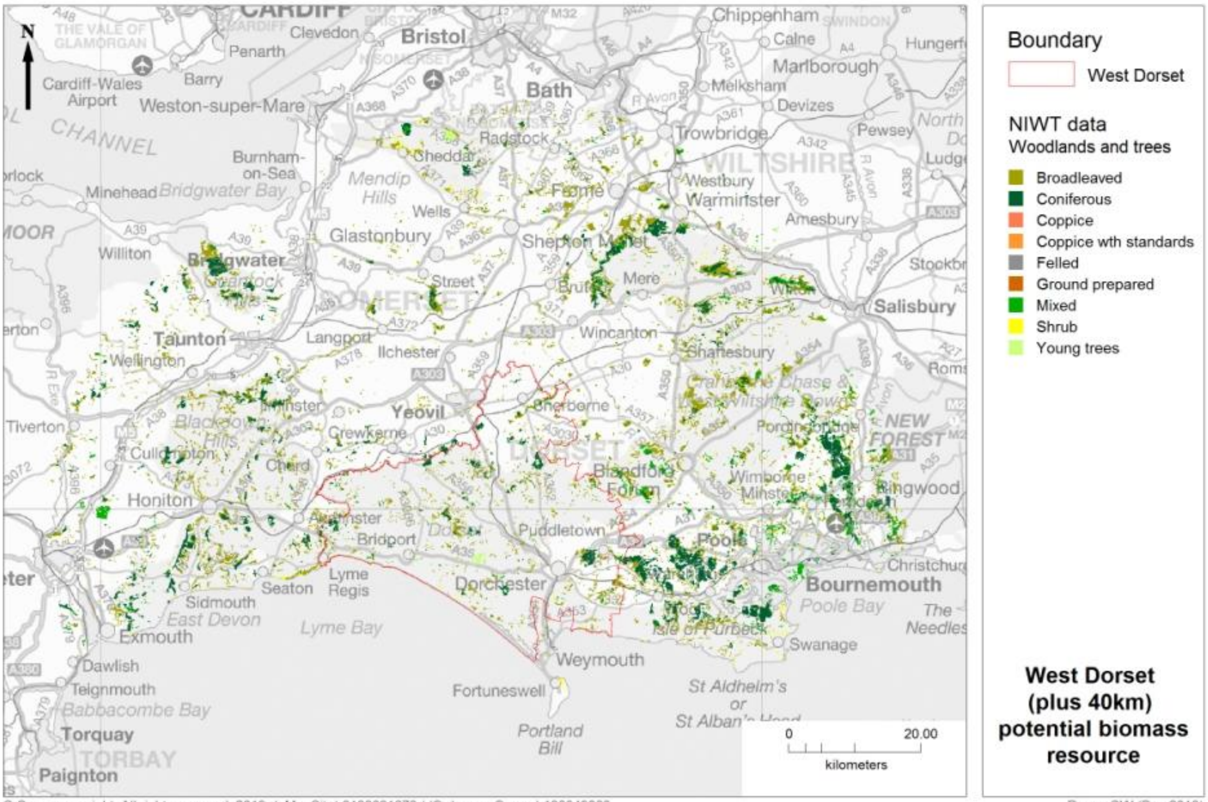
6.7.1.2 Findings

Table 16: Clean wood - West Dorset

West Dorset	Forestry	Clean Wood Waste (odt)		Total
		Arboriculture	Industry & construction	
Oven dried tonnes	15,940	650	1,730	18,320
Energy content GWh heat (based on 5.3MWh/odt and 85% boiler efficiency)	71.81	2.93	7.79	82.53
Installed capacity - 20% load factor (MW)	41	1.7	4.4	47

The AEA study estimates that a total potential of 15,940 oven dried tonnes could be extracted from woodland in West Dorset As the forestry resource estimates are for operationally available resource, they do not take into account the cost of extraction of the wood or competing uses. Therefore they tend to be an overestimate of the economically viable woodfuel resource. However, with the introduction of the Renewable Heat Incentive, the existing economic threshold to extract woodfuel may change in the future. The 2009 *Technical study –Woodfuel supply and demand in Dorset* by CSE and Crops for Energy found that across Dorset there are a large number of undermanaged woodlands, which could provide a source of woodfuel if returned to active management. Figure 15 shows the woodland and trees within 40km radius of West Dorset. 40km is often quoted as the economically viable distance for transporting woodfuel and therefore in theory West Dorset could use resources from up 40km from its boundary.

Figure 15: Woodlands and trees within 40km radius of West Dorset



Regen SW (Dec 2010)

Arboricultural activities such as tree surgery or domestic garden waste are estimated by the AEA study to generate around 650 tonnes of potential wood fuel within West Dorset. The arboricultural figures are an estimate based on the south west resource, so local knowledge will be needed to verify the results.

Clean wood waste from industrial and construction activities is estimated to produce 1,730 oven dried tonnes of potential fuel within West Dorset. This is likely to be an overestimate of the clean wood resource as it includes all construction and industrial wood waste – a large proportion of which is likely to be treated, mixed with contaminated waste or burnt on site. West Dorset could consider how to access this resource in conjunction with the other local authorities in Dorset. As an example in Bristol, the City Council is working in partnership with a not for profit organisation, Woodwise, to collect and recycle timber offcuts from local businesses, turning them into shredded wood chip fuel. This wood fuel is distributed free of charge to schools and community facilities equipped with biomass boilers.

The Biomass Energy Centre (www.biomassenergycentre.org.uk) suggest an average heat content of 5.3MWh/oven dried tonne for wood fuel. Based on this assumption and 85% boiler efficiency, a total of 82.53 GWh of useable heat could be produced from forestry, arboricultural arisings and industrial/construction waste in West Dorset. It is highly unlikely that all of this fuel would be used for energy production within West Dorset, but it is useful to understand the upper limits of the available resource.

Biomass can be used as a fuel at a range of output scales from very small domestic boilers to large, multi-MW CHP systems that feed into district heating. Small, non-domestic boilers in general have a load factor of approximately 10 to 20%. It has been assumed that clean wood will be used in small, non-domestic boilers as this tends to be the most efficient use of this resource.

If a load factor of approximately 20% is assumed, then forestry outputs, arboricultural arisings and clean wood waste within West Dorset would fuel approximately 47 MW of installed capacity. A 100kW biomass boiler might be used to heat a small school. As an indication only, if the maximum potential of woodland and arboricultural arisings was extracted and used as woodfuel, it could fuel biomass boilers in approximately 470 school-scale buildings.

6.7.2 Treated waste wood

6.7.2.1 Method

Treated waste wood includes wood from the municipal waste stream, known as municipal solid waste (MSW) and wood from demolition sites.

There are more restrictions on the use of treated waste wood, as it can only be used in Waste Incineration Directive compliant plant. WID compliant plant tends to be larger and more expensive due to the high capital costs of the equipment. As WID compliant plants tend to be larger, it can be assumed that treated waste wood will be used in Combined Heat and Power (CHP) plant or electricity only plant, rather than in large heat only plants which tend to struggle to find sufficient heat demand for their heat output.

Energy conversion was assumed at 5.3 MWh per odt with 20% electrical conversion and 2:1 heat to power ratio. Installed capacity was derived using a 90% load factor.

Key points of method	1. Treated waste wood figures obtained from AEA's *Addendum: Disaggregated analysis of the south west biomass resource by Local Authority* 2. Calculated potential energy content and installed capacity based on available resource using the following assumptions: • energy conversion of 5.3 MWh per odt. • treated wood is assumed to fuel WID compliant biomass CHP plant with 20% electrical conversion and 2:1 heat to power ratio. • Capacity is derived using a 90% load factor.
Datasets used	AEA Addendum: Disaggregated analysis of the south west biomass resource by Local Authority available from Regen SW. AEA study used: • WRAP(2009) *Wood waste market in the UK*, available from: http://www.wrap.org.uk/recycling_industry/publications/wood_waste_market.html

6.7.2.2 Findings

Estimates of treated wood waste in West Dorset were calculated by AEA from the regional resource.

Table 17: Treated wood waste - West Dorset

Treated Wood Waste (odt)			Energy content		Potential installed capacity	
Municipal solid waste	Demolition	Total	Electricity (GWh e)	Heat (GWh th)	Electricity (MW e)	Heat (MW th)
1,039	1,086	2,125	2.25	4.51	0.29	0.57

2125 oven dried tonnes of waste wood are estimated to be produced in West Dorset. The resource within West Dorset could produce 4.51 GWh of heat and 2.25 GWh of electricity, assuming it is used to fuel WID compliant biomass CHP plant. Energy conversion is assumed at 5.3 MWh per odt with 20% electrical conversion and 2:1 heat to power ratio..

If it is assumed that the maximum treated waste wood resource is extracted and used to in CHP plant with a 90% load factor, the resource from within West Dorset is estimated to be able to fuel an installed capacity of approximately 0.27MWe and 0.57MWth. Energy generation and installed capacity figures for electricity only plant would be lower due to the higher conversion losses from generating electricity.

Eco Sustainable Solutions re-submitted a planning application in 2010 for a 2.5MWe waste wood plant at their site in Parley, Christchurch. If successful, this plant will process 25,000 tonnes of waste wood that is currently exported from Dorset and according to the planning application will supply electricity for approximately 5,000 homes in the Ferndown area.

The 25,000 tonnes of fuel that the Eco Sustainable Solutions plant would consume is more than the estimated waste wood available across Bournemouth, Dorset and Poole according to AEA's study, which estimated there were just over 16,000 tonnes available from these three areas. If the plant is approved, it is therefore unlikely that further waste wood fuelled plants will be built in Dorset.

6.7.3 Wet bio-resource for anaerobic digestion

6.7.3.1 Method

Agricultural waste and organic food waste are wet bio-resources that can be used in anaerobic digestion. AEA's south west biomass resource study for the Environment Agency covered agricultural and organic (food) waste. Food waste has a higher calorific value than agricultural waste, and is often a required input to make plants economically viable.

The wet bio-resource was calculated based on cubic metres of methane per tonne of waste available for the following agricultural waste sources:

- agricultural waste from beef and dairy cattle (16 m3/t)
- pigs (19m3/t)
- poultry (48m3/t)

Methane from organic waste was calculated in cublic metres per tonnes as follows:

- domestic (86 m3/t)
- industrial (17m2/t)
- and commercial (35m3/t)

Energy conversion assumes the energy content of methane to be 9.4 kWh/m^3 and that methane is used in gas CHP engines with an electrical conversion of 40% and a heat to power ratio of 1.2:1. Potential installed capacity is derived using a 90% load factor. The AEA analysis does not include any non-food organic waste (e.g. paper) from MSW which may be available for advanced thermal treatment and legitimately regarded as renewable. The inclusion of this non food waste organic material would increase the renewable energy generation potential.

In addition, other fuels such as maize and grass sileage can also be used in anaerobic digestion. Figures for these fuels have not been calculated.

