SOUTH WEST DEVON COMMUNITY ENERGY PARTNERSHIP

South West Devon Strategic Energy Study

The Evidence Base

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South West Devon Strategic Energy Study: The Evidence Base

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Executive Summary

This report comprises an evidence base study, which forms the first stage of a Community Energy Plan for the South West Devon area. It has been produced for the South West Devon Community Energy Partnership (SWD CEP) and has been funded by the *Sustainable Energy Across the Common Space* (SEACS) project. The aim of the SWD CEP is to achieve energy resilience within 10-20 years. The area covered by this evidence base includes the districts of South Hams and West Devon, plus Dartmoor National Park. The area has around 160,000 inhabitants which is projected to rise by 15-20% over the next twenty years. Over this period, the proportion of the population over 65 will increase from one in five to one in three. There are a high proportion of people living in small isolated rural communities. People are generally very happy with living in this area, though there are specific local concerns about the affordability of housing, transport issues such as congestion and a lack of suitable public transport, and a lack of activities for teenagers. Unemployment is low, with the main employment sector varying across the area.

An analysis of current energy use estimates that there is a broadly equal split across the non-domestic, domestic and transport sectors in SW Devon. There are some differences in terms of breakdown in energy use across the different parts of SW Devon, though compared to the national picture the use of non-gas fuels in the homes is higher throughout. This energy consumption results in approximately £0.4 billion being spent on energy in SW Devon – equivalent to about a fifth of the economic output of the area or about 15,000 full time jobs. This is equivalent to about £2,600 per person per year on energy. Unlike when considering energy demand where there was an equal split between domestic, non-domestic and transport, in financial terms over half of the energy spend is on road transport. This is because fuel duty is a significant additional cost. Similarly, when cost is considered electricity becomes relatively more important than other fuels used in buildings such as natural gas or oil.

An estimate was made of the change in energy demand between now and 2022 as a result of both population growth and central government policy. This indicates that overall, energy demand could fall by 13%. Whilst many of the policies which result in this reduction are set by central government, the implementation requires significant action at a local level. In spite of this, it is estimated that the benefits of reductions in energy demand could be more than offset by rises in energy prices, meaning that overall over this period total spending on energy would increase.

There are significant opportunities to reduce energy consumption from buildings. New buildings offer the best potential to deliver high levels of energy efficiency. The building regulations require a minimum level of performance, which is improved upon over time. It would be challenging to require mandatory significant improvements beyond these standards, though encouraging more self-builders could mean that more aspirational standards such as Passivhaus are targeted voluntarily. There are also significant potential opportunities to develop local policy to help ensure “allowable solutions” contributions are used locally. There is much greater potential in tackling existing buildings. The domestic stock in SW Devon is characterised by having a high proportion of homes with solid walls and that are off the gas grid. There are also a high number of large and potentially under-occupied properties. Energy reduction will need to occur through a range of potential interventions, with the greatest potential from insulating solid walls. There are also large potential longer-term savings if homes could be retrofitted to a standard approaching Passivhaus. Behaviour measures such as purchasing the most efficient domestic appliances or energy saving measures around the house could also save a reasonable amount of energy, at relatively low or no cost. Non-domestic energy use is harder to analyse as it is very dependent on the specific use of a building, though a combination of national policies and pro-active energy management could be expected to lead to reasonable and cost effective reductions in energy use.

Transport is the largest consuming sector of energy in SW Devon. Due to the rural nature of the area, there is a very high dependency on private car use, and for example, most commuting journeys are made by single car drivers. Traditional public transport models are very challenging to implement in rural areas due to low passenger densities and the high level of subsidy required. Going forward, the improving efficiency of vehicles will reduce transport energy use by a modest amount. Savings from other behavioural type measures are potentially very small for the assumptions we have made in this report. There are a number of local schemes in operation, though again their impact at the moment is likely to be small. There is also a lack of detailed local information on people's transport needs. Making more significant reductions in transport energy is likely to require fundamental changes to how people organise their lives across the area, and will only happen if there are attractive alternatives to private car travel.

A review of current assessments of the potential for renewable energy indicates that although a huge step-change in delivery would be required, South West Devon has the natural resources to meet a high proportion of the demand for energy, especially once energy demand is reduced through efficiency measures. Local energy resilience will need to be achieved using a broad mix of technologies, each of which would need to be deployed far more extensively than at present. The technologies with the greatest potential impact are likely to comprise large scale electricity generation, predominantly wind turbines though also PV farms, and building scale renewable heat technologies such as biomass boilers and heat pumps. Each of these technologies has significant barriers to deployment which would need to be resolved.

In overall terms, this evidence base has shown that there is plenty of potential to both reduce energy demand, and to generate more sustainable supplies of energy within the area. Of the opportunities examined here, there is high diversity between the potential measures in terms of impact, cost, number of measures required and whether it is suitable for implementing now or in the longer-term. A series of priority themes and action areas has been identified to take forward to the next steps of the community energy plan. These are:

- **Domestic Retrofit**: Improving the energy efficiency of existing dwellings, generally through fabric measures such as insulation.
- **Domestic behaviour**: Encouraging behaviour measures to reduce energy use in the home, especially around issues of thermal comfort.
- **New Development**: Developing local policy so the benefits of new development are realised in the local area, especially around promoting exemplary self-build projects and the emerging "allowable solutions" policy.
- Reducing energy use from the **non-domestic** sector.
- Reducing **single occupant car travel.**
- **Large Scale Renewable Energy**: Determining the appropriateness of large scale renewable energy generation in SW Devon, and to maximise local benefit where it can be deployed.
- Promoting and implementing **renewable heat technologies** in buildings.
- **Renewable Futures Group**: Keeping abreast of potential opportunities for the area due to new innovations and improvements to emerging technologies.

Contents

1. BACKGROUND TO PROJECT

CHAPTER SUMMARY: This section introduces the background to the South West Devon Community Energy Partnership (SWD CEP). It introduces this evidence base study, which forms the first stage of a Community Energy Plan for the area. The aim of the SWD CEP is to achieve energy resilience within 10-20 years. This is also viewed as a real opportunity to bring economic benefits to the area.

Sustainable Energy Across the Common Space (SEACS)[i] is a three year project (2011-2014) covering Devon, Dorset and Wiltshire in England, and Côtes d'Armor and Lannion Trégor Agglomération in Brittany, France. The partners are working together to raise awareness of climate and energy issues across their territories, to stimulate demand for sustainable energy, and to leave a legacy of tools and processes for others to use. As part of the SEACS project the South West Devon Community Energy Partnership (SWD CEP), supported by Devon County Council, has been formed to produce a community energy plan (CEP), covering the combined administrative areas of West Devon, South Hams and Dartmoor National Park. The membership of SWD CEP comprises:

Community Groups

- Totnes: Transition Town Totnes
- Ivybridge: PL21
- South Brent: Sustainable South Brent
- Tavistock: Transition Tavistock
- Okehampton: Devon Heartlands and Okehampton College
- North Tawton: North Tawton Environment Trust
- Dartmoor (including Moretonhampstead, Chagford, Buckfastleigh and Ashburton): Dartmoor Circle
- Dartmouth: Dartmouth Academy
- South Hams (including Kingsbridge): South Devon Coastal Renewable Energy Network
- Teign Valley: Greener Teign
- Newton and Noss: Newton and Noss Environment Group

Councils

- Devon County Council (DCC)
- South Hams District Council (SHDC)
- West Devon Borough Council (WDBC)
- Dartmoor National Park Authority (DNPA)

Specialists

- Devon Association for Renewable Energy (DARE).

The community energy plan is comprised of three stages:

Stage 1 – The evidence base.
Stage 2 – Consideration of objectives, strategic options and policies.
Stage 3 – Delivery and action plans.

The Centre for Energy and the Environment (CEE) at the University of Exeter was appointed to undertake Stage 1 (the evidence base) of the CEP. This report presents the findings of the evidence, together with priority areas for councils, individuals and community groups. The aim of the SWDEP is to achieve energy resilience within 10-20 years. Reducing demand for energy, and increasing generation of sustainable forms of energy are also viewed as a real opportunity to bring economic benefits to the area. This evidence base is therefore focussed on identifying opportunities set within the context of these two central ambitions.

[i] Sustainable Energy Across the Common Space': Selected under the European Cross-border Cooperation Programme INTERREG IV A France (Channel) – England, co-funded by the ERDF (see: www.seacs.info)

2. THE SOUTH WEST DEVON AREA

CHAPTER SUMMARY: The area covered by this evidence base comprises the districts of South Hams and West Devon, plus Dartmoor National Park. Within the analysis later in the report, this has required using apportionment methods to estimate the potential for energy demand and supply side measures across the area. The SW Devon area itself has around 160,000 inhabitants, with this projected to rise by 15-20% over the next twenty years. Over this period, the proportion of the population over 65 will increase from one in five to one in three. There are a high proportion of people living in small isolated rural communities. People are generally very happy with living in this area, though there are specific local concerns about the affordability of housing, transport issues such as congestion and a lack of suitable public transport, and a lack of activities for teenagers. Unemployment is low, with the main employment sector varying across the area. For example, tourism related sectors feature strongly around Dartmouth and Kingsbridge, whilst manufacturing and wholesale are more significant around Ivybridge and Okehampton.

2.1. SW DEVON: CLASSIFICATION OF THE STUDY AREA

The geographical area covered by the South West Devon Community Energy Partnership comprises the districts of South Hams and West Devon, and Dartmoor National Park (Figure 1). Whilst the majority of Dartmoor falls within these districts, it also extends into Teignbridge and to a very minor extent, Mid-Devon (under 0.5% of Dartmoor, only 6 postcodes). This evidence base mainly collates existing sources of data, and applies them to SW Devon to establish the potential for energy demand and supply measures. A wide range of data sources has been used at various levels of spatial resolution. Many sources present data at district level, whilst other sources are available at a more detailed level, for example by electoral ward or "super output areas" – small statistical geographic areas. Some data was only available at a regional or national resolution. To apply this data to SW Devon, a range of apportionment techniques was applied. This was a particular issue for Dartmoor, where there was barely any raw data available.

The approach taken within the evidence base was that for every issue examined the output should be made available at each of South Hams, West Devon and Dartmoor, and for the whole of SW Devon. As Dartmoor extends into South Hams and West Devon, the total for SW Devon was generally taken to be the sum of the two districts, plus the component of Dartmoor which lies in Teignbridge. Mid-Devon was excluded from the evidence base to reduce complexity. Initial testing showed that the inclusion of Mid-Devon would have a negligible impact on any outcomes.

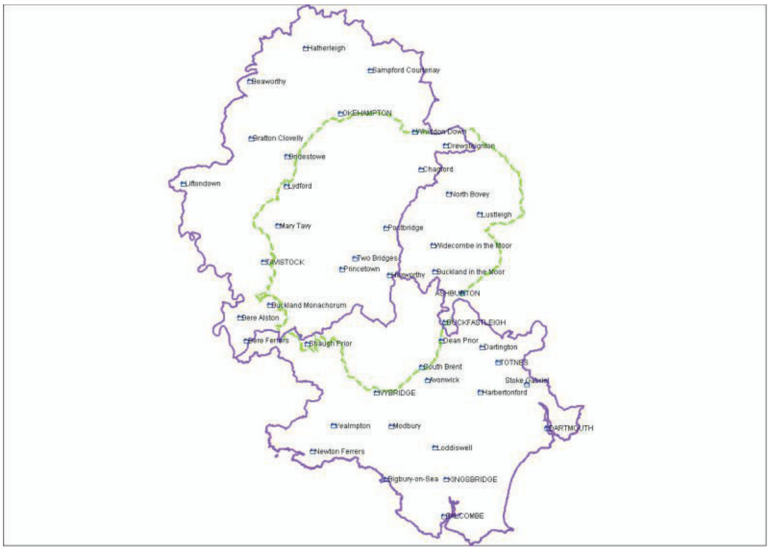


Figure 1: Boundary of the SW Devon Area. The districts of South Hams and West Devon are shown by the purple boundary, and Dartmoor is shown by the green boundary. The area of Dartmoor outside of these two districts falls almost exclusively in Teignbridge.

2.2. SW Devon: Headline Contextual Information

There are about 160,000 living in the SW Devon area (Table 1). Of these, just over a half are in South Hams and just over a third in West Devon and about a quarter of inhabitants living in Dartmoor. The population is predicted to grow by 15 to 20% over the next 20 years. Accompanying this growth will be a demographic shift (Figure 2). At present, those over 65 account for just over 1 in 5 of the population. In 20 years time it this will increase to 1 in 3.