Key points of method	1. Wet bio-resource figures obtained from AEA's *Addendum: Disaggregated analysis of the south west biomass resource by Local Authority* 2. Calculated potential energy content and installed capacity based on available resource using the following assumptions: • energy content of methane 9.4 kWh/m^3 • methane used in gas CHP engines with an electrical conversion of 40% and a heat to power ratio of 1.2:1. • Potential installed capacity derived using a 90% load factor.
Datasets used	AEA Addendum: Disaggregated analysis of the south west biomass resource by Local Authority, available from Regen SW. AEA study used: • Defra Livestock Census • Defra WDF statistics • Environment Agency's Pollution Inventor

6.7.3.2 Findings

Wet bio-resource can be used as a fuel for anaerobic digestion. Table 18 shows the estimated wet bio-resource available in West Dorset. If all of this resource was used in anaerobic digestion, an estimated 18.10 GWh of electricity and 21.72 GWh of heat could be produced. If a load factor of 0.9 is assumed, an estimated 2.3MWe and 2.8MWth of anaerobic digestion installed capacity could be fuelled by the resource from within West Dorset.

There is currently one 0.48MWe anaerobic digestion plant installed in West Dorset at Melbury Dairy, with another 0.7MWe plant approved at Piddlehinton and a 1.4MWe plant to power 3,000 homes in Poundbury currently awaiting determination. If these two additional sites are built, the total installed capacity in West Dorset will be 2.58MWe, which is higher than the estimated potential of 2.3MWe. There are a number of potential reasons for this, including inaccuracies in the data on available resources, differences between the actual and assumed heat to power ratios, energy content, or plant efficiencies, as well as the fact that resources can be imported from other areas outside West Dorset and other feedstocks such as maize and sileage can be used.

Despite these potential differences, comparing planned and installed capacities for anaerobic digestion with the estimated available resource is useful because it gives a clear indication that there the potential for further large anaerobic digestion plants across West Dorset is limited and therefore anaerobic digestion does not present a major opportunity for further renewable energy generation in the district.

Table 18: Wet bio-resource - West Dorset

West Dorset	Agricultural Waste (Tonnes)				Organic Waste (Tonnes)			
	Beef	Dairy	Pigs	Poultry	MSW	Industrial	Commercial	Total
Resource (tonnes)	3,669	186,067	23,818	7,408	7,850	11,744	2,159	242,715
Methane yield m3/t wet	16	16	19	48	86	17	35	20
Methane vol m3	58,704	2,977,072	452,542	355,584	675,100	199,648	75,565	4,794,215

Total resource: Methane (m^3)	Potential energy generation		Potential installed capacity	
	Electricity (GWh)	Heat (GWh)	Electricity (MW e)	Heat (MW th)
4,794,215	18.10	21.72	2.3	2.8

6.7.4 Sewage gas

6.7.4.1 Method

The AEA analysis quantified sewage gas in the south west at 33,588,830 m3/year for the region's 5 million inhabitants, giving a figure of 6.8m^3/person/year . Sewage gas resource was allocated to West Dorset based on its population. Methane was converted to energy assuming an energy content of 9.4 kWh/m3 and use in a gas CHP engine with an electrical conversion of 40% and a heat to power ratio of 1.2:1. Potential installed capacity was derived using a 90% load factor.

Key points of method	1. Sewage gas resource figure for South West obtained from AEA's *Regional potential for sustainable renewable energy: biomass south west – Stage 1 Resource Quantification* 2. Calculated potential West Dorset resource based on 6.8m^3/person/year. 3. Calculated potential energy content and installed capacity based on available resource using the following assumptions: • energy content of methane of 9.4 kWh/m^3 • use in a gas CHP engine with an electrical conversion of 40% and a heat to power ratio of 1.2:1 • potential installed capacity derived using a 90% load factor
Datasets used	AEA's *Regional potential for sustainable renewable energy: biomass south west – Stage 1 Resource Quantification* West Dorset population figure from the UK National Statistics - http://www.statistics.gov.uk/hub/population/index.html

6.7.4.2 Findings

West Dorset has a population of 92,360, which can be estimated to produce 629,462m^3 of methane. Assumptions were applied that methane is converted to energy assuming an energy content of 9.4 kWh/m3 and use in a gas CHP engine with an electrical conversion of 40% and a heat to power ratio of 1.2:1. Based on these assumptions, 2.08GWh of electricity and 2.50GWh of heat could be produced from sewage gas in West Dorset, with an installed capacity of 0.3MWe and 0.3MWth if a 90% load factor is assumed.

Table 19: Sewage gas (for anaerobic digestion at water treatment plants)

	Population	Methane m^3	Energy generation potential		Potential installed capacity	
			Electricity GWh	Heat GWh	Electricity MW	Heat MW
West Dorset	92,360	629,462	2.08	2.50	0.3	0.3

Sewage gas is exploited by water companies where it is viable e.g. at Berry Hill Treatment works in Bournemouth and the majority of energy generated by sewage gas is used on site in the sewage treatment process. Sewage gas is not currently used to generate energy in West Dorset. It can be assumed that this is because the water company does not see it as a viable opportunity at present. This, together with the relatively low energy generation potential, means that sewage gas does not present a major renewable energy opportunity for West Dorset in the foreseeable future.

6.7.5 Energy crops

6.7.5.1 Method

To date growing energy crops such as miscanthus and short rotation coppice (SRC) or short rotation forestry (SRF) of native or exotic tree species has seen relatively low levels of uptake in Dorset. Miscanthus and SRC willow are the most common energy crops grown in the UK and have a lead in time of around four years from planning to commercial harvest. Miscanthus will reach its peak yield in year 5 and SRC will achieve its peak yield in the second rotation which is harvested in year 7[15]. Growing native species as short rotation forestry or broadleaved coppice require planting 10-20 years prior to the first commercial harvest[16].

There are a number of landscape and environmental issues relating to energy crop growing. Dorset Energy Group has produced excellent guidance for farmers on growing energy crops, which gives details of the main issues.

The AEA biomass resource assessment assumed 10% of agricultural land across the region (excluding permenant pasture) is suitable for growing energy crops. It does not provide a breakdown of energy crops by district or county. The nearest proxy breakdown for Dorset is the REvision 2010 allocation of forestry and energy crop resource which allocates 58 GWh of the south west's 792 GWh to the county (7.3%). Using a 7.3% allocation of the AEA's regional total figure gives a Dorset energy crop potential of 7,087odt/year miscanthus and

[15] CSE and Crops for Energy (2009) *Technical study –Woodfuel supply and demand in Dorset* CSE and Crops for Energy

[16] CSE and Crops for Energy (2009) *Technical study –Woodfuel supply and demand in Dorset* CSE and Crops for Energy

2,123 odt/year SRC, which is a total of 9,210 odt/year. An allocation has been made for West Dorset, based on the proportion of Dorset's land area that it covers.

It was assumed that energy crops are used in biomass CHP plant. Energy conversion is assumed at 5.3 MWh per odt with 20% electrical conversion and 2:1 heat to power ratio. Capacity is derived using a 90% load factor. The analysis does not include energy crops such as maize to fuel anaerobic digestion.

Key points of method	1. Energy crop resource figure for South West obtained from AEA's *Regional potential for sustainable renewable energy: biomass south west – Stage 1 Resource Quantification* 2. Calculated potential Dorset resource based on percentage of regional resource in line with REVision 2010 allocation 3. Calculated West Dorset resource based on proportion of total Dorset land area 4. Calculated potential energy content and installed capacity based on available resource using the following assumptions: • energy conversion of 5.3 MWh per odt • use in a gas CHP engine with 20% electrical conversion and 2:1 heat to power ratio. • potential installed capacity derived using a 90% load factor
Datasets used	AEA's *Regional potential for sustainable renewable energy: biomass south west – Stage 1 Resource Quantification* West Dorset population figure from the UK National Statistics - http://www.statistics.gov.uk/hub/population/index.html

6.7.5.2 Findings

In West Dorset, 3 hectares of short rotation coppice willow has been planted at Kingston Maurwood College. From 2011, this should yield 90 oven dried tonnes of wood fuel every three years, providing up to 0.48GWh of heat.

There is potential for other sites in West Dorset to grow energy crops. West Dorset makes up 43.5% of the land area of Dorset and so it was assumed that 43.5% of the energy crops potential for Dorset (9,210 oven dried tonnes) could be grown in West Dorset, giving an estimate of 3,920 oven dried tonnes.

Table 20 sets out the potential energy generation from energy crops based on the assumptions set out above.

Table 20: Energy crops

	Energy generation potential		**Potential installed capacity**	
	Electricity GWh	Heat GWh	Electricity MW	Heat MW
West Dorset	4.16	8.31	0.53	1.05

6.8 Waste

A portion of municipal solid waste (MSW) is organic and energy produced from this fraction of the waste stream can be classified as renewable. In addition to treated waste wood as discussed in section 6.7.2, this fraction of the waste stream includes other non-woody but organic types of MSW. MSW disposal is dealt with at county level by the Dorset Waste Partnership. West Dorset District Council has little ability to influence decisions on disposal. A planning application has been approved by Dorset County Council for an energy from waste plant to supply the Dorset Green Technology Park in Purbeck with heat. When built, this plant is likely to process 116k tonnes per year of non-hazardous waste and non-waste biomass in a 10MWe and 24MWt plant. With this plant and the other waste contracts currently in place, it is unlikely that energy from waste plants processing MSW will be built in the near future in West Dorset. There may be opportunities for private sector-led plants processing commercial waste streams.

7 Identification of key opportunities for district heating

7.1 Method

Through a DECC funded project, Regen SW commissioned the Centre for Sustainable Energy to produce the South West Heat Map – www.southwestheatmap.co.uk . The South West Heat Map models the heat demand from every property in the south west. To understand how this modelling has been undertaken in detail, read the report on the South West Heat Map.

The South West Heat Map is an address-level model of annual demand for space and water heating covering the geographical extent of the South West of England. It was created using a range of large publicly available datasets, combining information on buildings with benchmarks for estimating their heat demand. At its core is a list of the approximately 2.6 million addresses of premises in the region, with Ordnance Survey grid co-ordinates and estimated annual heat demand stored alongside each address. The model elements are therefore points in space representing the locations of individual premises, and the buildings that contain them. This is in contrast with earlier approaches to heat demand mapping where the model elements tended to be arbitrary area units on various census or grid geographies, containing hundreds to thousands of buildings each.

The South West Heat Map is a useful tool for identifying potential opportunities for district heat networks. By definition heat distribution has to be organised spatially, and there are a number of spatial factors which influence strongly the viability of opportunities for (and benefits from) district heating systems. Box 1 is taken from the South West Heat Map report by CSE and Geofutures and summarises the spatial factors.