Table 1: Population and Household Estimates for the Area (Source: DCC and 2011 Census)

	Population	Households
South Hams	86,779	36,858
West Devon	55,000	22,725
Dartmoor	39734	14,124
SW Devon	158,220	65,767

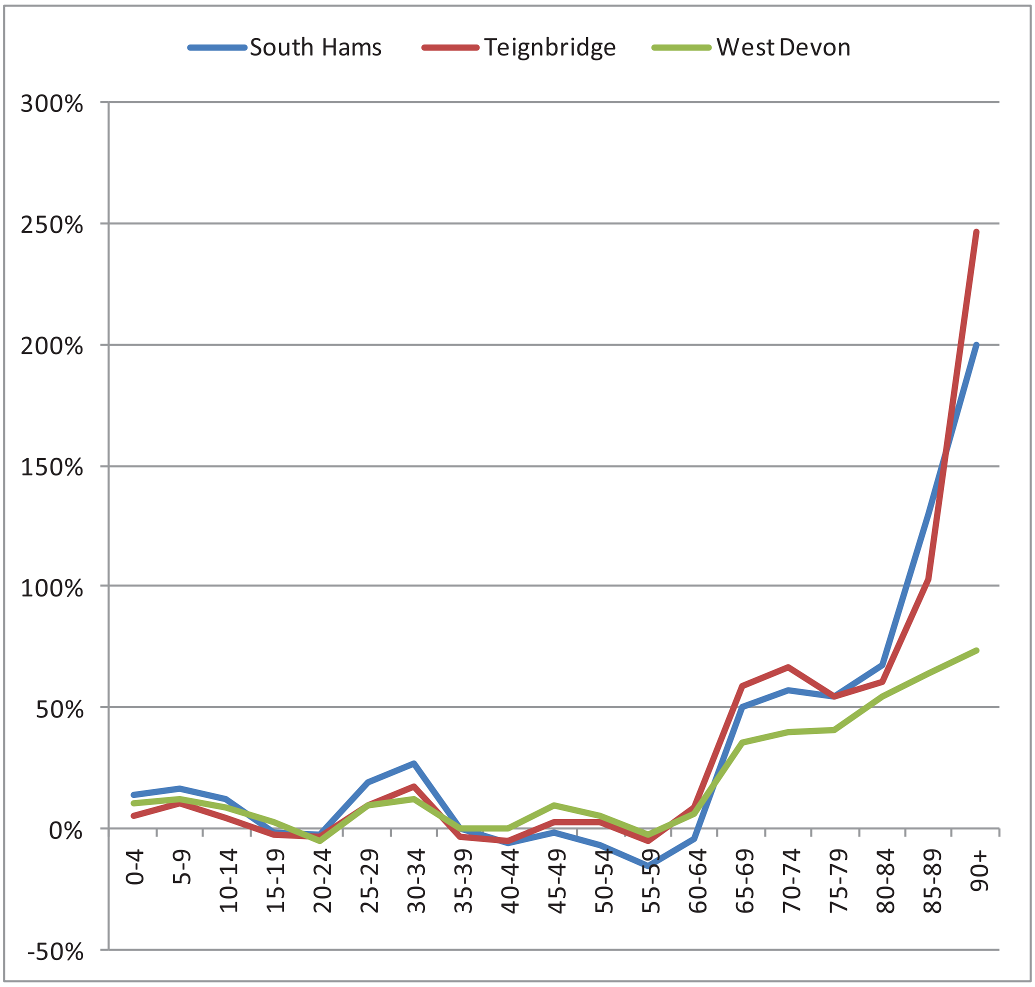


Figure 2: Percentage change in population between 2008 and 2033 across the three districts within SW Devon broken down by age. The high increase in the elderly population is evident (Source: DCC)

DCC has undertaken an analysis of a series of 29 market town areas which make up the county[ii]. The boundaries of these town areas are shown in Figure 3 and key statistics from each of them in Table 2. Across SW Devon, this analysis reveals that:

- People are relatively happy living where they do.
- The area is very rural. For example, almost half of the population in the Okehampton town area are classified as living in isolated rural communities.
- Unemployment and crime rates are typically lower than the Devon averages, which in turn are lower than the national averages. Despite this, job prospects are an area of concern in almost every town area.
- The cost of housing is typically much higher than the national average, whilst income is lower. The lack of affordable housing is a key concern in every part of the study area.
- Transport is also a concern in many parts of SW Devon, mainly due to congestion and a lack of suitable public transport.
- There is an almost universal concern regarding a lack of suitable activities for teenagers.
- There is high variance regarding main employment sector across the area. The main sectors which in some areas feature significantly include retail, education, accommodation and food services, manufacturing and wholesale.

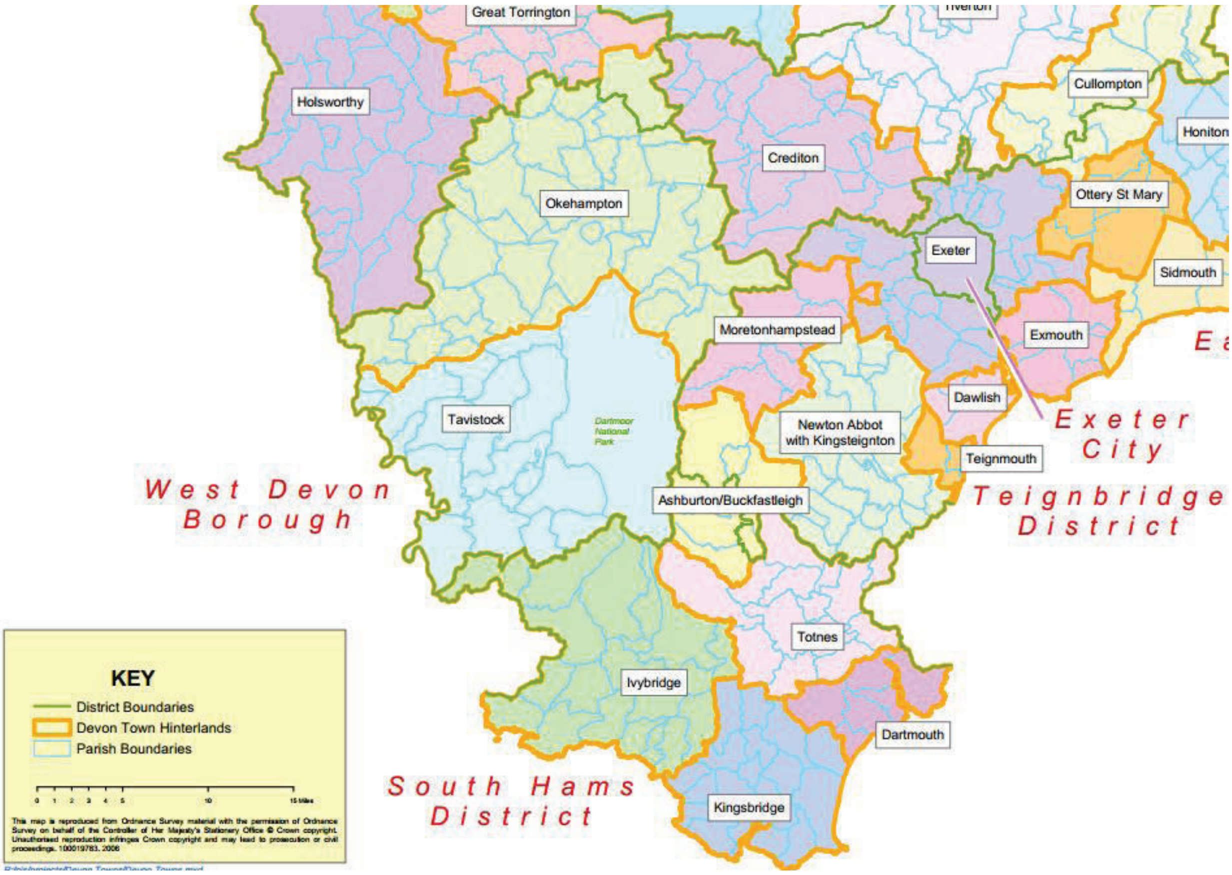


Figure 3: Map of Devon town areas (Source: DCC)

[ii] http://www.devon.gov.uk/devontownprofiles

Table 2: Characteristics of the various market town areas within SW Devon (Source: DCC)

Area	Characteristics	Top five things that need most improving in the area (ranked)
Ashburton and Buckfastleigh	➢ Population: 11,142. Similar age profile as Devon though marginally older. ➢ 26% of "residents of isolated rural communities" with an additional very high proportion (34%) of "Residents of small and mid-sized towns with strong local roots". A significant proportion also classified as "Residents with sufficient incomes in right-to-buy social houses". ➢ Very high proportion of population employed in wholesale sector and in Education specifically in Ashburton. ➢ Similar unemployment to Devon average, and low crime. ➢ Average house price approximately £250,000 – above Devon average though below South Hams average.	➢ Affordable decent housing ➢ Activities for teenagers ➢ Public transport ➢ The level of traffic congestion ➢ Road and pavement repairs
Dartmouth	➢ Population: 10,695. Twice as many over 60s compared to national average. ➢ 43% classified as "Active elderly people living in pleasant retirement locations". ➢ Very high proportion of population employed in accommodation and food services. ➢ High proportion of children living in poverty ➢ Low unemployment and crime. ➢ Average house price approximately £370,000 – this highest in the area.	➢ Affordable decent housing ➢ The level of traffic congestion ➢ Job prospects ➢ Public transport ➢ Wage levels and cost of living
Ivybridge	➢ Population: 36,385. Similar demographics to Devon average – older population than national average. ➢ 20% of "residents of isolated rural communities" and higher proportion of young couples and families in modern homes. ➢ Comparatively high proportion of population employed in manufacturing. ➢ Low unemployment and low crime. ➢ Average house price approximately £250,000 – above Devon average though below South Hams average.	➢ Public transport ➢ Activities for teenagers ➢ Affordable decent housing ➢ Road and pavement repairs ➢ Shopping facilities

Area	Characteristics	Top five things that need most improving in the area (ranked)
Kingsbridge	➢ Population: 19,278. Twice as many over 60s compared to national average. ➢ High proportion of "active elderly people living in pleasant retirement locations" and "residents of isolated rural communities". ➢ High proportion of people employed in retail. ➢ Low unemployment and low crime. ➢ Average house price approximately £345,000 – over twice the national average.	➢ Affordable decent housing ➢ Wage levels & local cost of living ➢ Activities for teenagers ➢ Job prospects ➢ Public transport
Okehampton	➢ Population: 27,184. Similar demographics to Devon average – older population than national average. ➢ 44% of "residents of isolated rural communities" which strongly dominates the classification of households. ➢ Higher unemployment, child deprivation and fuel poverty than Devon average. ➢ Comparatively high proportion of population employed in manufacturing and accommodation and food services. ➢ Average house price approximately £230,000 – just below the Devon average.	➢ Public transport ➢ Affordable decent housing ➢ The level of traffic congestion ➢ Job prospects ➢ Activities for teenagers
Tavistock	➢ Population: 30,054. Similar demographics to Devon average – older population than national average. ➢ 25% of "residents of isolated rural communities" and higher proportion of "Residents of small and mid-sized towns with strong local roots" and "Successful professionals living in suburban or semi-rural homes". ➢ Comparatively high proportion of population employed in education and accommodation and food services. ➢ Low unemployment and low crime. ➢ Average house price approximately £220,000 – below the Devon average.	➢ Activities for teenagers ➢ The level of traffic congestion ➢ Affordable decent housing ➢ Public transport ➢ Job prospects

Area	Characteristics	Top five things that need most improving in the area (ranked)
Totnes	➢ Population: 25,137. Population generally older than both the Devon and national average. ➢ 30% of "residents of isolated rural communities" with an additional high proportion (27%) of "Residents of small and mid-sized towns with strong local roots". ➢ Similar distribution of employment across sectors compared to Devon, though higher concentration in retail. ➢ Low crime and similar unemployment to Devon average. ➢ Average house price approximately £270,000 – above Devon average though below South Hams average.	➢ The level of traffic congestion ➢ Affordable decent housing ➢ Activities for teenagers ➢ Wage levels and cost of living ➢ Job prospects

3. Current Energy Usage and How This May Change

CHAPTER SUMMARY: This chapter estimates the current demand for energy in SW Devon. A statistical method is used to apply key published sources of information to the non-domestic, domestic and transport sectors in SW Devon. There is a broadly equal split across the three. There are some differences in terms of breakdown in energy use across the different areas of SW Devon, though compared to the national picture the use of non-gas fuels in the homes is higher throughout. Projections for the area indicate that population could increase by about 20% over the next twenty years, with a lot of this growth occurring in the over-65s. An estimate was made of the change in energy demand to 2022 as a result of both growth and central government policy. This indicates that overall, energy demand could fall by 13%. Whilst many of the policies which result in the reduction are set by central government, the implementation requires action at a local level.

3.1. Current Energy Usage

3.1.1. Approach to Establishing Current Usage

An exercise was undertaken to understand the current energy use for the SW Devon area. More specific information is given in the technical appendix, though broadly speaking the approach and key challenges involved in this were as follows:

- Regular and credible information on current energy use by district is published by the government (DECC) at a district level. The SW Devon area comprises two districts and Dartmoor National Park. In order to establish energy use in the area, it was therefore necessary to establish energy use for the elements of Dartmoor which fell within each of South Hams, Teignbridge and West Devon. The total energy use in the SW Devon area is therefore the sum of energy use in South Hams, West Devon and the proportion of Dartmoor which lies in Teignbridge. It is for this reason also that a simple sum of South Hams, West Devon and Dartmoor as a whole exceeds energy use for SW Devon.
- In order to establish energy use at a sub-district level, additional data sources and methods had to be adopted. Very simply, this involved using the NAEI dataset which gives carbon emissions by end use and sector at a resolution of 1 x 1 km across the UK. In order to apply this to SW Devon, we undertook an exercise using GIS to overlay the area boundaries with the 1 x 1 km grid and to establish factors to apportion energy use from each grid square to the correct area. For buildings this was based on location of postcode points, and for transport it was major trunk roads, with manual checks undertaken to ensure correct allocation of road energy use at the Dartmoor border.
- Carbon emissions had to be converted back into energy using Defra conversion factors, and these were then scaled to ensure consistency with the latest DECC data for residential, non-domestic and transport energy use.

3.1.2. Discussion of Current Energy Use

The current energy use in the SW Devon area and the districts within the area are shown graphically in Figure 4 to Figure 7. Some key emerging points include:

- In energy terms, there is an approximately equal three way split between the domestic, non-domestic and transport sectors.
- South Hams uses more energy than West Devon which uses more than Dartmoor. This is expected as there is a relationship between population and energy use.
- In terms of energy intensity (energy per person), West Devon is higher than South Hams which is higher than Dartmoor. Whilst domestic energy use is broadly similar across the area, in West Devon there is a higher reactive proportion of non-domestic agriculture fuel and transport fuel. South Hams has the highest non-domestic intensity, which is probably influenced by sites such as

Lee Mill Industrial Estate, and the fringes of Plymouth. Dartmoor has the lowest non-domestic intensity reflecting it's designation as a National Park.

- For all three sectors, there is a mix of fuel types. The biggest difference between SW Devon and the national picture is the mix of fuels within the domestic sector, which includes significant oil usage. This reflects the rural and off-gas nature of the area.
- The majority of transport energy use is from cars, which use almost two-thirds of transport energy.
- An important point to consider is who *owns* this energy use. The results presented here are of energy used *within* the SW Devon area. It is reasonable to state that the domestic energy use is owned by the people of SW Devon. The same cannot be said of the other sectors. For example, transport energy will include energy use of people travelling through the area, in the same way as transport energy use of residents of SW Devon travelling outside the area will not be included. Given the geography of the area, it is likely that energy use due to people travelling between Exeter and Plymouth or in and out of Cornwall will be greater than energy use of SW Devon residents travelling outside the area. Therefore transport energy use could be over-stated.
- Similarly, energy is used by business and industry in the area. Whilst the energy is used *by* those businesses, the goods and services they provide are likely to extend to outside of the area, in the same way as residents within SW Devon will consume goods and services which resulted in energy being used elsewhere (embodied energy). It is likely that the non-domestic energy used due to the demand for goods and services *by* the SW Devon population will exceed the energy used by the non-domestic sector (and transport sector LGV and HGV) *in* SW Devon. There is however a benefit to focussing on energy use of businesses (and the public sector) in the area, as increased efficiency would improve competitiveness which could help to secure growth and jobs for the area.

Figure 4: Breakdown of energy use by sector and fuel in the SW Devon area

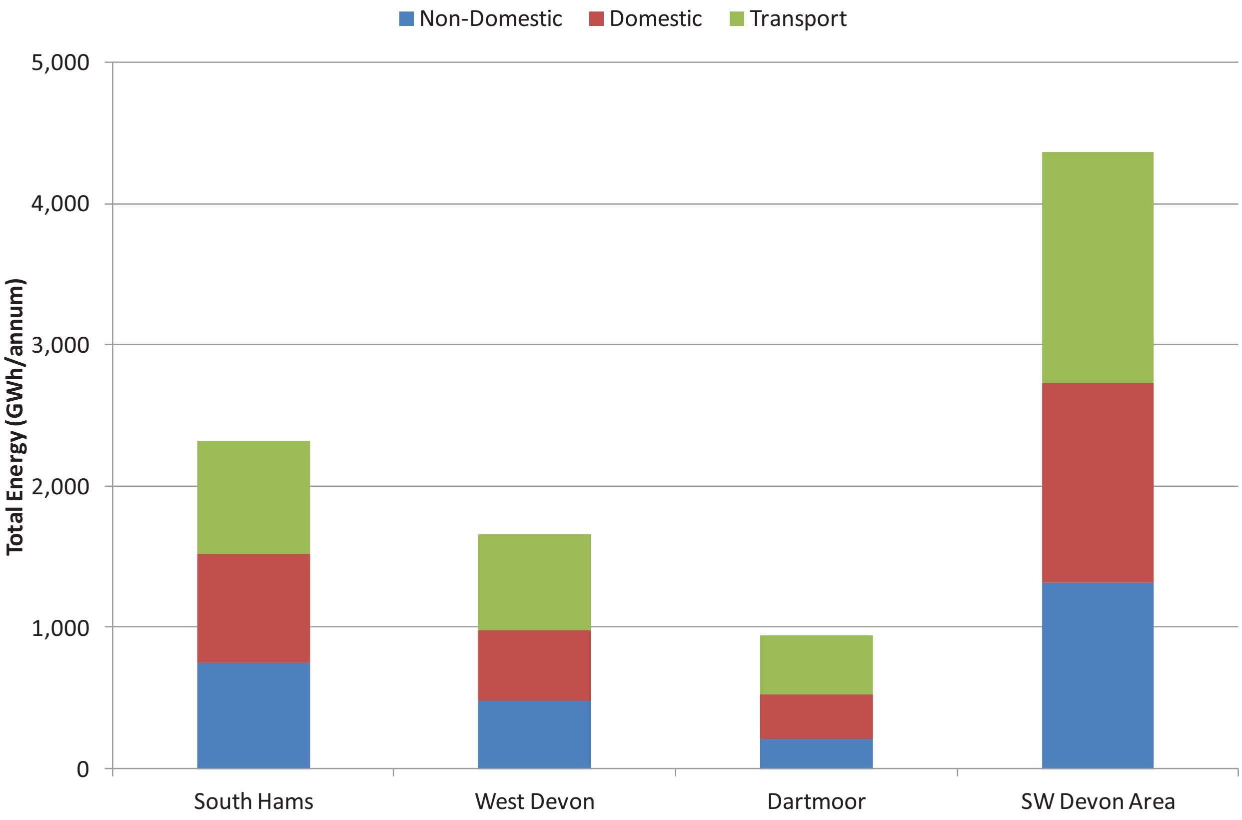


Figure 5: Total energy use in each authority area within SW Devon for the three broad sectors.

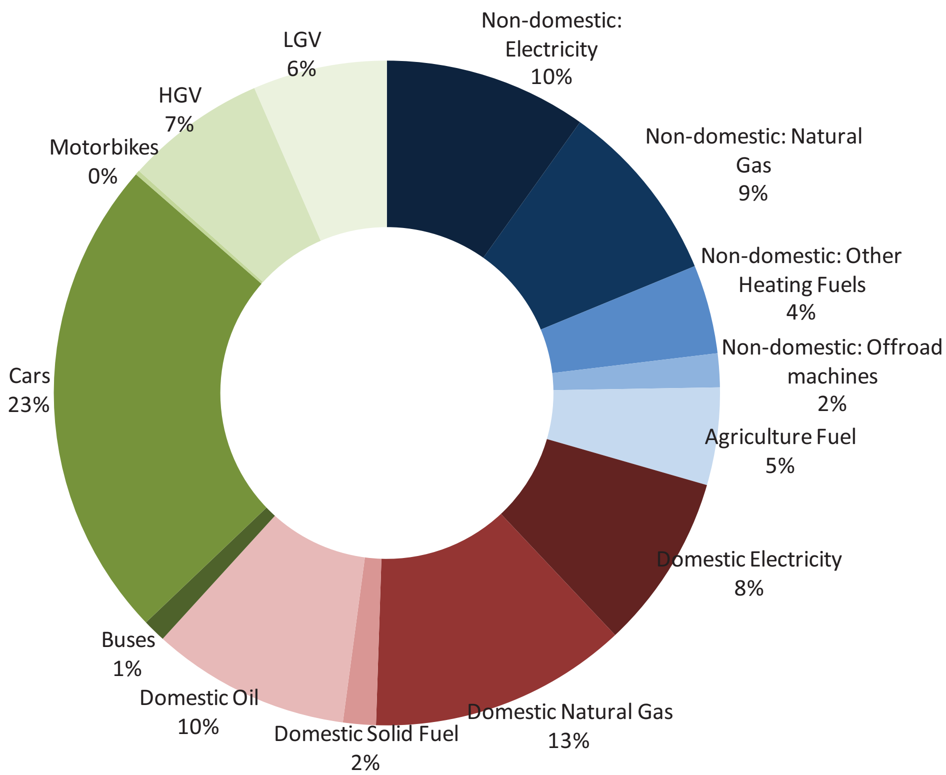


Figure 6: Split of energy use across SW Devon by sector and fuel

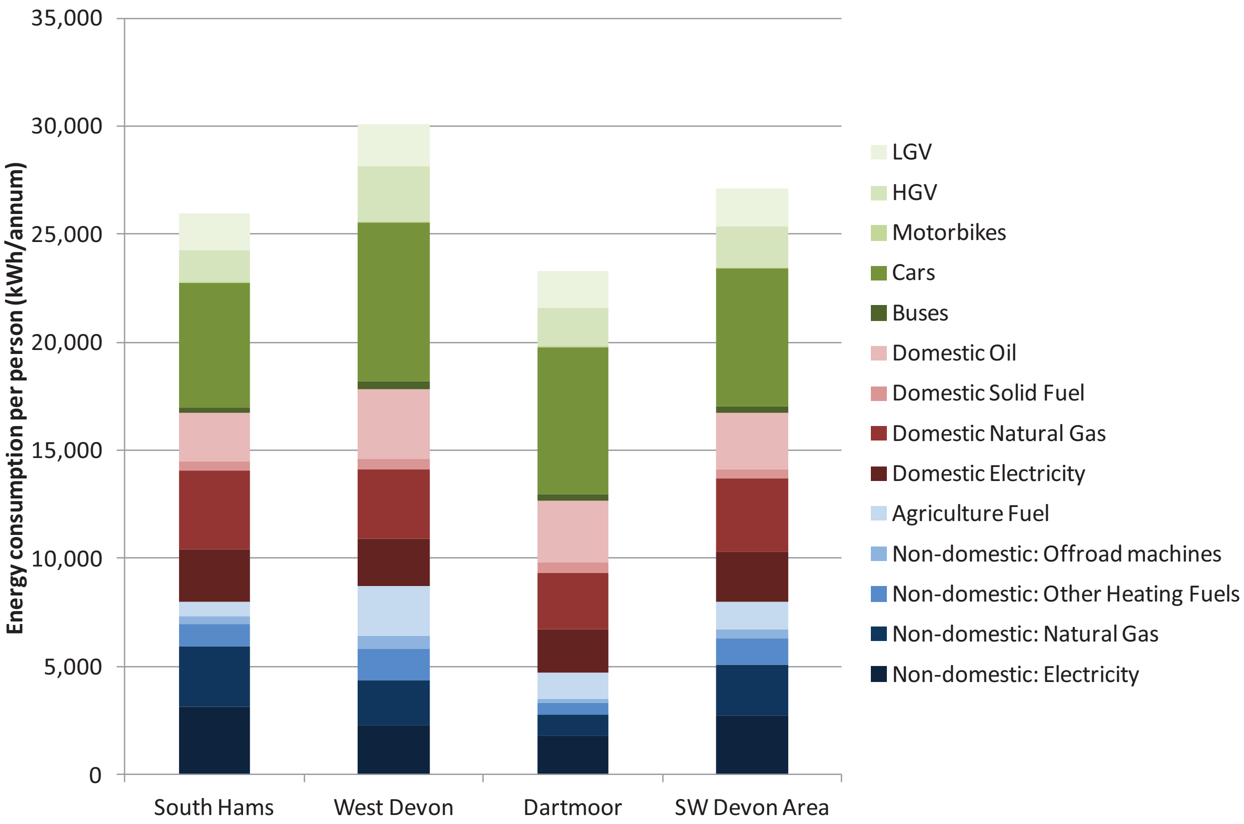


Figure 7: Total energy use per person across each authority area within SW Devon by sector and fuel

3.2. Future Development and Impact on Energy Use

3.2.1. Growth in the Area

Over the next 20 years, the population in the area is projected to increase by 16% in South Hams and 24% in West Devon. This is broadly similar to the equivalent national projected increase of 18% over the same period. There will be a minor increase in the under-65 age bracket, though this will be significant exceeded by the increase to those aged 65+. Across the area, currently just over 1 in 5 people are over 65. By 2033, it will be 1 in 3.

Future planning policy from each authority within the SW Devon area indicates the planned for growth within the area. The projections for South Hams and West Devon are shown in Table 3 and Table 4 . In Dartmoor, the Core Strategy gives an estimated strictly local needs housing provision for the Dartmoor National Park of 50 units per year between 2006 and 2026.

Table 3: Planned growth in South Hams from 2006 Development Plan and 2011 Site Allocations

	Development up to 2016		Development beyond 2016	
	Dwellings	*Employment land (Ha)*	*Dwellings*	*Employment land (Ha)*
Dartmouth	200	2	345	2.6
Ivybridge	100	5	325	5

Kingsbridge	185	1.6	300	1
Totnes	523	4.1	180	0.3
Rural areas - local town centres[iii]	200	2.5	150	1.5
Rural areas - villages	315	0.7	350	1.4
Total	1523	15.9	1650	11.8

Table 4: Planned growth in West Devon from 2006-2026 Core Strategy

	Dwellings[iv]	Hectares employment land by 2026
Okehampton	1760	10
Tavistock	1500	13
Local centres and villages	1160	
Total	4400	

3.2.2. Impact of Growth and Government Policy on Baseline Energy Use

In order to estimate the potential baseline change in energy use over time, consideration needs to be given to projected changes to the population, predictions for the economy, and the impact of national energy reduction policy. The Committee on Climate Change (CCC) publish an annual progress report on the UK's performance against climate change targets, together with projections for future performance based on key Government policies. As the change in population is similar in SW Devon to the country as a whole, we used the projections from the most recent CCC progress report (2012) to make estimates of projected energy use in the area to the end of the 3rd UK carbon budget period (2022). The results of this are shown in Figure 8. The policies in conjunction with growth estimates are estimated to result in a reduction in energy demand of 13% by 2022.

[iii] Modbury, Salcombe, Stokenham and Chillington, Yealampton

[iv] The actual development plans are based on an annual number of new dwellings over the period.

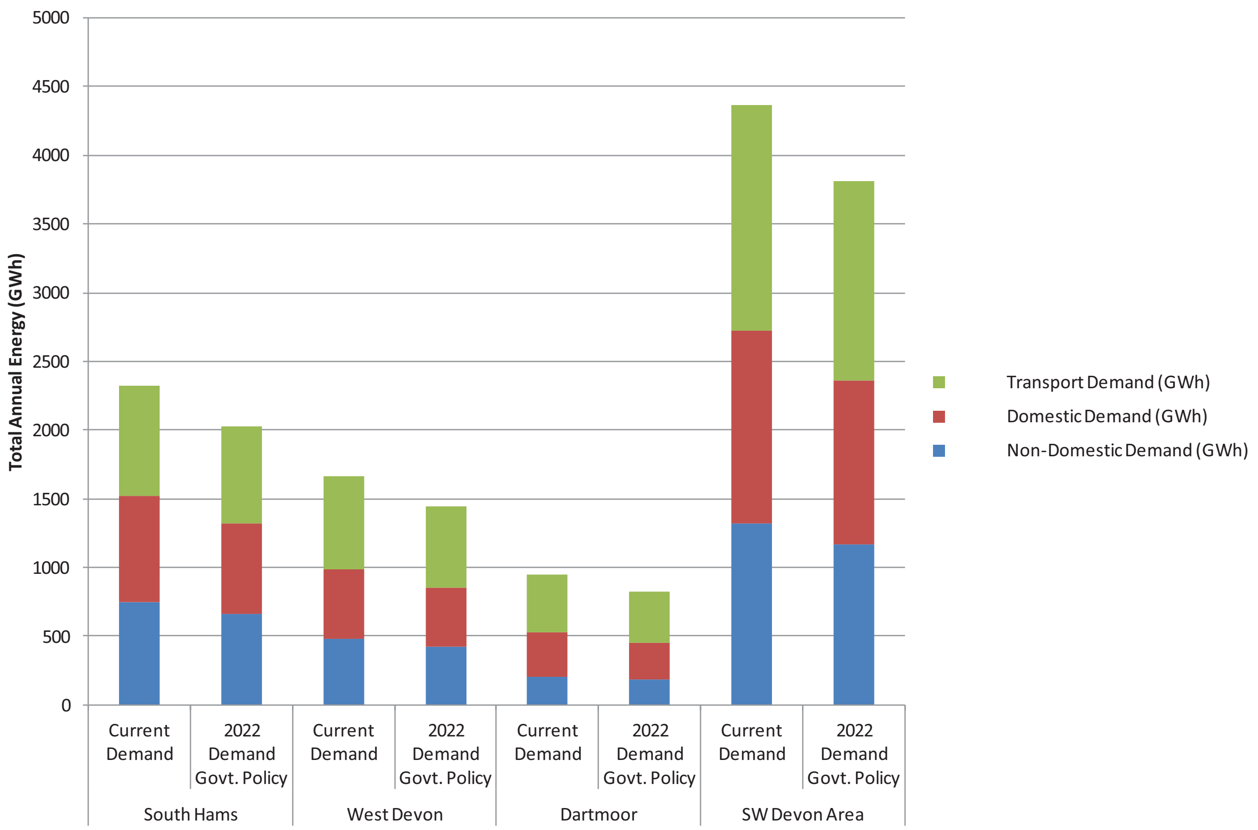


Figure 8: Estimated changes in energy demand in SW Devon between now and 2022 as a result of central government policy

Broadly speaking, the headline government policies covering the areas within the scope of this study are:

- Power: A significant reduction in carbon intensity of the grid, due to increases in both onshore and offshore wind, nuclear and carbon capture and storage. These supply polices are not shown in the graph above.
- Domestic: A 19% reduction in non-electricity demand led by uptake of insulation measures through the Green Deal and increased penetration of efficient white goods leading to a 3% reduction in electricity demand.
- Non-Domestic: Relatively minor energy demand reduction projections – the majority of carbon reduction in this sector is assumed to come from increased biomass penetration and the lower carbon intensity of the power supply.
- Transport: Significant carbon reduction of road transport led by increased efficiency of the vehicle fleet as old cars are replaced by new efficient models, the use of biofuel in the fuel mix, increased electric vehicles and demand side measures such as eco-driver training and "smarter choices".