Box 1: Spatial factors for district heating

Existing heat demand density

The density of heat demand served by a district heating network is one of the key determinants of the economics of the system. When the heat distribution route is known, the appropriate measure to use is the linear density of heat demand served by the system – that is, kWh of heat delivered per linear metre of heat distribution pipework. This is because the length of the network is a key determinant of its capital cost, while the volume of heat sold is a key determinant of revenue. However, calculating linear heat demand densities requires knowledge of the heat distribution route and connected heat loads. In a wide-area study (such as the work presented here), this information is by definition not available. In such cases the best indicator of areas of high potential for community heating is spatial heat demand density – that is, kWh of heat demand per square metre.

Diversity of existing heat load

The economics of a heating system are also sensitive to the heat load duration curve over the day, week, month and year. Systems serving diverse types of customer are likely to have a greater return on investment than those focused on, for example, housing alone. This is because more diverse loads tend to have lower peak to base load ratios and hence require less network capacity to deliver a given volume of heat over the year. This translates into reduced capital costs to build the network as a smaller diameter of pipework can be used for a given annual load.

Location and nature of new development

New development represents the single biggest opportunity for initiating new district heating projects. This is because (a) the capital cost of installing district heating is much lower if it is integrated into the design process at the master planning stage; and (b) because the planning decision process can be used to give developers a significant incentive to incorporate district heating in their proposals, over and above the longer-term energy economics arguments that apply to the connection of existing heat loads.

Redevelopment of existing buildings and infrastructure

The redevelopment of existing buildings and infrastructure (such as roads, utilities, broadband etc) can also present opportunities to phase the connection of district heating to anchor loads – for example where the costs of digging trenches for pipework can be shared between multiple utilities.

Public sector and Anchor heat loads

The establishment or extension of district heating systems requires securing a sufficient heat customer base to justify the initial investment in the network and plant infrastructure. Project economics can be greatly simplified and enhanced by the inclusion of public sector customers. In addition to social housing, community heating projects benefit from the early inclusion of other public sector loads, such as hospitals and local authority buildings. The identification of clusters of such point loads is therefore an important component of area-wide pre-feasibility work on community heating potential.

Existing heat sources

Use of waste/excess heat from existing sources can reduce the total up-front capital expenditure required to initiate a new community heating project. It also represents the most efficient approach to carbon savings as it minimises the use of new fuel inputs.

The South West Heat Map is a useful tool for identifying opportunities for district heating as it allows the mapping and interrogation of: estimated heat demand from individual buildings; heat demand density and areas of optimal load profile, where heat demand is both high and relatively continuous over a 24 hour period. Datasets displayed by the South West Heat Map are detailed in Table 21.

Table 21: Datasets displayed by the South West Heat Map

Dataset	**Corresponding layer on website**
A point-map in which each point represents the location of a building, with estimated heat demand value stored at each point in space	Buildings
A continuous surface layer showing how the average heat demand per square metre of land area varies across space	Total Heat Demand
A continuous surface layer identifying areas of relatively high heat demand density in which the demand is expected to be relatively continuous over a typical 24 hour period	Optimal load profile areas
A set of continuous surface layers showing average heat demand per square metre of land area from a subset of building types considered to be good candidates for heat distribution projects	Anchor load clusters

The South West Heat Map is viewable online at www.southwestheatmap.co.uk. The address-level dataset is available from Regen SW for local authorities to import into their GIS (on payment of an admin fee). For more details on how the South West Heat Map was created see the South West Heat Map report which is available to download on the website.

7.1.1 Using the South West Heat Map in West Dorset

The South West Heat Map estimates heat demand from individual buildings. It becomes more powerful as a tool for identifying district heat opportunities when used in conjunction with other local datasets. In West Dorset, the energy demand from West Dorset District Council buildings and Dorset County Council buildings gathered in the National Indicator 185 dataset was mapped alongside the heat map data. This introduces real heat demand values into the model, improving the accuracy. In addition, new domestic and non-domestic development sites were mapped.

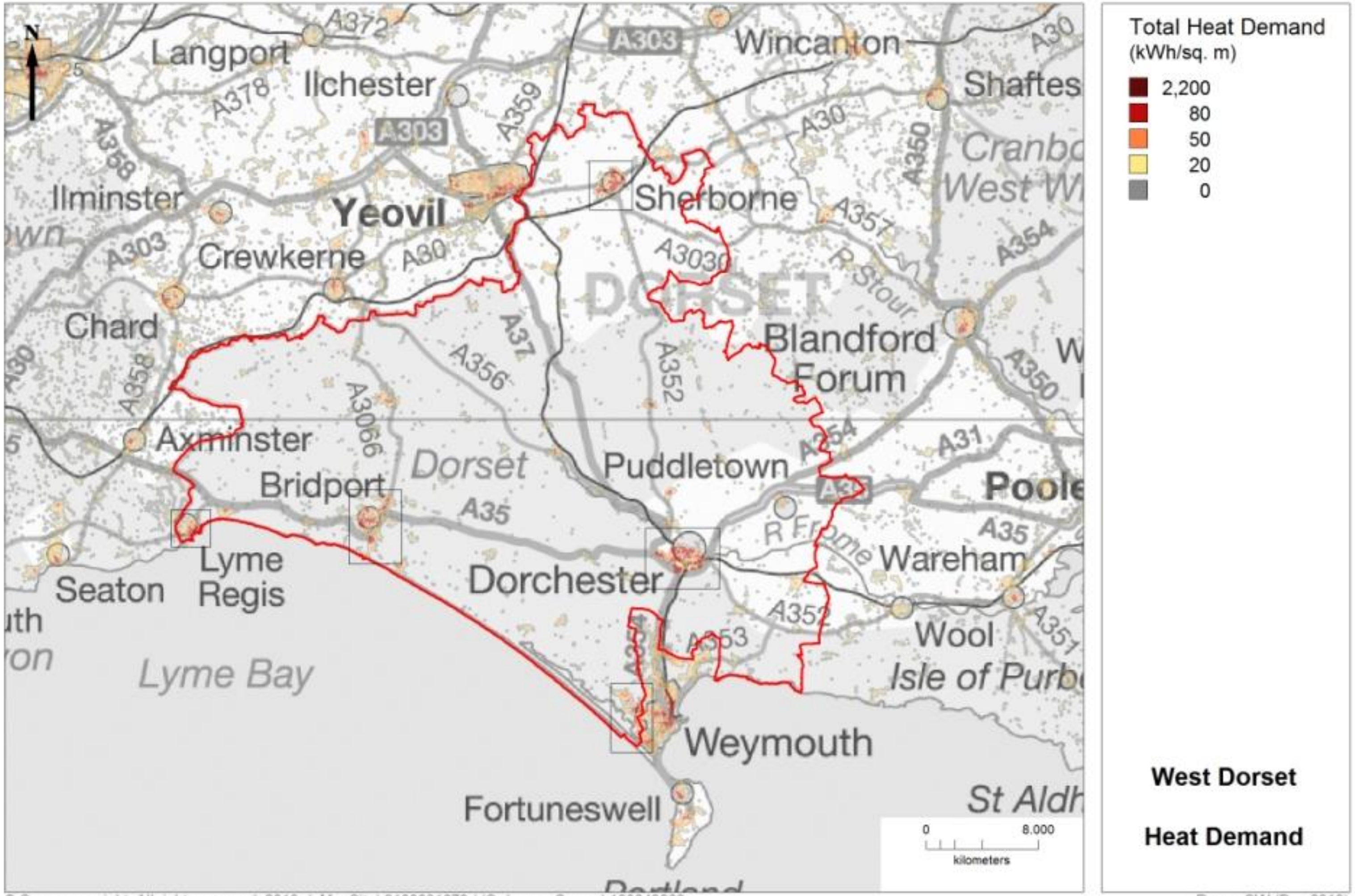
The resulting datasets were analysed for district heating opportunities by examining the local area in detail for areas with potential to fulfil some of the criteria set out in Box 1. For example, new development sites were examined for their proximity to existing high heat users. Existing areas of heat demand with optimal load profiles are highlighted as a data layer by the South West Heat Map. These areas were examined in more detail with the locally specific datasets.

Key points of method	Analysis of South West Heat Map dataset alongside local datasets for areas particularly suitable for district heating
Datasets used	South West Heat Map – viewable at www.southwestheatmap.co.uk, data layers available from Regen SW for south west local authorities National Indicator 185 for West Dorset from West Dorset District Council National Indicator 185 for Dorset County Council from Dorset County Council Social housing SAP ratings from Magna Housing Group New development areas from West Dorset District Council

7.2 Findings

The South West Heat Map data for West Dorset was examined and five key areas of high existing heat demand were identified, outlined in Figure 16: Lyme Regis, Bridport, Chickerell, Dorchester and Sherborne. These areas were examined in more detail for district heating opportunities. Lyme Regis was ruled out of the analysis at this stage, due to the steep topography of the area and the lack of new developments in the area.

Figure 16: Existing heat demand across West Dorset

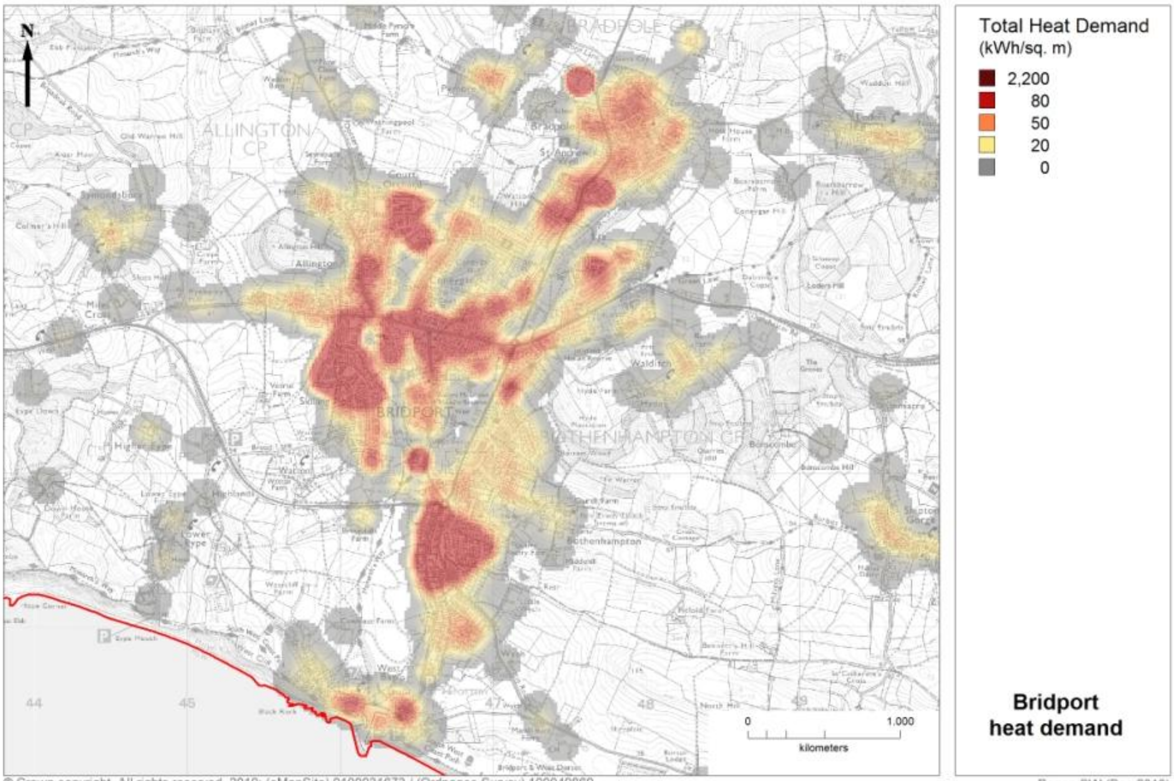


Regen SW (Dec 2010)

7.2.1 Bridport

Figure 17 shows estimated existing heat demand in Bridport.