Whilst these policies are set by central government, it is clear that many of them require significant local action. It is likely therefore that any local policies will be as much to *support* national policy to ensure the often optimistic assumptions are achieved, as well as to result in *additional* energy reduction.

4. Current and Predicted Energy Costs

CHAPTER SUMMARY: This chapter estimates that about £0.4 billion is spent on energy in SW Devon – equivalent to about a fifth of the economic output of the area or about 15,000 full time jobs. This is equivalent to about £2,600 per person per year on energy. Unlike when considering energy demand where there was an equal split between domestic, non-domestic and transport, in financial terms over half of the energy spend is on road transport. This is because fuel duty is a significant additional cost. Similarly, when cost is considered electricity becomes relatively more important than other fuels used in buildings such as natural gas or oil. It is estimated that the benefits of reductions in energy demand due to national policies could be more than offset by rises in energy prices, meaning that overall over this period total spending on energy would increase.

4.1. Current Costs

An estimate was made of the current spend on energy in SW Devon. The calculations have been based on the estimated energy demand from Section 3, together with current fuel prices from a number of sources. The results of this are shown in Figure 9 to Figure 13 and in Table 5. Key findings from these reveal that:

- Whereas in energy terms there was an even split across the three main sectors, when converted to cost the transport sector is the largest. It is responsible for over half of energy spend, and almost 60% in West Devon and Dartmoor. This is because a large proportion of road transport fuel price is fuel duty, which makes it more expensive.
- Similarly, the relative importance of electricity is amplified when converting from energy use to cost, as electricity is a more expensive fuel than other fossil fuels such as natural gas or oil. The underlying reasons for this explain why at the moment it is also more carbon intensive.
- Over £400,000,000 is spent on energy in SW Devon, with over half of that in South Hams.
- The equivalent of £2,600 is spent per person per year on energy.
- Over £600 is spent per person a year on energy use in the home. This equates to over £1,500 per average household.
- An equivalent of over £1,000 a year is spent per person on all non-domestic and transport logistics (LGV and HGV).
- About £900 is spent per person on private vehicle use. As explained previously, this may over-state total cost as the overall energy use would likely include people travelling through the area.
- Put simply, the amount spent on energy in SW Devon is equivalent to about 20% of its economic output, or the equivalent of 15,000 full time jobs.

Figure 9: Breakdown of energy cost by sector and fuel in the SW Devon area

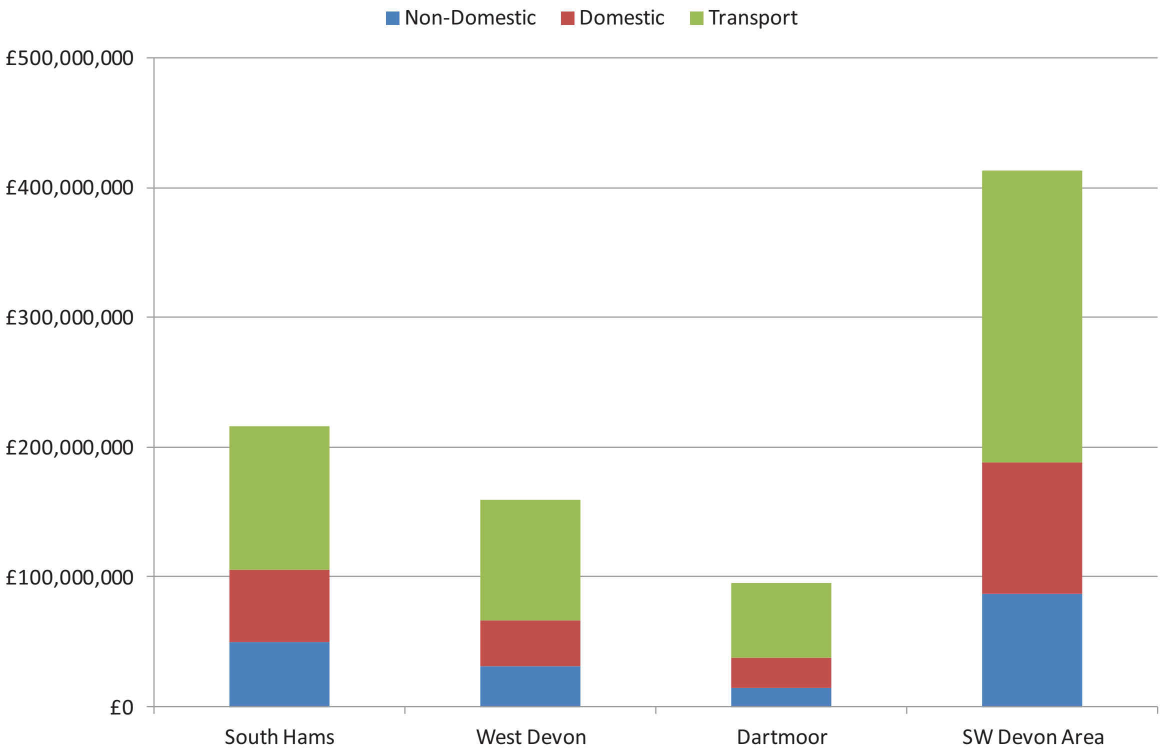


Figure 10: Total energy cost in each authority area within SW Devon for the three broad sectors

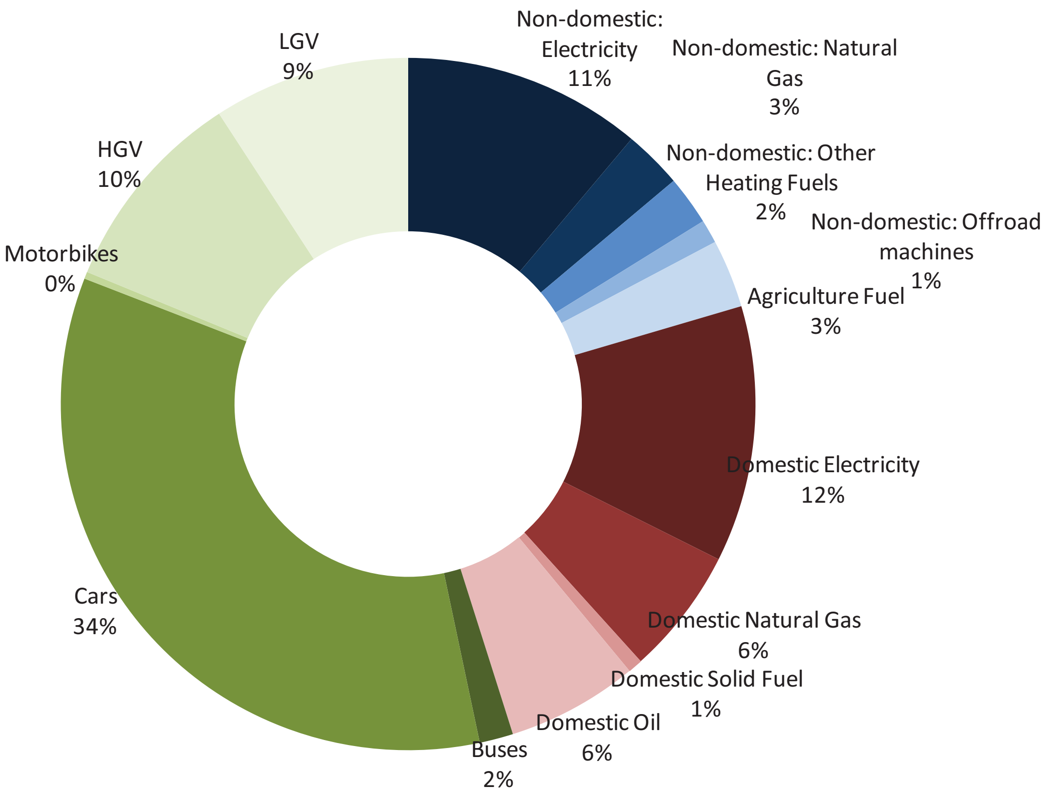


Figure 11: Split of energy cost across SW Devon by sector and fuel

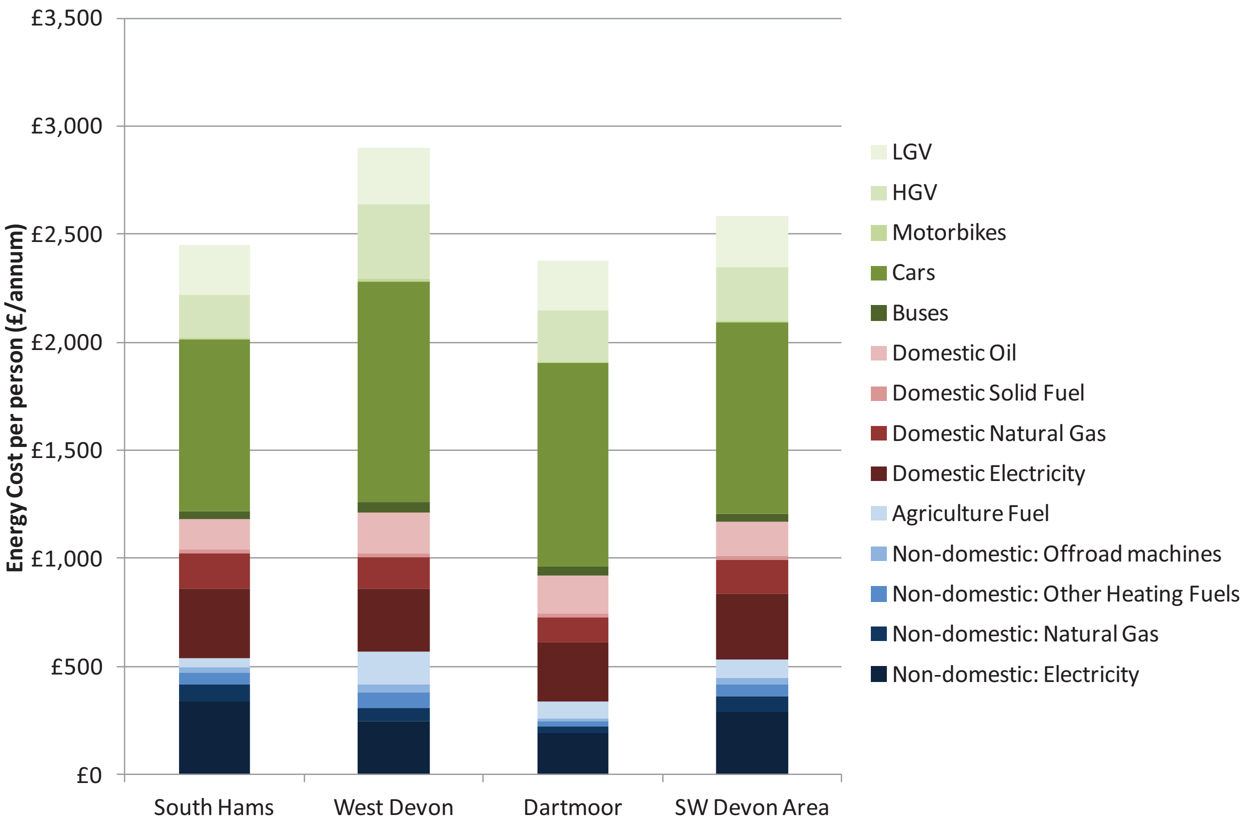


Figure 12: Total energy cost per person across each authority area within SW Devon by sector and fuel

Table 5: Economic Indicators for energy spend in SW Devon

	Non-Domestic	Domestic	Transport	Total	% Energy spend of GVA	Energy spend as equivalent FTE
South Hams	£49,941,281	£56,015,694	£110,133,926	£216,090,900	17.5%	7,132
West Devon	£31,297,828	£35,453,467	£92,680,542	£159,431,837	24.8%	5,368
Dartmoor	£14,636,521	£23,191,232	£57,807,156	£95,634,909	18.7%	3,216
SW Devon	£87,268,975	£101,063,097	£224,581,703	£412,913,776	18.9%	15,166

4.2. PREDICTED FUTURE COSTS

Predicting the future price of energy is notoriously fraught with difficulty. An estimate has been made for the future energy spend in the area by combining the prediction for energy use as a result of growth and government policy with projections for energy prices. These price projections are based on a recent analysis by DECC of future gas and electricity prices for both domestic and business users resulting from implementing their policies. Transport fuel was assumed to increase under a "High" price scenario following the published DECC oil price projections. Although we have previously estimated that energy demand will reduce by 13%, it can be seen from Figure 13 that total energy spend in the area may actually increase by 10%, as the real terms increase in energy prices more than offset the demand reduction.

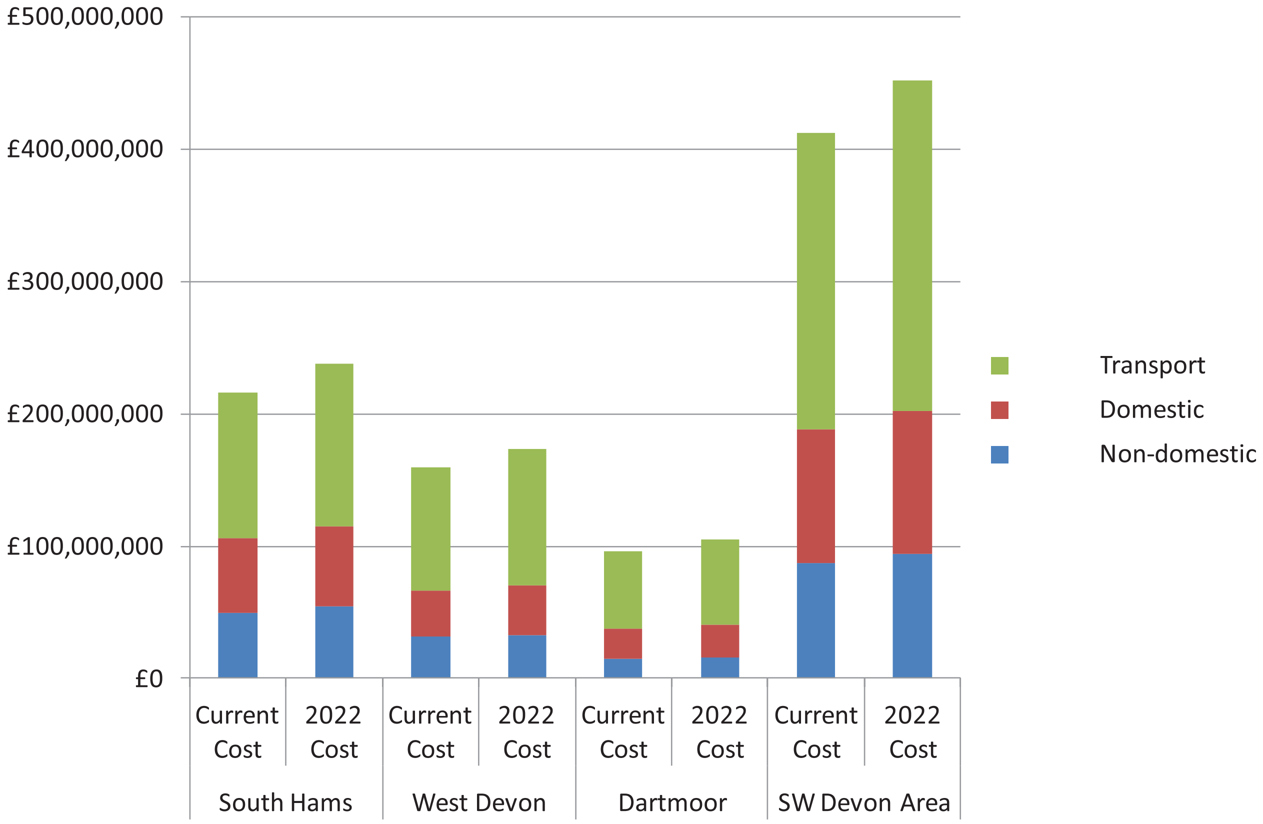


Figure 13: Estimated changes in energy cost in SW Devon between now and 2022 as a result of central government policy

5. Opportunities for Energy Reduction from Building and Construction

***CHAPTER SUMMARY:** There are significant opportunities to reduce energy consumption from the domestic sector. New buildings offer the best potential to deliver highly energy efficient buildings. The building regulations require a minimum level of performance, which is improved upon over time. It is unlikely that improvements beyond these standards could be made mandatory, though encouraging more self-builders could mean that more aspirational standards such as Passivhaus are targeted voluntarily. There are also potential opportunities to develop local policy to help ensure "allowable solutions" contributions are used on local projects. There is much greater potential in tackling existing buildings. The domestic stock in SW Devon is characterised by having a high proportion of homes with solid walls and that are off the gas grid. There are also a high number of large and potentially under-occupied properties. Energy reduction will need to occur through a range of potential interventions, with the greatest potential from insulating solid walls. There are also large potential longer-term savings if homes could be retrofitted to a standard approaching Passivhaus. Behaviour measures such as purchasing the most efficient domestic appliances or energy saving measures around the house could also save a reasonable amount of energy, at relatively low or no cost. Non-domestic energy use is harder to analyse as it is very dependent on the specific use of a building, though a combination of national policies and pro-active energy management could be expected to lead to reasonable and cost effective reductions in energy use.*

5.1. New buildings

New buildings represent the best opportunity to design in high levels of energy efficiency at their outset. The energy performance of new buildings is legislated through the Building Regulations, and more specifically Approved Document L on the conservation of fuel and power. These regulations are tightened periodically, with the next iteration of the regulations due later in 2013. The regulations represent the minimum acceptable energy performance of new buildings. In addition to this, planning policy can be used to further improve standards. For example, West Devon Borough Council Strategic Policy 2 states *"at least 10% of all energy to be used in new development of more than 10 dwellings or 1000m² of non-residential development should come from decentralised and renewable or low carbon sources unless it can be demonstrated that it would affect the viability of the scheme or is not practical on the site."* Whilst this policy could lead to a building which only just meets the minimum standards, in theory making additional efficiency savings would mean less renewable energy would be needed to meet the 10% target. If a planning authority were to require improved minimum standards beyond the Part L minimum, then a case would need to be made to the Planning Inspector as to why local conditions mean this is viable. This is likely to be challenging. The trajectory of Part L means that from 2016 new homes will be "zero carbon", and commercial buildings from 2019. The carbon emissions are calculated using theoretical calculations, and are based only on "regulated" emissions i.e. from building systems such as boilers, cooling, ventilation and lighting, though not from any equipment in the building. Meeting these targets will be achieved using a three tiered hierarchy as shown in Figure 14.

- Energy Efficiency: A minimum standard of fabric efficiency will be required, for example, the heat loss from the building surfaces, or from air leakage (draughts).
- Carbon Compliance: A minimum amount of carbon reduction achieved on-site, either from increased fabric efficiency, renewable energy or "connected heat" such as district heating schemes.
- Allowable Solutions: There is recognition that it would not be technically or economically possible for all buildings to achieve "zero carbon" on-site. Therefore there is an emerging policy on "allowable solutions"[v]. Effectively, these will enable a developer to pay for additional carbon reduction which may be offsite and could be local or national. Examples of the kind of projects allowable solutions could support include district heating schemes, social housing retrofits and LED street lighting.

[v] Zero Carbon Hub 2012, Allowable Solutions Evaluating Opportunities And Priorities

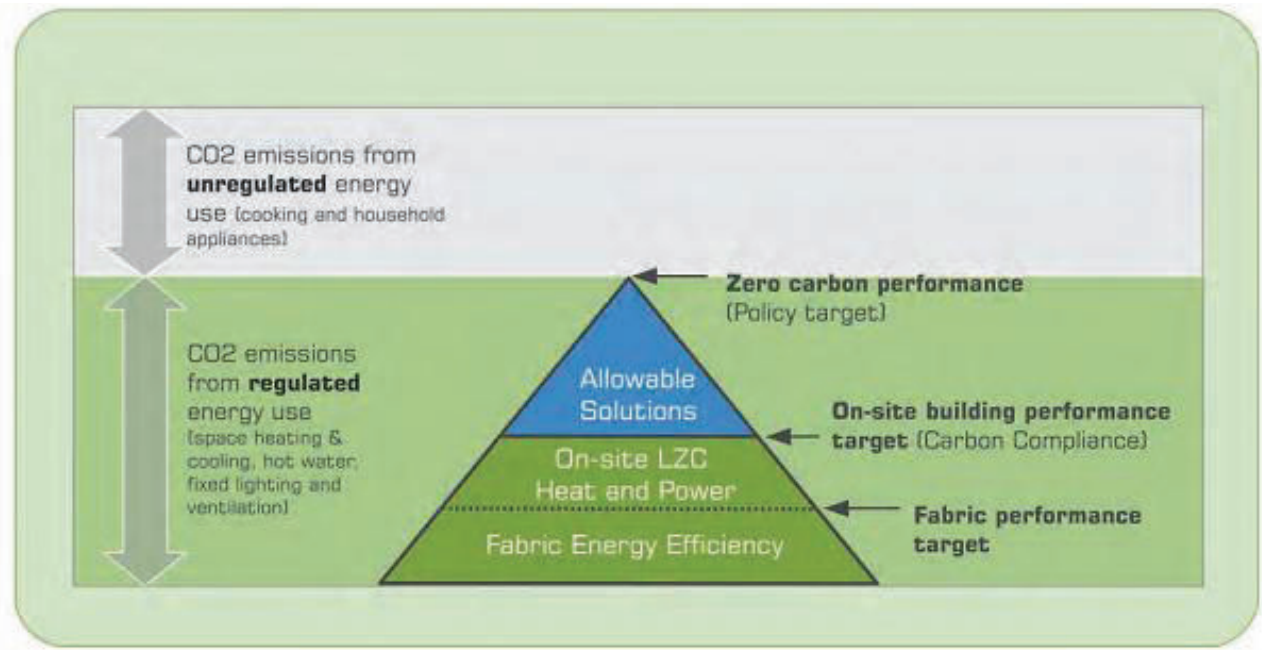


Figure 14: Carbon reduction policy hierarchy for zero carbon homes (Source: Zero Carbon Hub)

The current estimate for allowable solutions is that they would cost £46 per tonne of carbon dioxide over a 30 year period. It has recently been shown that this level of abatement is lower cost than many potential projects that this funding could be used for, and so it is suggested that the fund could be used as match funding to carbon reduction projects. Developers would have the choice to pay allowable solutions contributions to national schemes, or to community projects. An estimate of the potential value of these contributions up to 2026 in SW Devon has been estimated based on development projections from local plans (Table 6). The total value to SW Devon could be £16 million. This could only be used in community projects if there is local policy in place, and a schedule of community schemes with cost effective carbon abatement measures. There is the potential for allowable solutions funding to be combined across the SWD CEP area if local planning policy was to be developed through the new local plan. It is recommended that this is an area local planning authorities consider.

Table 6: Potential Value of Allowable Solutions in SW Devon

	Homes (number)	Employment Space (Ha)	Allowable Solutions Homes	Allowable Solutions Employment Space	Allowable Solutions Total
South Hams	1,650	8.3	£2,700,000	£4,800,000	£7,500,000
West Devon	2,200	8.1	£3,800,000	£4,700,000	£8,400,000
Dartmoor	500	n/a	£870,000	n/a	£870,000
Total	4,017	16	£6,800,000	£9,500,000	£16,000,000

It is generally challenging to persuade developers to go beyond minimum regulatory standards. However, there can be many benefits. The Passivhaus standard for example is likely to be cost effective over the building's lifetime, and could lead to improved comfort too. In Germany where the standard is used much more widely, the capital cost uplift is estimated to be 3-8% compared to a minimum standard building, and there is a variety of assistance available for financing this cost[vi]. Implementing Passivhaus in new

[vi] NHBC Report 47, Lessons from Germany's Passivhaus experience, 2012

developments is more likely to be driven by self-builders and small developers than volume house-builders, and given the forecast development in the area the actual magnitude of the savings would only be comparatively small. However, there is an opportunity for the area to be at the forefront of UK development in the area, if local demand for these buildings can be stimulated. Passivhaus is not only constricted to new development. It can also be applied as a refurbishment of existing buildings, with a good local example being the Totnes Passivhaus Bed and Breakfast[vii] near Dartington.

5.2. REFURBISHMENT OF EXISTING DWELLINGS

Whilst new buildings have the potential to have good energy performance built into their design, the significant majority of energy use within buildings will come from the stock which already exists. A high level analysis was undertaken of the potential for energy reduction in homes in SW Devon. This drew on many sources, with two main sources of data being from the Energy Savings Trust (EST). The first of these was a series of detailed datasets describing the condition of the housing stock. This information was available at ward level, though has been presented here at a district level. More detailed information could be sought through discussions with the EST. The second key source was a large-scale field study of electricity use in over 250 households, again by the EST. Our calculations are generally based on a "typical" UK house – clearly actual savings in any particular property will depend on circumstances. The main measures we considered together with headline assumptions are shown in Table 7. When undertaking the calculations we accounted for both the "comfort factor" (that improvements in efficiency are sometimes used to "buy" comfort rather than a reduction in energy[viii]) and the "heat replacement effect" (where energy savings in electrical devices needs to be partially offset by useful gains which contribute to space heating e.g. replacing an old inefficient light bulb with an LED would result in lower electricity consumption though higher space heating requirements).

Table 7: Measures and assumptions considered for refurbishment in homes

Measure	Broad Assumptions
Cavity Wall Insulation	About half of all homes in SW Devon have insulated cavity walls. There are about 19,400 unfilled cavity walls in the area. Once "Hard to Fill" (generally too narrow, random stone or wall faults) cavities have been removed, this leaves about 11,500 cavities to be filled.
Solid Wall Insulation	There are approximately 14,200 solid wall properties, which when the "Hard to Fill" cavity properties are added to, results in 22,100 potential properties. An estimate was made of the number of listed homes, and these were removed. For demonstration purposes it has been assumed that the remainder of these properties have the potential to incorporate solid wall insulation. It was assumed that 75% of properties would be externally insulated, with the remainder internally insulated. This measure will be targeted through the Green Deal and specifically ECO, though the estimated take-up rates by the government are significantly lower than the maximum theoretical potential we have presented here, with the actual "outturn" of solid wall insulation measures being lower still.

[vii] http://www.passivhausbandb.co.uk/

[viii] The impact assessment for the Green Deal and ECO states that an academic review suggests a range of between 10% and 30% reduced energy savings due to the direct "rebound effect". http://www.bre.co.uk/filelibrary/accreditation/GreenDeal/publications/DECC-Green-Deal-Impact-Assessment.pdf

Measure	Broad Assumptions
Loft Insulation	There is very limited potential for installing virgin loft insulation. Only 2% of homes have no (0-50mm) insulation. Around 45% of homes have lower than recommended levels of insulation (50-150mm). It was assumed all of these properties were topped-up to 300mm. There are diminishing returns with insulation thickness – the annual energy saving of going from no insulation to 270mm is just under 4,000 kWh, but only 500 kWh going from 100mm to 270mm.
Glazing	Two measures were considered for glazing improvements. The first of these was replacing all existing single glazing with either double or secondary glazing. The actual amounts of single glazing within a property were estimated from the BRE's Domestic Energy Factfile. Secondly, the potential saving that could be achieved by then replacing all double glazed windows with triple-glazed windows was explored. Whilst this is likely to be an expensive measure now, the same was true when double glazing first emerged, and it is now cheaper than single glazing.
Draughtproofing	Two measures were considered. Firstly, simple draughtproofing measures were implemented to convert "leaky" homes to ones on a par with the minimum acceptable standard of today's building regulations. This calculation was based on the estimated proportion of homes which already have reasonable draughtproofing. Then, an additional calculation was undertaken to estimate the potential for improving the air-tightness to much better levels. This would involve much more effort and potentially disruption, and is much easier to build into a new home than to retrospectively apply. It was modelled to see the potential, and because the next measure (MVHR) should not be implemented in a home unless it is reasonably airtight.
Mechanical Ventilation with Heat Recovery (MVHR)	Mechanical Ventilation with Heat Recovery involves providing and extracting ventilation air mechanically through ducts and electrically driven fans. The warm exhaust air is passed over the cold incoming air within a heat exchanger, resulting in a transfer of heat from exhaust to supply – the heat is therefore kept within the building. This measure assumed all homes in SW Devon were made to be reasonably well sealed (permeability 3 $m^3/h.m^2$@50Pa). It was then assumed that MVHR could be applied to all households and that high heat exchange efficiency could be achieved.
Boiler Replacements	Boiler replacements were not specifically modelled here. Whilst there are likely to be energy savings as old boilers are replaced with newer boilers, replacing old systems with renewable sources of heat such as biomass boilers or heat pumps were chosen as the preferred option, given the headline aim the SWD CEP of becoming energy resilient.
Tank and Primary Pipework Insulation	The number of potential homes requiring insulation to hot water storage tanks was estimated from BRE data. It was assumed that these properties would also be fitted with insulation to the pipework between the tank and the boiler (the primary circuit).