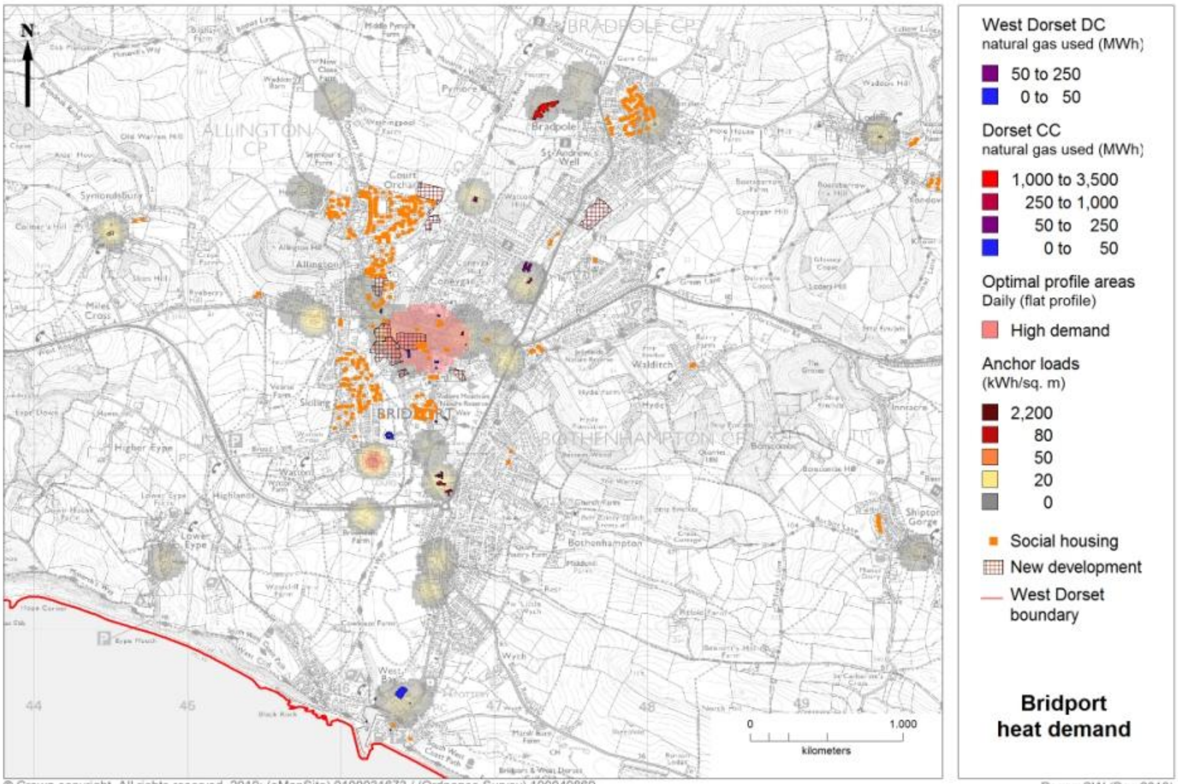
Figure 17: Bridport existing heat demand



Regen SW (Dec 2010)

Heat demand in Bridport was examined in more detail. Figure 18 maps new developments planned around Bridport, areas with an optimal load profiles, anchor loads, and heat demand from council owned buildings, as well as the location of social housing.

Figure 18: Detailed existing and potential heat demand in Bridport

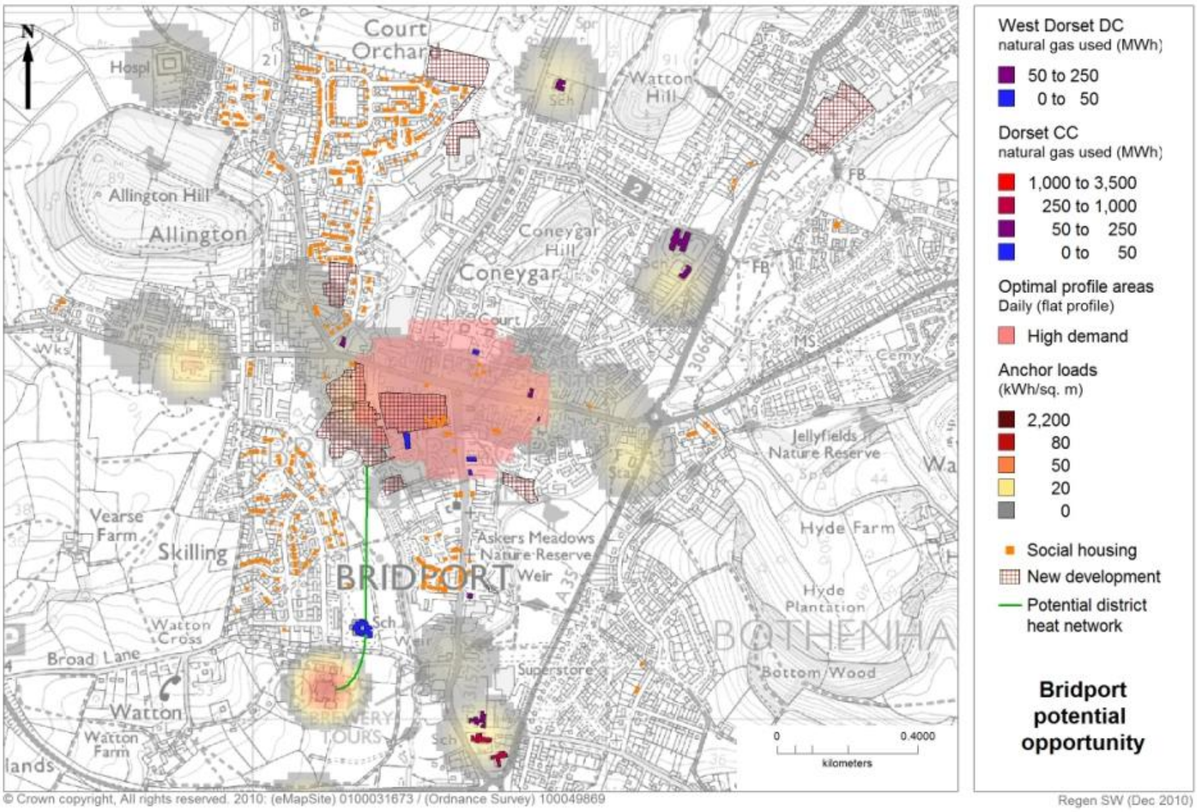


Regen SW (Dec 2010)

The map shows that the centre of Bridport is deemed to have an optimal load profile – where demand is high and constant. This is as a result of a mixture of residential and commercial properties in the area offering complementary heat demand profiles. However, there are limited anchor loads in the centre of Bridport that could serve as a base load for a district heat network and that would justify the initial investment in the network and plant infrastructure.

The allocated development areas in Bridport may support a site-wide solution on their own, particularly those areas that are mixed uses. In addition, there is a brewery, highlighted as an anchor load in Figure 19, that may offer a source of waste heat that could be used to supply a district heat network. This potential heat source is located a reasonable distance from the new development sites, which may prove prohibitive. However, the route between the brewery and the development sites is a "green dig" – that is, it is undeveloped land, rather than a road route. There is a school located on route that a potential network could supply. Social housing is located on either side of the potential network route and so could potentially be served by a network. However, the map shows that this social housing is relatively low density and so may not be suitable. Figure 19 shows the potential opportunity. Further investigation would be needed to verify whether this is a viable opportunity – for example, contacting the brewery owners to determine their interest and whether adequate waste heat is produced.

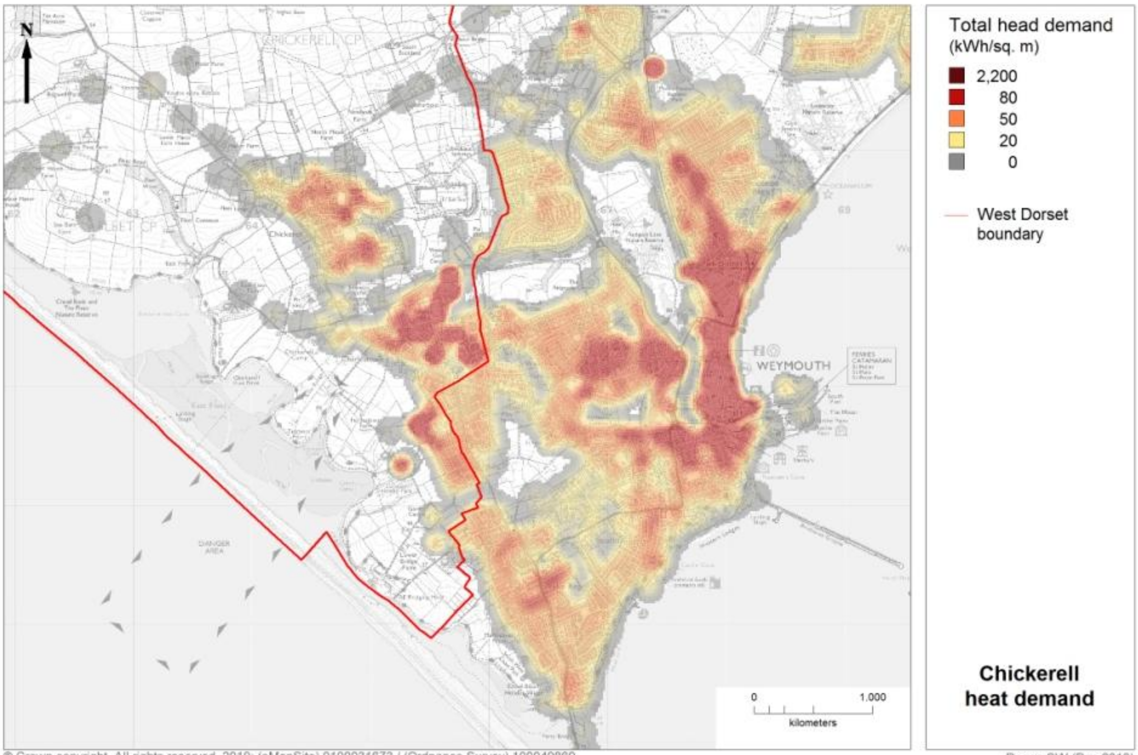
Figure 19: Potential opportunity for district heating in Bridport



7.2.2 Chickerell

Heat demand in Chickerell was examined. As shown by Figure 20, any district heating opportunities investigated in more detail in Chickerell should be considered alongside heat demand and development areas in Weymouth.

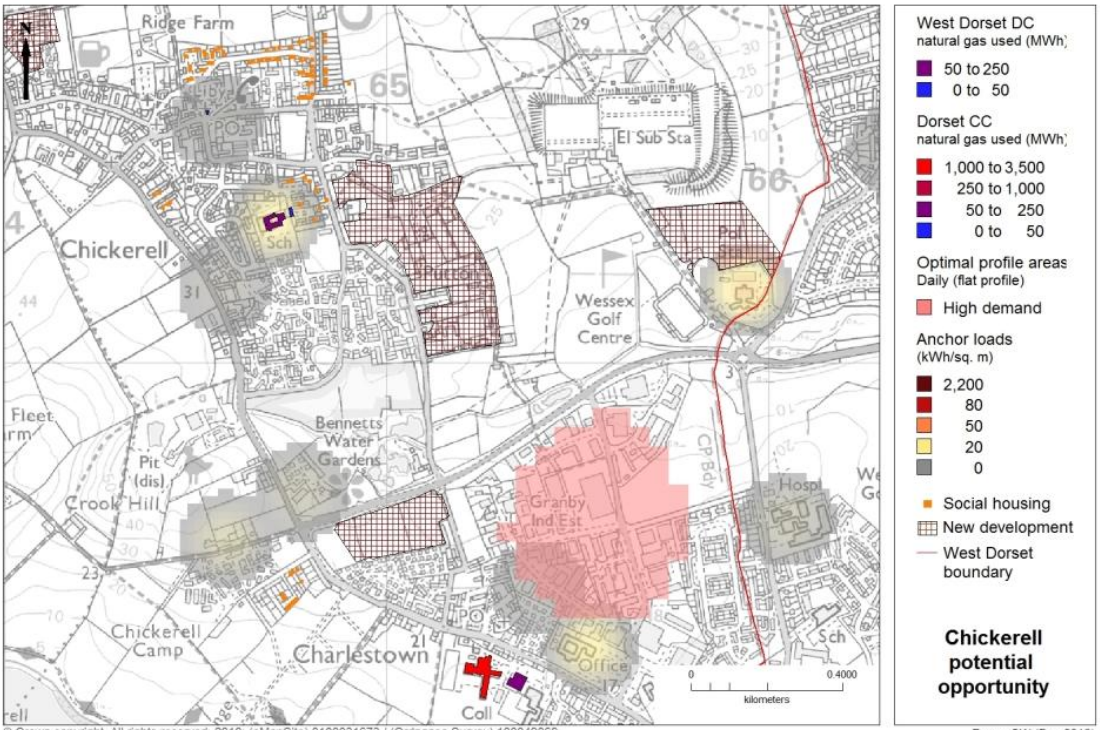
Figure 20: Existing heat demand in Chickerell



 Regen SW (Dec 2010)

Existing and potential heat demand in Chickerell is shown in more detail in Figure 21.

Figure 21: Detailed existing and potential heat demand in Chickerell



 Regen SW (Dec 2010)

In Chickerell, there may be potential for the development sites to include site-wide district heating and this is likely to be the most cost effective method of achieving the 44% reduction in CO_2 emissions required by changes to the Building Regulations due to be implemented from 2013. A golf course separates the larger development sites from the smaller site to the east (and the potential anchor load from the police station) and this may be a barrier to creating a link between the sites.

The area marked as having an optimal load profile is an industrial estate. There is a single landlord for the industrial estate, which increases the likelihood that there may be potential to connect it to a heat network. Without a single landlord, it can be difficult to get industrial units to agree to connect.

Existing anchor loads in the area are limited. The hospital just over the boundary with Weymouth is a small complex with dispersed buildings and is a reasonable distance from the new development. It is therefore unlikely to be a suitable base load for a network. There is a school to the north west of the large development area that could benefit from connection to a heat network, but is unlikely to offer a suitable base load as schools tend to only require heat during class hours in term time, rather than around the clock.

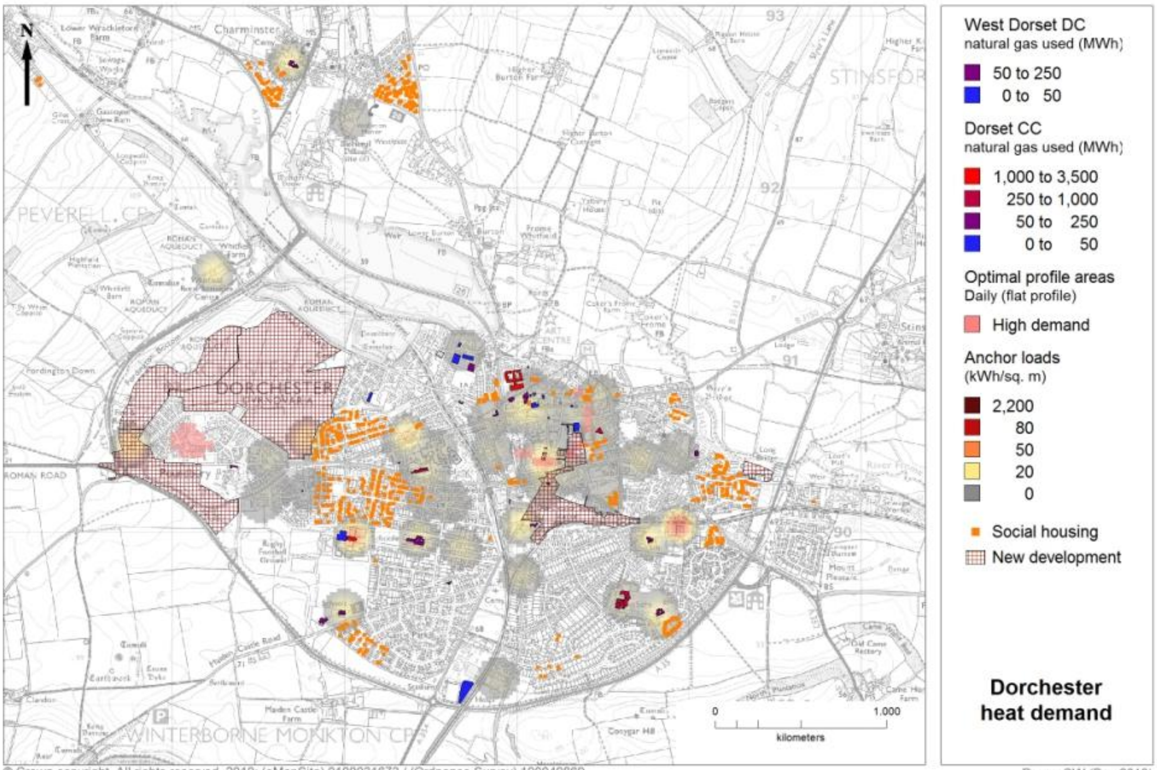
7.2.3 Dorchester

Dorchester is the largest town in West Dorset and has the largest area of high heat density.

Figure 22: Existing heat demand in Dorchester

Regen SW (Dec 2010)

Figure 23: Detailed existing and potential heat demand in Dorchester



Regen SW (Dec 2010)

In Dorchester, the majority of new planned development is in the Poundbury area, where district heating is already being pursued both for domestic and non-domestic properties.

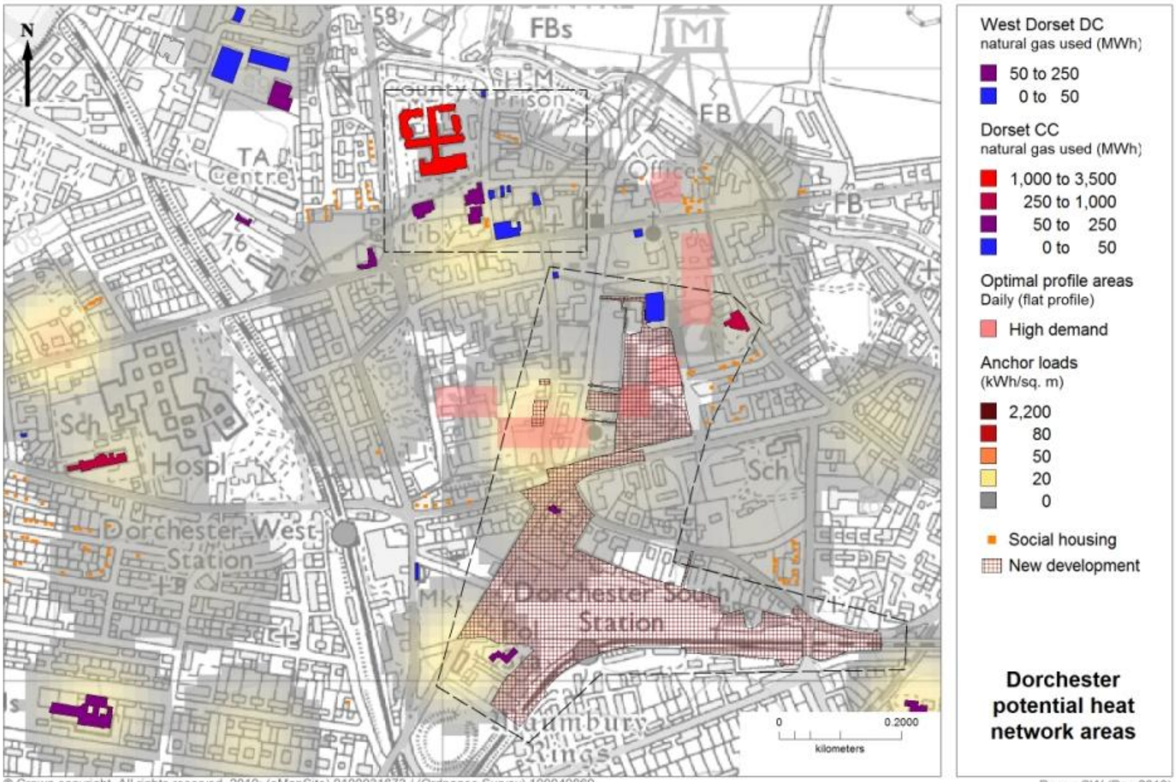
Additional potential areas of opportunity include the anchor loads of county hall and Dorchester prison, shown in more detail below in Figure 24. A district heat network supplying these two buildings could be developed. It could also pick up heat loads from other council property in the area (although West Dorset District Council's offices are due to close), social housing opposite county hall and other residential property in the area.

The second area outlined in Figure 24 is an area of new development in the centre of Dorchester. There is potential for this mixed development to include district heating, using for example West Dorset District Council's new offices or a supermarket as a base load.