5.3. Behaviour and Equipment in Dwellings

As with physical refurbishment measures to existing homes, estimates were made for the potential reductions in energy demand resulting from a series of measures relating to behaviour and equipment. The measures considered are relatively conservative in their nature, though they assume everyone takes them up. The potential scope of measures that could be considered as behaviour change is much larger. For example, more energy would be saved if the entire population of SW Devon abandoned their televisions and associated hi-fi and video consoles and instead spent time partaking in less energy intensive activities such as gardening, than we have estimated could be generated by PV panels on domestic roofs in the area. Whilst it isn't practical to model large numbers of potential scenarios such as these, it should be borne in mind that there could be a greater latent potential to reduce energy use through fundamentally changing the way we live our lives. However, significant energy reduction across the area would only correspondingly occur if significant numbers of people went down this path.

Table 8: Measures and assumptions considered for behaviour measures in homes

Measure	Broad Assumptions
Low Energy Lighting	It was assumed that all old style "GLS" light bulbs will be replaced by compact fluorescent (CFC) and that all halogen bulbs (low voltage and mains voltage) will be replaced by LED equivalents. These alternatives are commonly available and reasonably priced. No estimate was made for further savings which could be possible through behaviour change such as better management.
White Goods	It was assumed that all white goods (cold goods and wet goods) were replaced with the most efficient types A+ or A++.
Cooking	A series of behaviour measures were modelled, which included replacing one in every four meals cooked in the oven with one cooked in a microwave (e.g. through cooking up larger batches then reheating in the future),using lids on pans, and only boiling as much water as we need in the kettle.
Appliances – Audio Visual (AV)	This assumed all inefficient televisions (CRT or plasma) will be replaced by 32" LED TVs, and that all TVs and other AV equipment are also turned off rather than left on standby.
Appliances – Computers	It was assumed that all computers and related equipment would be turned off rather than left on standby. It was also assumed that desktop computers would be replaced with laptop computers which in general use much less energy. It was assumed that monitors were still used, as they could be used in conjunction with a laptop.
Hot Water Usage	The average length of time for a shower in the UK is 8 minutes. It was assumed that this could be reduced to 5 minutes, and that the flow rate of the shower could be removed through the use of aerating shower heads.
Thermostat Set-Point	A broad estimate of energy reduction through reducing the set-point heating temperature was taken from the EST. This measure was then applied to all properties with the exception of those that are fuel poor, on the assumption that there is a reasonable chance these are presently under-heated. This is a broad measure which could be achieved through simply tolerating lower temperatures, or as a proxy for better control of heating within homes e.g. down to room level. It may be the case that energy savings potential is even larger if the set-point is reduced further, which may be possible through behaviour measures like "dressing for the seasons".

5.4. Summary of Domestic Potential

The total potential energy reduction in homes for a series of potential refurbishment and behaviour measures is shown in Figure 15 and Figure 16. If all the measures proposed in the sections above were implemented, then domestic energy use would be halved. The remaining "baseline" energy consumption could potentially still be reduced further, though would require more aggressive still efficiency and behaviour measures. Key points from this analysis indicate that:

- Energy reduction will require a broad range of measures to be implemented very widely across the homes in the area.
- Most of the "low hanging fruit" has been achieved already on the insulation side. There are not many unfilled cavity walls or uninsulated roofs. Though of course, these should be addressed if they can be identified. It is suggested that discussion with EST and the use of their detailed datasets could help to find those properties.
- There is likely to be some potential to reduce energy use through simple draughtproofing and central heating insulation measures, which are low cost and not disruptive.
- The single measure with the greatest overall potential is the insulation of solid walled homes. However, it is also probably the most challenging, both in terms of cost and disruption. In addition, where changes in visual appearance would be a problem (e.g. in the National Park), then internal insulation is more disruptive still.
- The Green Deal and more specifically the ECO will help to implement some of these measures. Through the ECO Home Heating Cost Reduction Obligation (HHCRO) and Carbon Saving Community Obligation (CSCO) 37% of remaining properties requiring cavity wall insulation and 24% of solid wall properties are eligible for support. The SWD CEP already has a task force prioritising improving the insulation of existing dwellings through Green Deal/ECO or local alternatives, and this should remain a priority.
- There are some longer term fabric measures such as triple glazed windows or making buildings airtight and fitting MVHR which could save significant energy. However at the moment they are not cost competitive, and in the case of achieving high airtightness are not straightforward.
- There are some relatively minor savings which could be achieved through modifying behaviour around appliance use and replacing older items with the most efficient models. There are likely larger savings by fundamentally rethinking our relationship with consumer electronics.
- There are potentially significant savings which could come at no or little cost by reducing the temperature of our homes. This could be either through simply reducing the whole house temperature or through considering energy use more intelligently at a room by room basis. This is even more important for larger potentially under-occupied homes, of which there may be a high proportion in SW Devon.

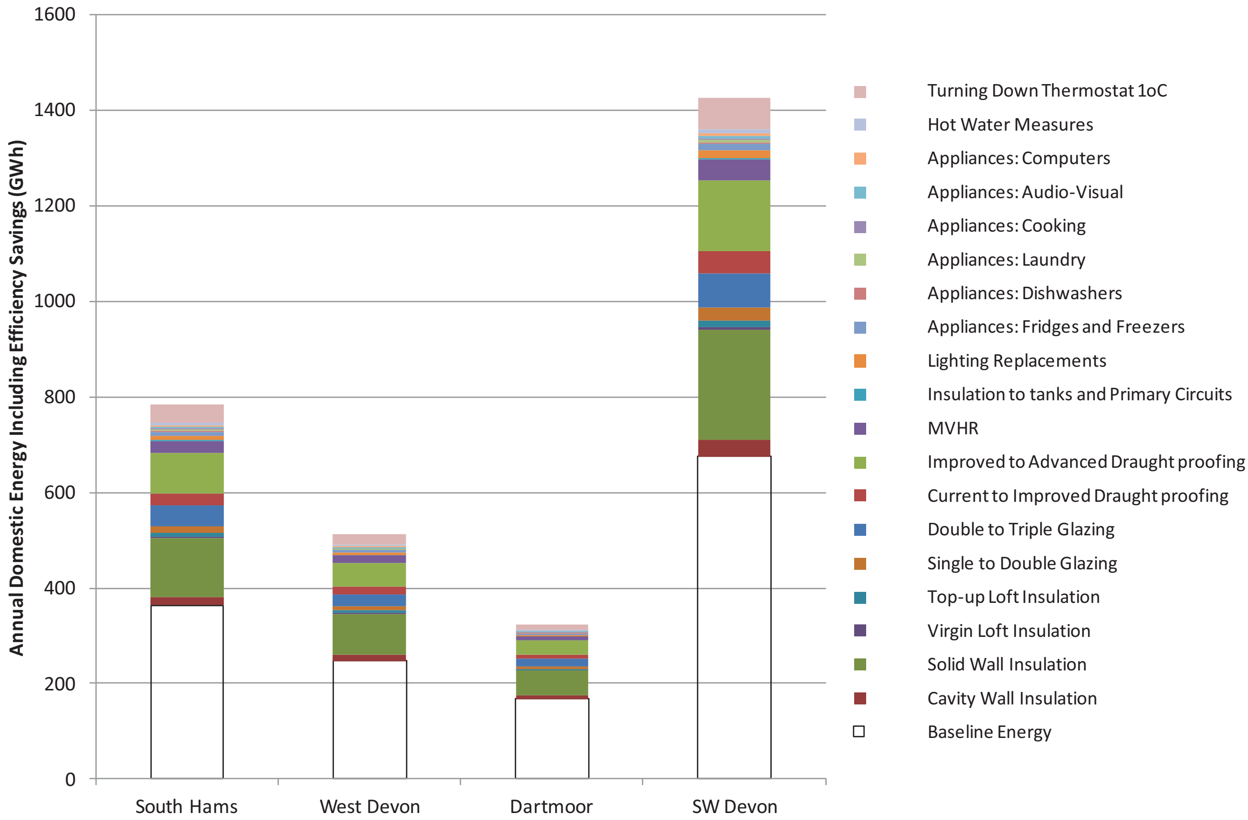


Figure 15: Potential energy savings from a series of energy reduction and behaviour measures. The total height of each stack represents the current domestic energy consumption in each area. If all the measures are implemented in their entirety, then the remaining energy (white bar) represents "baseline" energy. It could be possible to reduce this further by pursuing more aggressive efficiency or behaviour measures.

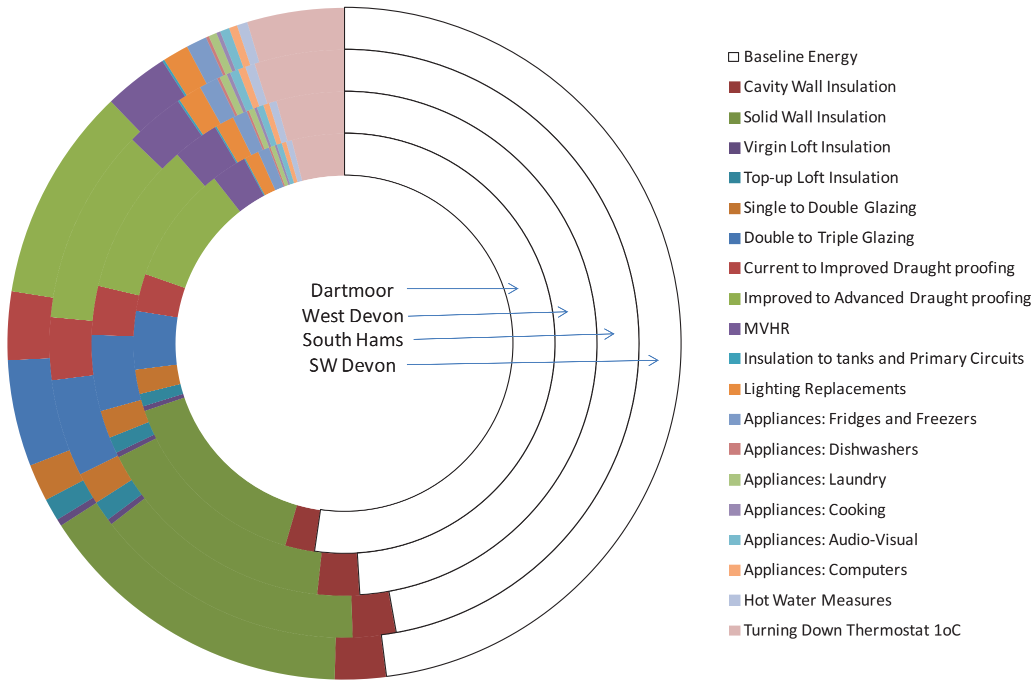


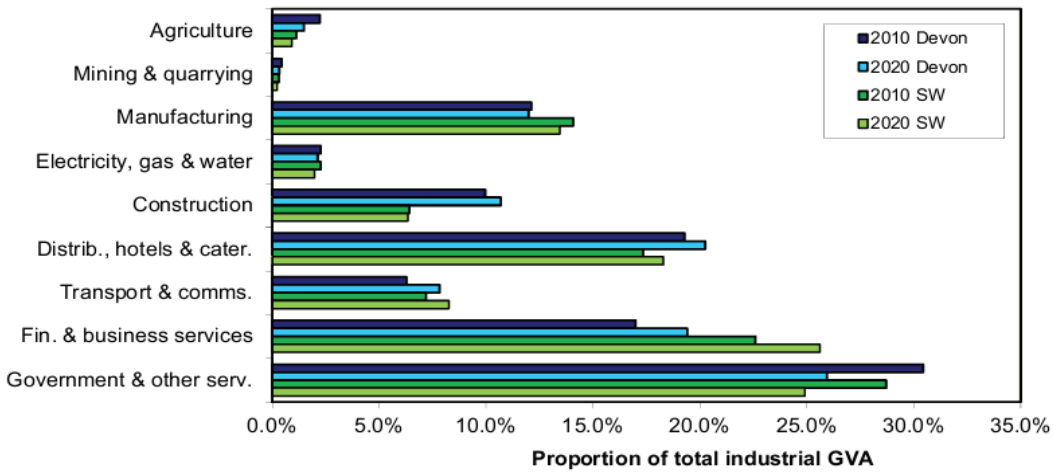
Figure 16: Relative breakdown of potential energy reduction measures in homes compared to the current overall energy use.

5.5. THE NON-DOMESTIC SECTOR

The non-domestic sector is responsible for 30% energy consumption and 20% of spend on energy in SW Devon. The sector itself is highly diverse, making it very difficult to assess the breakdown of energy use, and the energy saving potential. Like the rest of the country, the majority of economic output from the non-domestic sector is from the services sector. The public sector is the largest employing sector in Devon, with distribution, hotels and catering, and financial and business services also being significant (Figure 17). Compared to the wider region, Devon has a stronger emphasis on hotels and catering, construction and agriculture. Each of these sectors uses energy in different ways to achieve different ends. For example, whilst manufacturing is responsible for about 10% of economic output, it disproportionately uses more energy.

There are about 3,000 commercial premises in South Hams and 1,500 in West Devon. Retail and offices make up about half of all buildings, though due to their larger size, warehouses and manufacturing sites account for up to three-quarters of commercial floor area (Figure 18). South Hams has a greater emphasis on manufacturing than West Devon. Each commercial building in the area is about 40% smaller than the national average.

In the public sector, there are about 70 primary schools, 11 secondary schools and 15 large public sector buildings[ix].