If both potential schemes were developed, in the future they could be linked up, supplying heat to buildings along the route.

The hospital located to the west of the railway line in Figure 24 offers another potential high heat user that could be used as an anchor load for a network. There is a school next door that could take some of the heat. The railway line could be a barrier to linking a network developed here to other potential networks to the east.

Figure 24: Potential district heating opportunities in Dorchester



Regen SW (Dec 2010)

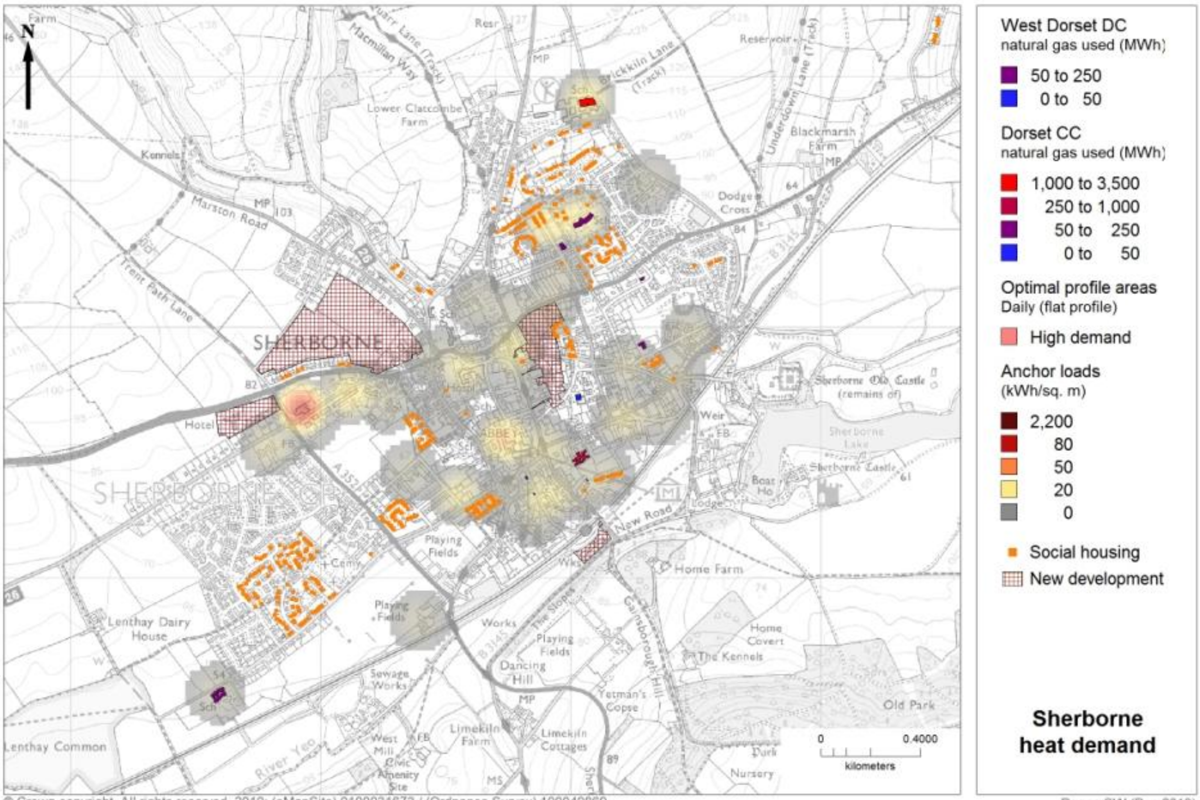
7.2.4 Sherborne

Heat demand in Sherborne was examined in detail.

Figure 25: Existing heat demand in Sherborne

Regen SW (Dec 2010)

Figure 26: Detailed existing and potential heat demand in Sherborne

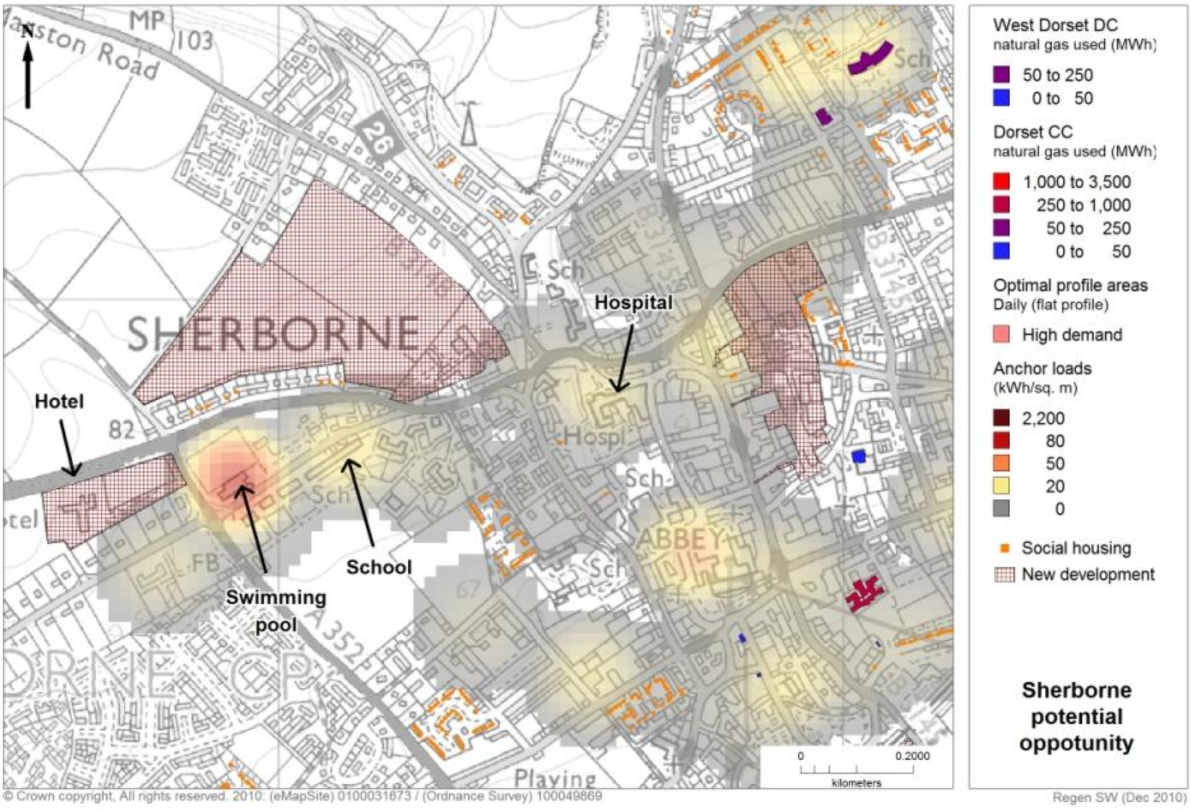


Regen SW (Dec 2010)

Sherborne has a large development site allocated to the north west of the town. This site is of a scale that would mean that a site-wide district heating network could be viable. Whilst there is no minimum scale of development that can be used to definitively determine whether a district heat network is viable, larger sites tend to be more suitable for district heating due to economies of scale. In addition, there are a number of potential existing anchor loads that could provide base load demand – there is a sports centre with a swimming pool, a hotel and a school. There is also a hospital in the near vicinity, although this is a relatively small hospital with a number of separate units.

There may also be some potential for a network based around the second main area allocated to development in the centre of Sherborne. However, whilst there is some social housing located next to the development area, in general there appear to be fewer potential anchor loads in the close vicinity.

Figure 27: District heating opportunities in Sherborne



7.2.5 Further opportunities

The heat map dataset has been imported to the West Dorset District Council GIS system. It could be used by officers in determining future allocations of land use, e.g. in siting new development near to existing anchor loads to facilitate the development of district heat networks.

8 Conclusions

8.1 *Targets*

At present, Regen SW figures estimate that an annual total of 6.35GWh of renewable energy is produced from renewable sources in West Dorset. Whilst West Dorset does not have a target for renewable energy generation, it is committed through the West Dorset Partnership to the target of cutting carbon emissions by 30% from 2005 levels by 2020 in the West Dorset Climate Change Strategy.

Energy demand reduction and renewable energy generation will both have roles to play if the carbon target is to be achieved. If West Dorset were to try locally to replicate the national renewable energy target of 15% of energy consumed coming from renewable sources, it would need to generate 353 GWh of renewable electricity and heat (assuming 3.75% of transport energy use came from renewable sources and significant reductions in heat and electricity). To reach a more stretching 20% target, 484 GWh of renewable electricity and heat would be needed.

Recommendations:

1. The evidence in this Local Energy plan sets out the contribution that energy efficiency and renewable energy generation could make in West Dorset and could be used to understand the contribution that these could make towards the district's carbon target.

2. The West Dorset Partnership and West Dorset District Council could consider setting a local renewable energy target using the information about available resources from this report.

8.2 *Energy demand reduction*

8.2.1 Domestic energy efficiency

The Energy Saving Trust's analysis of the 39,000 private homes in West Dorset found that there are potentially significant opportunities for energy efficiency measures to be installed.

Just over 10,000 homes have solid walls; whilst no assessment of the numbers with solid wall insulation was made, it can be assumed that to date roll out of this measure is relatively low as it is across the UK and so there is a high level of potential for solid wall insulation. 14,300 homes were estimated to have a cavity wall potentially in need of filling and ten wards had over 600 homes with potentially empty cavities.

The Energy Saving Trust recommends all homes have 270mm of loft insulation. 6550 homes were estimated to have little or no loft insulation, with a further 25,630 homes with 60 to 200mm.

The Energy Saving Trust's analysis estimates insulating all lofts to 270mm and filling all cavities in West Dorset would save an estimated 35,331 tonnes of CO_2 and 171GWh of energy consumption per year, with average annual bill savings for householders of £198. If achieved, this would equate to a saving on domestic energy demand of 18% on 2008 consumption levels and would make a significant (4.2%) contribution towards achieving West Dorset's carbon reduction target.

Recommendations:

3. West Dorset District Council should explore opportunities for area based approaches to domestic energy efficiency measures with Dorset County Council

8.2.2 Commercial demand reduction

51 percent of total electricity consumption and 26 percent of gas consumption in West Dorset in 2009 was by non-domestic users. However, there is a lack of information available about the potential for energy efficiency in commercial sector buildings and a lack of drivers on the majority of businesses to prioritise investing in reducing their energy demand. There is significant potential for demand reductions from the commercial sector to contribute towards West Dorset's carbon reduction target. Officers in West Dorset District Council have an excellent understanding of the opportunities and have links with businesses in their area. Opportunities for the Council to do more to support the commercial and industrial sector on this agenda could be investigated.

Recommendations:

4. West Dorset District Council should investigate opportunities to use its links with businesses to provide them with support and information on energy demand reduction and renewable energy opportunities.

8.2.3 West Dorset District Council energy demand reduction

Energy consumption by West Dorset District Council properties equalled 0.1% of total building related (i.e. not transport) energy consumption in West Dorset in 2008. This is a very small proportion and the potential for energy savings that could have a significant impact on carbon emissions across West Dorset is therefore limited. However, West Dorset District Council has the potential to influence energy use from its own estate and has set a target of reducing carbon emissions from its own energy use by 35% from 2008/09 levels by 2014/15. West Dorset District Council plans to move to new, more energy efficient offices in 2012 which will further reduce its energy demand.

Other opportunities for energy demand reductions include investigating opportunities for energy efficiency at Thomas Hardy's leisure centre (if ownership is retained) and continuing the programme of upgrades to public conveniences, focussing on those with high energy use.

Recommendations:

5. West Dorset District Council should continue to review and upgrade energy efficiency in its remaining properties, focussing on those with the highest energy consumption - particularly Thomas Hardy's leisure centre.

8.3 Renewable and low carbon energy generation

8.3.1 Current installations

The current installed capacity if renewable energy in West Dorset is relatively low, with 0.964MW of renewable electricity and 0.898MW of renewable heat capacity identified through Regen SW's annual survey 2010 and the Central FIT register. One large AD plant makes up 0.48MW of the renewable electricity installed capacity, with the rest coming from microgeneration projects. On the renewable heat side, 13 biomass projects make up 0.539MW of capacity, with the rest coming from microgeneration projects. It is estimated that these projects generate a total of 6.34GWh of renewable energy per year.

There is one medium renewable energy project that has been approved, but not yet built – a 0.7MW anaerobic digestion plant at Piddlehinton and a decision is pending on an 1.4MW anaerobic digestion plant at Poundbury. Some larger renewable energy projects are currently in pre-application discussions.

Without some larger scale renewable energy projects being built in the area, West Dorset is unlikely to see a shift in its energy consumption of any significant scale away from fossil fuels.

8.3.2 Renewable resources

West Dorset has considerable potential to generate renewable energy from resources from within its boundaries. Figure 28 shows a summary of the theoretical maximum renewable energy generation using West Dorset resources, and includes for comparison current renewable energy generation. The dotted lines show how much renewable energy would need to be generated to reach a 15% and 20% of energy consumption renewable target. Table 22 shows the data shown in Figure 28.

Figure 28: Theoretical maximum renewable energy generation potential from West Dorset resources and current renewable generation

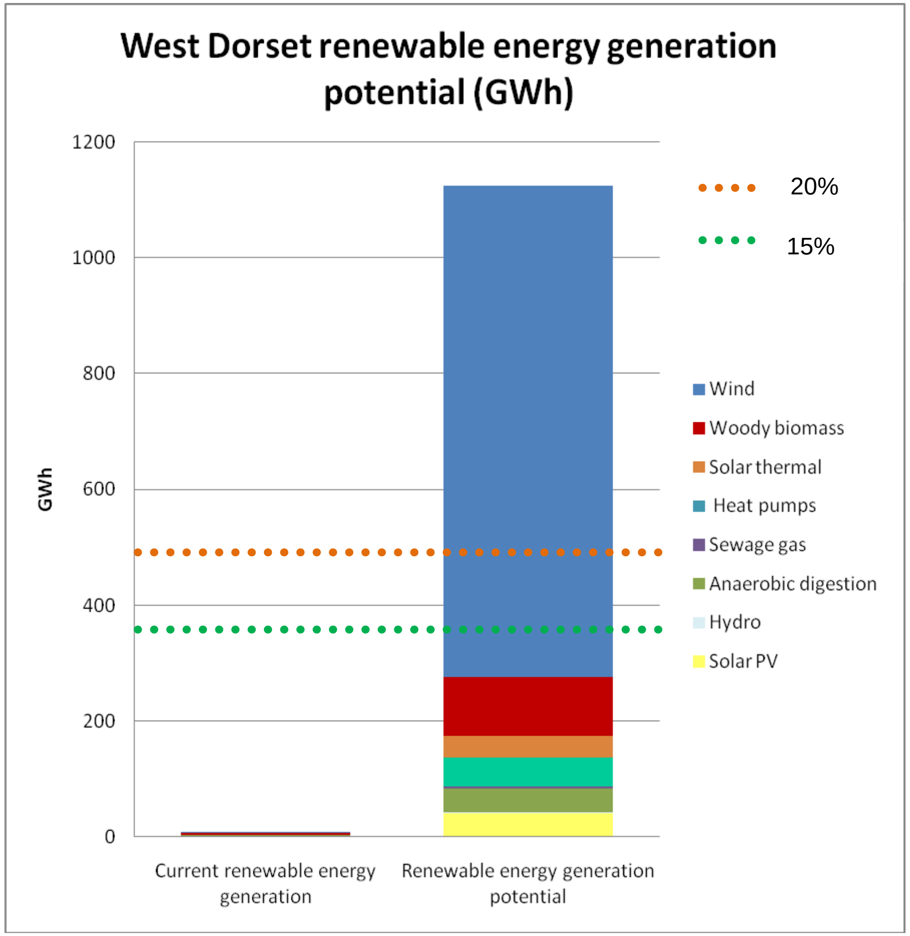


Table 22: Theoretical maximum renewable energy generation potential from West Dorset resources and current renewable generation

	Current renewable energy generation (GWh)	Renewable energy generation potential (GWh)[17]
Large wind	0.22	848.00
Woody biomass	1.89	101.76
Solar thermal	0.15	18.88
Heat pumps	0.32	49.69
Sewage gas	0.00	4.57
Wet bio-resource (AD)	3.36	39.82
Hydro	0.06	2.00
Solar PV	0.33	22.29
Total	6.34	1087.01

[17] Current renewable energy generation was calculated using the installed capacity figures gathered through Regen SW's annual survey 2010 and from the Central FIT register. The calculated figure of 6.3GWh is lower than the figure quoted from DECC in

Table 2 of 25GWh. It is unclear how DECC calculated the higher figure.

West Dorset has access to a range of renewable energy resources. The following paragraphs discuss the available resources and highlight opportunities to support uptake of those resources with significant potential to deliver renewable energy installations and carbon savings.

8.3.2.1 Wind

Wind is most abundant renewable energy resource in West Dorset. The large-scale resource assessment found that West Dorset could have 143 turbines, constituting 358 MW of installed capacity. This would generate an estimated 848 GWh/yr and save 455KT Carbon/yr. The resource assessment does not allow for cumulative impact and other factors such as radar issues and obtaining planning consent and so in reality West Dorset is unlikely to see this number of large-scale wind turbines developed.

The resource assessment sought to maximise the total potential resource available and so only considered large turbines, which offer the most efficient use of available wind resources. However, medium and small scale wind also have a role to play in renewable energy generation in West Dorset, particularly as smaller turbines can be accommodated in certain locations within the AONB.

Achieving a 15% of energy consumption renewable target by 2020 in West Dorset would not be possible without at least 114GWh of wind energy[18]. This is equivalent to 19.3 large (2.5MW) turbines or 3771.7 small (15kW) turbines[19]. This minimum number of wind turbines is based on maximum exploitation of every other renewable electricity and heat resource, which in reality is unlikely, meaning that a greater number of wind installations would be required.

There are no large or medium scale wind turbines in the district at present. West Dorset must consider whether it can meet its 30% carbon reduction target without wind energy and if not, how it can support the development of wind turbines in the right locations. Undertaking a landscape assessment for wind turbines can be a positive step forward if it is developed in consultation with wind developers and other stakeholders.

Recommendations:

6. West Dorset District Council should consider its approach to wind energy, e.g. by undertaking a landscape assessment.

8.3.2.2 Hydropower

41 sites were identified that are potentially viable for hydropower, with a potential total installed capacity of 457 kW. If a capacity factor of 50% is assumed, these sites could generate up to a total of 2.00 GWh/year, which is equivalent to the electricity consumed by 407 households. Based on this resource assessment, hydropower has a limited role to play

[18] If it is assumed that one 5 MW solar park is built in West Dorset and the generation is taken into account, this figure will be 109.61 GWh, equivalent to 18.5 large 2.5 MW turbines.

[19] Based on a 27% load factor for large wind and 23% capacity factor for small wind

in renewable energy generation in West Dorset. In addition, hydropower projects tend to have relatively high initial capital costs and economic viability tends to be the key barrier to installation. Hydropower projects are most likely to be installed where there is a local enthusiast driving the project.

8.3.2.3 Solar PV and solar thermal

Solar PV and solar thermal were considered together in the AEA microgeneration assessment as they compete for roof space. A total installed capacity of 47 MW of solar PV or 43.1 MW of solar thermal could be achieved by 2020 in West Dorset, if one in every four domestic properties and 40% of commercial (for PV) and 80% of industrial properties installed solar panels, along with 50% of new houses built between now and 2020. This is equivalent to 16,930 solar PV or 16150 solar thermal installations.

There are currently approximately 135 solar PV installations and 43 solar thermal installations in West Dorset. The feed in tariff and potentially the Renewable Heat Incentive are expected to cause a surge in solar installations and there remains significant potential for installations in West Dorset. However, even if the theoretical maximum number of panels were to be installed, they would only generate energy equivalent to around 1.6% of 2020 total energy demand in West Dorset.

The solar roofs assessment found that an estimated 147kW of solar panels could be installed on West Dorset District Council roofs, with a further 42kW of solar panels potentially possible on roofs where the opportunity could not be fully assessed. This potential needs to be assessed in more detail on a roof-by-roof basis, by visiting the sites, to determine which are viable.

The large-scale commercial roofs analysis has identified some potentially very large opportunities for roof mounted solar PV. Making building owners aware of the opportunity is the key issue with commercial roof projects. The spreadsheet created will be useful to identify landlords or owners with potentially viable roofs. BusinessLink could be the organisation to approach commercial building owners to raise their awareness of the opportunity.

Some large scale and some smaller scale solar parks are likely to be built in West Dorset due to the current availability of the Feed-in Tariff. It is expected that government will reduce the Feed-in Tariff for this scale of installation from 1 August 2011. Solar parks are expected to make a limited contribution to renewable energy generation in West Dorset. If one 5MW solar park is built, it would contribute 4.56 GWh of renewable energy.

Recommendations:

7. West Dorset District Council should lead by example through considering the opportunities identified for PV on its own estate and for other renewables

8. West Dorset District Council should consider developing an approach to promoting renewables to the commercial sector, making use of the PV roofs' assessment undertaken through this Local Energy Plan

8.3.2.4 Heat pumps

A relatively high potential for heat pumps was estimated for West Dorset, offering up to 50GWh of renewable energy, due to the high number of properties off the gas grid. At present, Energy Saving Trust research suggests that heat pumps are only suitable for well insulated properties off the gas grid or in new developments with high thermal ratings. Regen SW considers that the potential for heat pumps estimated here (50GWh) to be an overestimate of realistic installation levels. Installation rates for heat pumps will depend largely on how building regulations relating to low carbon buildings are implemented and whether or not the Renewable Heat Incentive is made available for heat pumps and if so at what tariff level.