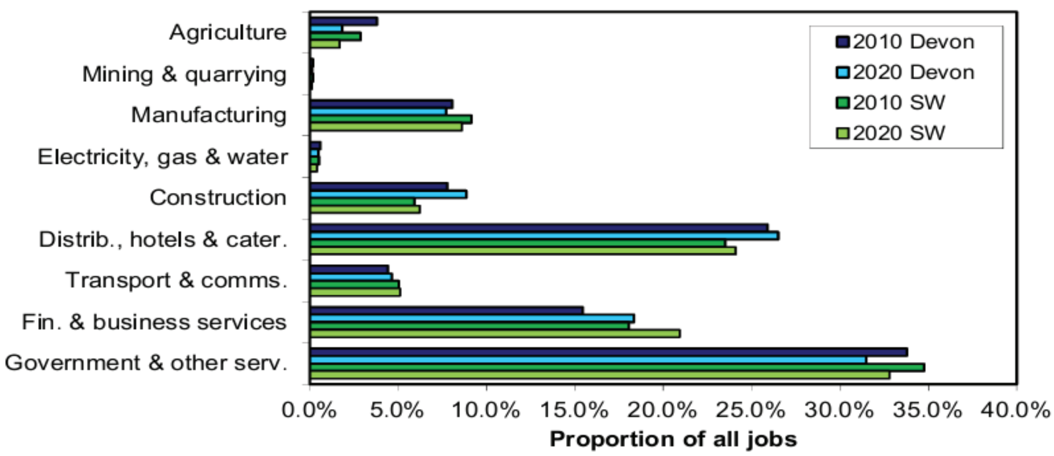


Figure 17: Breakdown of the economy in Devon and the South West in terms of economic output as GVA (top graph) and employment (bottom graph) in 2010 and 2020 (Source: DCC Local Economic Assessment 2011)

[ix] Large being over 1,000 m^2 as counted through lodged Display Energy Certificates.

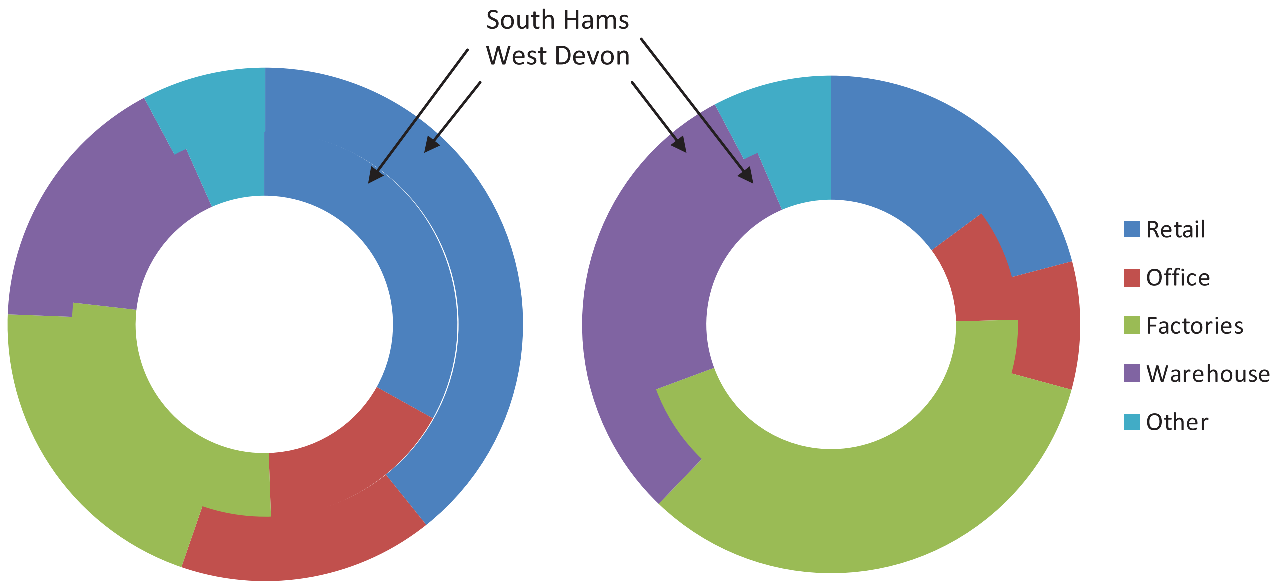


Figure 18: Split of number of commercial "hereditaments" (left graph) and total floor area (right graph) in South Hams (inner rings) and West Devon (outer rings). (Source: neighbourhood Statistics 2005 data)

Energy use will strongly depend on the specific use of the building. Within the services sector the dominant uses for energy will be to provide space heating and lighting. Within the manufacturing sector, energy use will be mainly for industrial processes such as low temperature heating, motors, and high temperature processes (Figure 19). An analysis of electricity consumption data in the area reveals that almost 60% of all electricity is used by the 280 "half hourly" electricity meters. This represents only 2% of total electricity meters. Reducing energy consumption from the most significant energy users in SW Devon could be far more effective than targeting the very high number of small users. Though of course, there are potential benefits to saving energy for a user regardless of scale.

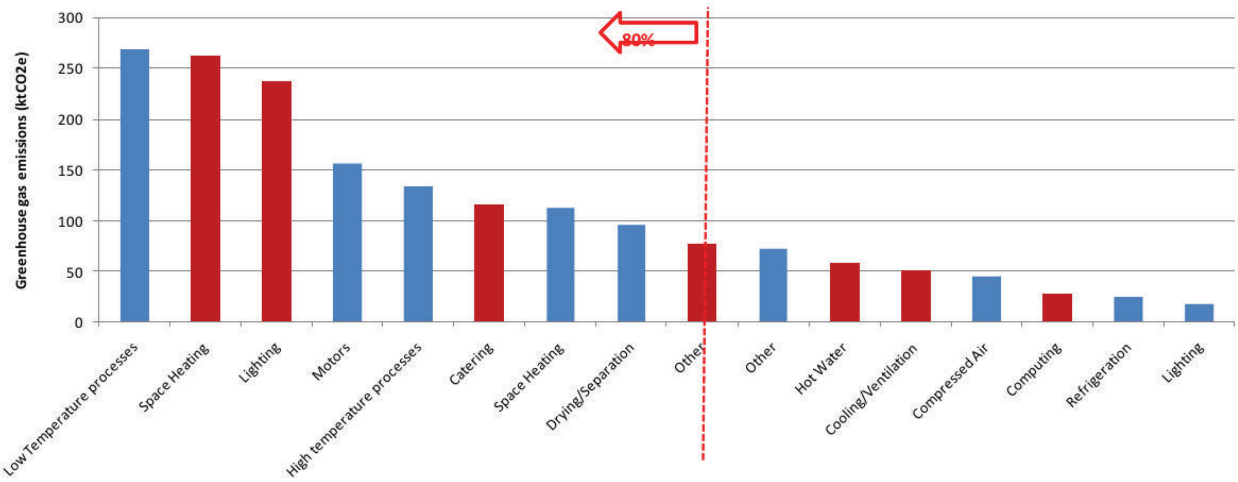


Figure 19: Proportion of non-domestic carbon emissions by end use in the manufacturing sector (blue bars) and the services sector (red bars) within Devon (Source: DCC Local Economic Assessment 2010)

The Carbon Trust[x] state that *"most organisations can save up to 20% on their fuel bills simply by better managing their energy use and investing in cost-effective measures."* Such measures normally pay back

[x] Energy management guide (CTG054) - Carbon Trust, 2011

within two years, and it is not unusual to save 5-10% with just minimal expenditure. This potential energy reduction through better management was applied to all non-domestic energy use in the area as an additional saving to the projected energy reduction from national policy as described in the Committee for Climate Change progress reports (Figure 20).

Observations of past energy trends in the non-domestic sector reveal that the single biggest factor in energy use from a sector is economic growth. For example, the ongoing recession has been very effective at curbing emissions from the non-domestic sector. Similarly, exporting our production (offshoring) is also very effective at reducing apparent energy consumption when considering energy as a supply-side measure. However, when considered in terms of the energy used to produce the goods and services we consume, such actions can increase energy use. For the UK, in net terms the energy embedded within our imported goods and services exceed those of our exported goods and services.

In order to reduce energy consumption within this sector, it will be important for business to be represented in the community energy partnership. Schemes like the Green Deal will be open to businesses, and there is advice available to businesses for example through EU funded projects such as iNets[xi] and Centre for Business and Climate Solutions[xii]. Larger companies can recruit an associate to target energy performance within their company through the government Knowledge Transfer Partnership (KTP) scheme[xiii].

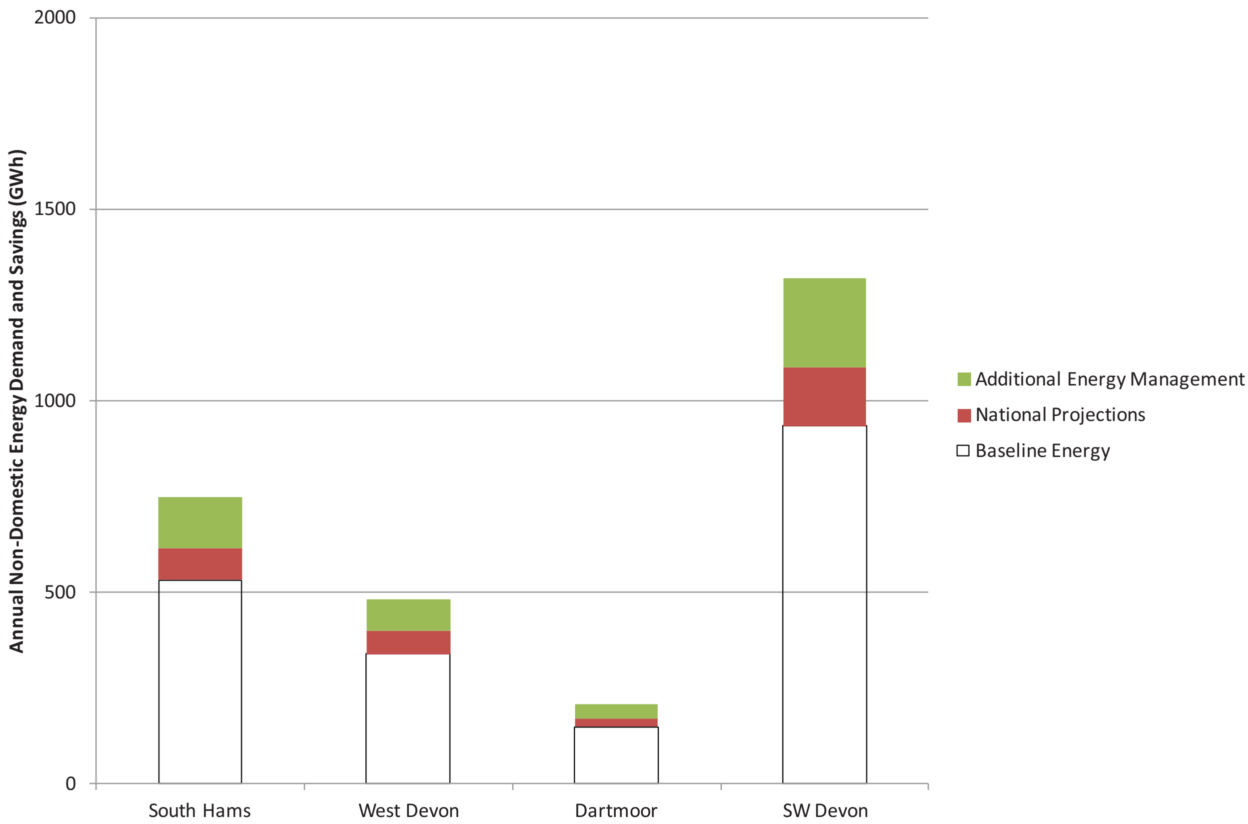


Figure 20: Estimated potential energy savings from national and local non-domestic reduction measures between now and 2022. The total height of each stack represents the current non-domestic energy consumption in each area. The red area represents the national projection for non-domestic energy use apportioned to SW Devon, the green area represents additional potential savings which the Carbon Trust indicate are possible through energy management. The white area represents "baseline" energy.

[xi] http://www.inets-sw.co.uk/
[xii] http://emps.exeter.ac.uk/engineering/research/climateassist/
[xiii] http://www.ktponline.org.uk/

6. Opportunities for Energy Reduction in the Transport Sector

CHAPTER SUMMARY: This section looks at transport energy use in SW Devon and examines the impact of some potential measures to reduce energy use. Transport is the largest consuming sector of energy in SW Devon. Due to the rural nature of the area, there is a very high dependency on private car use, and for example, most commuting journeys are made by single car drivers. Traditional public transport models are very challenging to implement in rural areas due to low passenger densities and the high level of subsidy required. Going forward, the improving efficiency of vehicles will reduce transport energy use by a modest amount. Savings from other behavioural type measures are potentially very small for the assumptions we have made in this report. There are a number of local schemes in operation, though again their impact at the moment is likely to be small. There is also a lack of detailed local information on people's transport needs. It is recommended that transport as a theme is given a high priority, and that in the first instance local communities should aim to understand the local needs of people and how existing schemes can be supported and expanded, or new initiatives formed. Making more significant reductions in transport energy is likely to require fundamental changes to how people organise their lives across the area. The issue will become more significant as the cost of transport fuel rises, though will only happen if there are attractive alternatives to private car travel.

6.1. Overview of Transport Energy Use

Transport uses 38% of all energy in SW Devon and is responsible for over half of all spending on energy. Cars are responsible for almost two-thirds of this energy, and for even more in terms of total trips or distance. The remainder of energy is mainly from LGVs and HGVs (approximately evenly split between the two). The area is rural by nature, and is characterised by having a high dependency on private car use. The majority of households have access to a private car, and most people commute to work as the single driver of a private car (Figure 21). There are some small concentrations of areas where people walk or cycle to work, at urban areas such as Okehampton, Dartmouth, Totnes and Kingsbridge. Even in these places though, under a third of people commute to work via these means. A high proportion (around three-quarters) of the total energy use occurs on the regions A-roads. It is quite likely that a significant proportion of transport energy use on these roads, specifically the A30 and A38, arise from people travelling through the area. People travel for a variety of reasons. Survey data for the SW region (Figure 22) shows that about a third of total distance travelled by cars is work related (either commuting or business travel), with the remainder being for a variety of personal and other uses. Additionally, whilst short journeys make up a large proportion of total trips, in terms of total distance travelled and therefore energy use[xiv], journeys of less than 5 miles make up only 13% of total distance travelled, whilst journeys of under 15 miles make up just over a quarter of total distance travelled. This means that even if walking and cycling were taken up much more widely, the impact on total energy use would only be modest.