8.3.2.5 Woody biomass

Woody biomass has the greatest potential to contribute to renewable heat generation in West Dorset, offering a total potential of 95.4GWh of renewable heat (and 6.4GWh of renewable electricity). A large proportion of the district is off-gas; biomass boilers using locally sourced clean wood-fuel could offer a viable alternative to other fossil fuels, particularly in off-gas areas. The Dorset Energy Group has a biomass working group that is working to promote wood-fuel supply and installations across the county.

Clean wood from forestry, arboricultural arisings and clean waste wood in West Dorset was found to be capable of producing 82.53 GWh of heat. Clean wood used for energy generation tends to be most efficiently used in small scale biomass boilers. The resource from within West Dorset could be used to fuel approximately 470 wood fuelled 100kW boilers on the basis of a 20% load factor. The 2009 *Technical study –Woodfuel supply and demand in Dorset* by CSE and Crops for Energy identified potential locations across Dorset for biomass boilers, including for example nursing homes, schools and dairies.

The estimated treated waste wood resource from within West Dorset could generate an estimated 2.25 GWh of electricity and 4.51 GWh of heat in WID compliant CHP plant. Eco Sustainable Solutions re-submitted a planning application in 2010 for a 2.5MWe waste wood plant at their site in Parley, Christchurch. If successful, this plant will process 25,000 tonnes of waste wood that is currently exported from Dorset. This constitutes a fuel input that is greater than the estimated treated waste wood produced across Dorset, Bournemouth and Poole. If the plant goes ahead, it is unlikely that there will be additional waste wood plants or resource available in West Dorset.

To date, only 3 hectares of energy crops are growing in West Dorset (at Kingston Maurwood College). Energy crops could contribute to biomass resource availability in the future. Guidance for energy crop growers has been developed by the Dorset Energy Group and should be considered in determining an appropriate approach for West Dorset District Council to energy crops. If 10% of suitable land were to be planted with energy crops, an estimated 4.16GWh of electricity and 8.31GWh of heat could be produced by using the energy crops in biomass powered CHP plant.

8.3.2.6 Anaerobic digestion

An estimated 18.10GWh of electricity and 21.72GWh of heat could be produced from anaerobic digestion of the wet-biomass resource produced in West Dorset. There is currently one 0.48MW anaerobic digestion plant installed in West Dorset at Melbury Dairy, with another 0.7MW plant approved at Piddlehinton and a 1.4MW plant to power 3,000 homes in Poundbury currently awaiting determination. There is limited potential for further anaerobic digestion plants in West Dorset.

8.3.2.7 Sewage gas

Sewage gas represents a very small resource in West Dorset, estimated at 2GWh of electricity and 2GWh of heat. Sewage gas will be exploited only when the water company responsible for the waste considers it to be financially viable to do so. To date there are no sewage gas energy plants in West Dorset.

8.3.2.8 Waste

A planning application has been approved by Dorset County Council for an energy from waste plant to supply the Dorset Green Technology Park in Purbeck with heat and to generate electricity. When built, this plant is likely to process 116k tonnes per year of non-hazardous waste and non-waste biomass in a 10MWe and 24MWt plant. With this plant and the other waste contracts currently in place, there are unlikely to be opportunities for energy from waste plants to be built in the near future in West Dorset.

8.3.2.9 District heating

Opportunities for district heat networks were examined in Bridport, Chickerell, Dorchester and Sherborne, The majority of these opportunities are centred around new development sites. For new development sites, conditions tend to be more favourable for district heat than in existing sites. For example, new housing estates tend to be higher densities, pipes can be laid at the same time as other utilities and heat distribution systems can be fitted when properties are built. West Dorset District Council should consider developing planning policy to support and encourage the development of district heat networks in potentially viable areas.

In addition, one potential retrofit opportunity was identified in Dorchester centring on the County Hall and the prison, with the potential to link to neighbouring social housing.

Recommendations:

9. West Dorset District Council should consider developing planning policy to support the delivery of district heating in Bridport, Chickerell, Dorchester and Sherborne.

8.4 Low carbon development planning policies

In new developments, deployment rates for building-integrated renewable technologies (solar PV, biomass boilers, heat pumps and solar thermal panels) as well as district heating are largely dependent on building regulations relating to energy use in new developments. There are also potentially opportunities for new developments to fund investments in standalone renewables through developers being authorised to provide a proportion of carbon savings through offsite “allowable solutions”.

At present, it seems that government intends to water down national guidance on the definition of zero-carbon and the requirements for new developments to meet higher levels of the Code for Sustainable Homes. West Dorset District Council could consider producing local planning policies on low carbon development, aimed at reducing the energy demand from new developments and increasing on and off-site renewable energy generation. However, it is not clear at present how local planning policy can be developed and implemented once the Localism Bill is passed. West Dorset District Council will be piloting the new planning system and should consider its approach to low carbon development through the pilot.

Recommendations:

10. West Dorset District Council should consider its approach to low carbon development planning policies through its pilot of the new planning system.

8.5 Next steps

West Dorset plans to use the datasets and analysis produced in the West Dorset Local Energy Plan as evidence in its pilot of the new planning system. A number of additional potential actions to promote sustainable energy uptake in West Dorset have been recommended.

Appendix A: Capacity factors[20]

The "capacity factor" or load factor of a particular technology, is an approximate way of estimating how much energy per year a certain installed capacity will produce. To work out how much energy a technology will generate: multiply the installed capacity, (in MW) by the capacity factor, and by the number of hours in a year (24x365=8760), to give annual energy output in MWh (Megawatt hours). One Gigawatt hour (GWh) is 1,000 MWh. One MWh is 1,000 Kilowatts hours (kWh).

The figures used for different capacity factors are based on experience from existing installations. Because capacity factors are in effect just a guide they can cause confusion among non-specialists about the length of time over which a particular technology is generating.

For example, a capacity factor of 0.1 or 10% for PV does not mean that a PV system in the UK will only generate electricity for 10% of the year. What it means is that all of the energy generated by the PV system over the course of a year is equivalent to the PV system generating at its full installed capacity for 10% of the year.

Similarly, wind power technology in the south west has a capacity factor of 0.27, or 27%, but a wind turbine will typically be generating electricity for 80% of the time, but will only be generating at full power for a smaller % of time, say 10- 15%. The rest of the time it is operating, the turbine is generating somewhere between full power and "cut-in", when it first starts to generate.

Another example would be a gas boiler or heat pump which may only operate at full capacity for 10% of the year, as no central heating is required in summer or during the night in winter.

Renewable energy technologies with low capacity factors are referred to as "intermittent", and this includes wind, PV and hydro. They are intermittent because the wind does not always blow, the sun does not always shine, and so on. Technologies with high capacity factors are referred to as "reliable", and these include biomass CHP and landfill gas. No energy technology, renewable or non-renewable has a 100% capacity factor, as there will always be a certain amount of downtime for maintenance, and for faults.

[20] This section is drawn from the 2003 *Bournemouth, Dorset and Poole Renewable Energy Strategy* by the Centre for Sustainable Energy. To download the strategy, visit http://www.dorsetforyou.com/387639

Typical capacity factors for each of the technologies are shown in the tables below.

Renewable technology **(Electricity)**	**Large onshore wind (2.5MW)**	**Small onshore wind (15kW)**	**Solar PV**	**Small hydro**	**Landfill gas**
Capacity factor	0.27	0.23	0.1	0.5	0.8

Renewable technology **(HEAT)**	**Biomass, woody** **(150Kw)**	**Heat pumps**	**Solar thermal**
Capacity factor	0.2	0.1	0.1

Renewable technology **(Combined heat and power)**	**Waste incineration compliant biomass CHP**	**Anaerobic digestion**	**Sewage gas**
Capacity factor	0.9	0.9	0.9

Appendix B: Summary of methodology for biomass resource assessment by AEA

Further details on the methodology used in *The regional potential for sustainable renewable energy: biomass in the south west* by AEA will be available when the Environment Agency publishes the report.

Forestry and clean wood

The AEA study used the National Inventory of Woodland and Trees database to calculate biomass resource from forestry.

The AEA study calculated arboricultural arisings based on the total south west resource detailed by the Forestry Commission's Woodfuel Resource tool available at http://www.eforestry.gov.uk/. The regional figures generated were spatially distributed across the south west, using population as a proxy. It should be recognised that population is not a very accurate proxy for arboricultural arisings and was used only in the absence of any better alternative.

Clean waste wood was analysed for south west local authorities by the AEA study by drawing on figures from WRAP, 2009, Wood waste market in the UK, which is available from: http://www.wrap.org.uk/recycling_industry/publications/wood_waste_market.html .

The resource was distributed spatially across local authorities based on levels of business activity from the Interdepartmental Business Register (IDBR).

Treated waste wood

Estimates of the contaminated/treated wood waste within the municipal solid waste (MSW) stream was calculated from the Defra Waste Data Flow database, which contains the amount of wood waste collected at civic amenity sites by local authority. This source was combined with an estimate of how much wood might be separated out of the MSW waste stream. The calculated resource was distributed by population.

Estimates of contaminated/treated wood waste from demolition were calculated based upon the national study by WRAP(2009) *Wood waste market in the UK*, which is available from: http://www.wrap.org.uk/recycling_industry/publications/wood_waste_market.html

The resource was distributed by population distribution. The influence of significant redevelopment projects could have an influence on the locality of the resource distribution.

Wet bio-resource

For agricultural waste, the wet bio-resource assessment drew on the Defra Livestock Census to calculate the potential tonnes of waste from different livestock types in each local authority area. The data has a fairly high resolution as it is based upon livestock numbers at farm level. Data on average slurry production by animal type was used to calculate the annual wet waste resource. Slurry yields from livestock sub-classes have been analysed and combined with a county level average slurry yield average. This estimate is relatively accurate but actual on-farm management will determine the ability to easily collect slurry or if the farm has a very different livestock sub-class compared to the county average then the local resource is likely to vary.

For organic waste, domestic, industrial and commercial organic waste was considered. For domestic, the proportion of food waste in household waste was estimated and applied to the volume of MSW waste by each local authority from Defra WDF statistics.

The industrial food waste data used the Environment Agency's Pollution Inventory to determine individual sites discharging organic waste that could be suitable for Anaerobic Digestion. The study was only able to make generic estimates of the composition and suitability of the waste for anaerobic digestion. In the food and drinks sector there are often alternative avenues for the use of waste products which limit availability for bio-energy. As such when looking at the data at a local level the available resource could potentially be much higher or lower than presented. It is recommended by AEA that if a local authority has a significant potential wet waste resource that this should be investigated further on an individual basis.

For commercial organic waste, the underlying data used was a national study that makes regional estimates for the commercial food waste sector, which also includes public sector food waste. An estimate of the proportion of food waste that could be separated was made and the resource was distributed by population distribution. The confidence in the accuracy of this data at a local level is low and there are limited national and regional level studies currently available in order to improve this estimate.