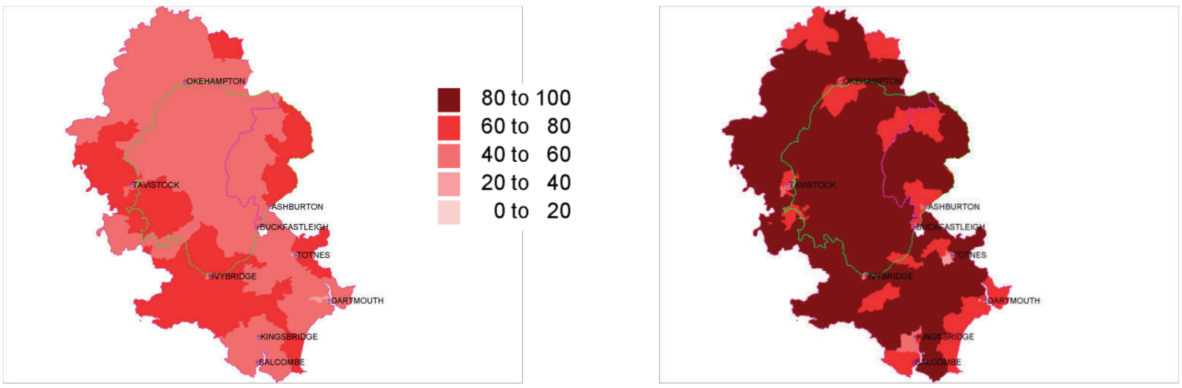


Figure 21: Proportion of people travelling to work as the single driver of a car (left) and the household availability of a private car (right) (Source: adapted from 2011 Census)

[xiv] Excluding the effect of "cold starts" which make short trips relatively more energy intensive.

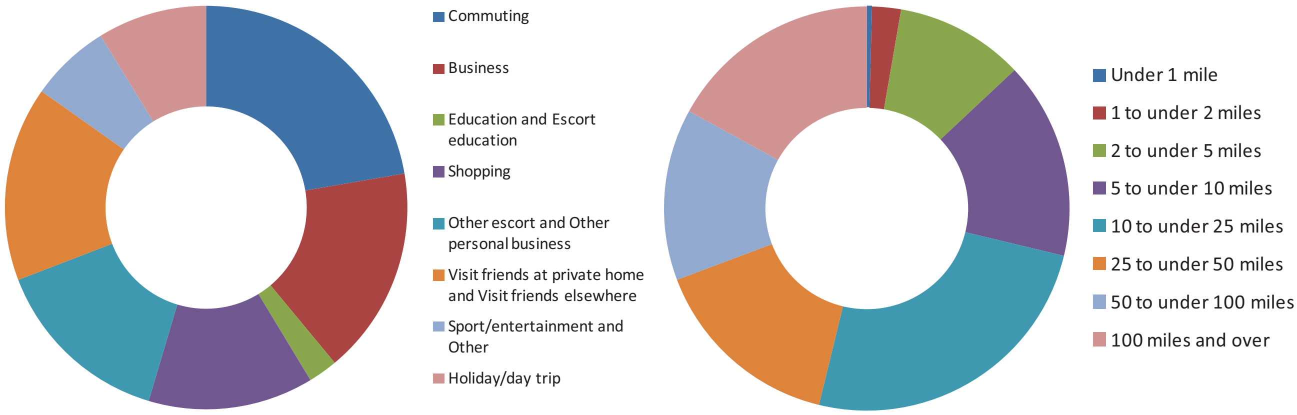


Figure 22: Proportion of total car distance for the South West Region (2002-2006) by journey purpose (left) and length (right) (Source: DfT)

6.2. Measures to Reduce Transport Energy Use

A high level estimate was undertaken for the potential to reduce transport energy use in the SW Devon area. The measures considered were based on national policy measures such as improvements to vehicle efficiencies with quantitative estimates taken from the Committee on Climate Change progress reports. Increasing the proportion of biofuels was not considered as this would not reduce energy demand as such, and the supply would be unlikely to come from the SW Devon area. This national data was supplemented by estimates made across some broad transport themes, taken from recent analysis[xv] undertaken of Devon's Local Transport Plan. The potential savings for Devon have been applied to the SW Devon area. The assumptions made for these measures are shown in Table 9, with potential energy reduction shown in Figure 23.

Table 9: Measures and assumptions considered for road transport measures.

Measure	Broad Assumptions
Improved Efficiency of Vehicles	Voluntary standards by vehicle manufacturers as incentivised by mandatory labelling and road taxing have meant that the fuel efficiency of new vehicles is constantly improving. For example, by 2022 it is envisaged the average economy of a new car will be 102 gCO_2/km. As people buy new vehicles and retire older ones, the overall fleet efficiency will improve. We have estimated the energy reduction in road transport to the end of the third carbon budget period in 2022 including adjustments due to increased traffic over the same period to be 12%.
"Smarter Choices"	Smarter choices activity covers the main information and promotional activity that authorities can use to encourage greater levels of walking and cycling and a shift to public transport. This area covers awareness campaigns, travel plans and personalised travel marketing. Some complementary infrastructure measure may be linked to these campaigns such as additional bus stops, cycle parking, etc. but not major public transport investment. It was assumed that urban car traffic is reduced by 4% by 2015, 8% by 2020 and by 10% by 2025 and that bus traffic increases by 0% by 2015, 2% by 2020 and 3% by 2025.

[xv] SWEEG Report 845 "The Effect of Devon's LTP3 Measures on Emissions of Carbon Dioxide", 2013.

Measure	Broad Assumptions
Eco-driving	Driving behaviour can result in significant improvements in energy efficiency. The government are targeting 4.5 million drivers to undergo eco-driver training by 2022, although in 2012 only 23,000 had undergone such training compared to a target of almost 900,000. Evidence from the Department for Transport has shown that eco-driving training programmes can result in a long-term efficiency improvement of 3%, if widely adopted. A staged implementation of an extensive county-wide eco-driving campaign has therefore been assumed here. Average car fuel economy has been increased by 1% in 2015, 2% by 2020 and 3% by 2025.
Car Sharing	Two people sharing a car journey will remove one journey from the road network. A typical car-sharing arrangement for a journey of 10 miles each way, splitting the running costs between two people, saves £370 per year. It has been assumed here that commuting is the main target of car sharing (15% of total trips), and that a 5% reduction in all commuting trips is achieved by 2020. A 5% reduction could imply 10% penetration of all commuters if they shared every trip, or a higher penetration though sharing fewer trips. This could be a significant challenge for the more rural parts of SW Devon where it could be harder to find people to share trips with. A theoretical maximum saving from car sharing assuming every commuter who travelled by car shared with one other person every day would be about 7% of all transport energy use. The existing Carsharedevon.com site is one of the biggest car share databases in the County.
Electric Vehicles	Electric vehicles could result in a reduction in energy use in SW Devon. Due to the lack of fuel duty on electricity used for transport, running costs could be significantly lower. Depending on how the electricity is produced, then carbon emissions and energy resilience could also be improved. In addition, a large network of electric vehicles could be an important part of a national energy storage solution, which could help balance the unpredictable supply from renewable energy sources with demand. The government have targeted 600,000 electric vehicles by 2022, and we have assumed that these will be proportionately applied to SW Devon. This is probably an over-estimate, as electric vehicles will be more likely to be taken up in urban areas with higher congestion and better potential for comprehensive charging infrastructure. The first beginnings of an electric movement have emerged in the area, for example through the EV Friendly[xvi] project.

[xvi] http://www.evfriendly.co.uk/

Measure	Broad Assumptions
Home Working	Increased home-working or tele-working could also have the potential to reduce transport energy use. SW Devon already has relatively high proportions of people home-working at approximately 12%. In our estimate here, we have assumed that home working rates could double across the area. The evidence is not clear on the exact potential for energy reduction. One study reported a 50-70% reduction in household car trips, another estimated 16% reduction in annual mileage by tele-working households. A third study was less positive suggesting tele-working had a range of effects from reducing commuting traffic to encouraging people to live further from work. We assumed that home working would reduce car commuting energy use by 50%. A further study[xvii] looked at how to achieve a 60% reduction in rural transport. As well as vehicle technology measures it considered a range of demand reduction measures for rural communities covering tele-working, tele-shopping with goods delivered locally, mobile services (such as library or food) and more local centres for work, community activities and education. Both technology and demand reduction were required to meet the target with the demand reduction requiring a significant change in lifestyle. It concluded that a service focused rather than transport focused approach was needed to generate these kinds of changes.

The savings implied by the measures and assumptions made here are very modest, and almost entirely driven by improvements to the efficiency of new vehicles. The estimates have involved sensible or even optimistic assumptions to the year 2022. For example, the assumption that all people will have undergone eco-training by 2025 is far more ambitious than the government's own targets, and the estimate also assumes the savings are sustained whereas there is evidence that training would need to be regularly repeated to maintain a saving. Similarly, even if *every* commuter journey involved a liftshare with one other, total transport savings would only be 7%.

Work by the Dartmoor Circle[xviii] observed that *"reducing car use only becomes feasible and possible if there is an appropriate and cheap alternative"* and has identified a range of initiatives that could or are currently aiming to reduce transport energy use in the area. These include:

- Implementing a rural variant of the Sustrans "*TravelSmart*" programme an estimated 10-14% car use reduction could be achieved.
- Travel planning for businesses where case study evidence resulted in an average 18% reduction in car trips.
- The Fare Car Scheme which is essentially a subsidised bookable taxi which runs when buses do not, though to an advertised timetable.
- Ring and Ride services for older people, though the main benefit of this is improved access rather than transport energy reduction.
- Various information websites such as *Journeydevon*, DCC's public transport pages, *Traveline*, and *Cycle-route.com*. It was recommended that a single travel planning website is developed which would collate information from these sources, which each only deal with part of the transport network.
- The Moorcar rural car club which has reduced private car ownership amongst its members by 20%.

[xvii] 'Rural Life Without Carbon', CRC, 2008
[xviii] http://www.dartmoorcircle.org.uk/lowcarbonplan.html

➢ A proposal for a Demand-responsive multi-use transport scheme, whereby vehicles which carry both passengers and freight, of different sizes, and are equipped to respond quickly to requests for pick-ups. The CallConnect[xix] case study has been shown to be effective in other rural areas.
➢ Promotion of sustainable tourism through potentially developing a network of lockable bike boxes around Dartmoor

Of the above schemes, those that are currently in effect are likely to be making only a very small impact on overall transport energy use. All of these schemes could fall under the broad “Smarter Choices” theme discussed in Table 9. The potential savings from any of these schemes are very hard to predict, as there is a lack of detailed local information relating to people’s travel needs. It is clear though, that given the significance of energy use and spend on transport in SW Devon, together with the inherent challenge of getting about in a rural area, more work is required locally to specifically understand the travel needs of local people and communities. Initially, the focus should then be to determine the most effective ways of reducing the proportion of single occupant private car journeys. This could start with investigating how existing schemes can be supported and expanded, and move onto developing new local initiatives. This could be a part of wider initiatives similar to *Transition Streets* where as a by-product of getting people to talk to one another, the issue of transport or sharing trips can form part of the discussions. Making more significant reductions in transport energy is likely to require very fundamental changes to how people organise their lives across the area, and is perhaps better reviewed in the medium term once alternatives to private car travel are better developed.

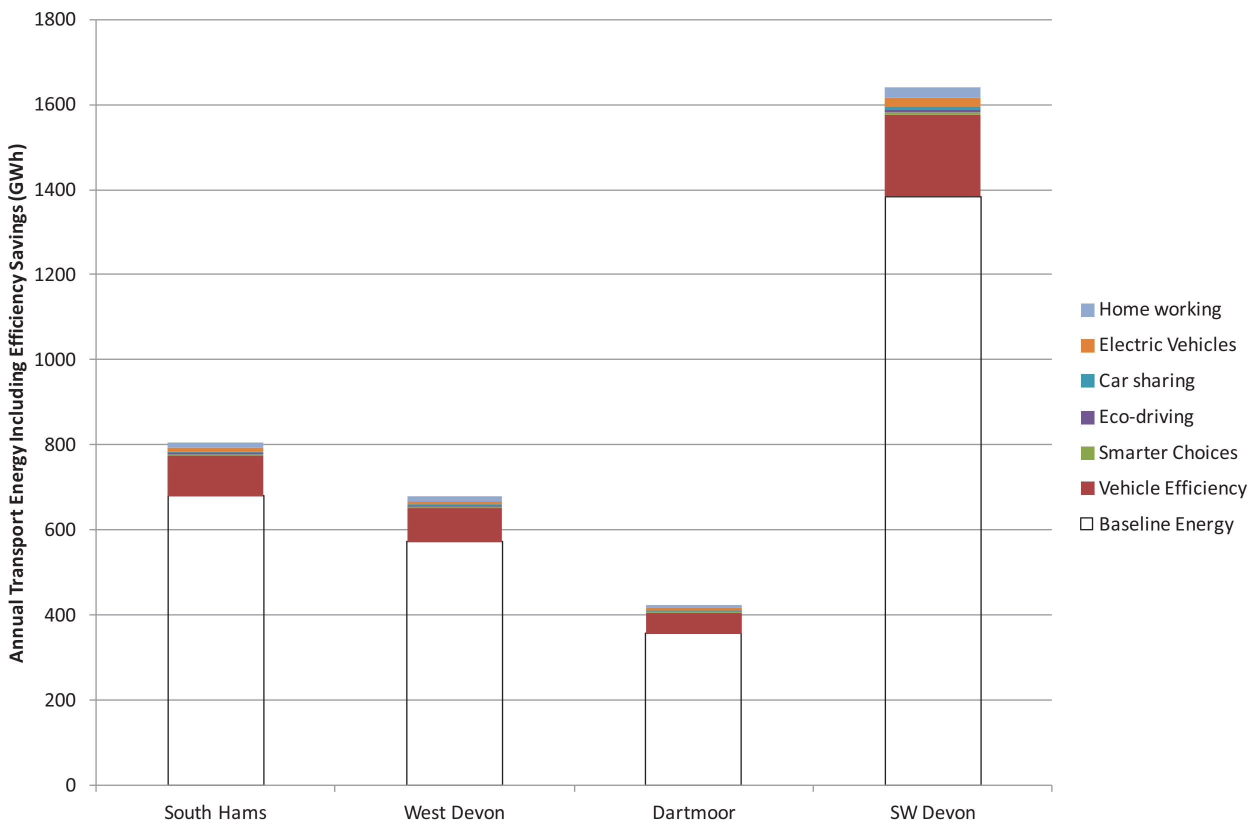


Figure 23: Estimated potential energy savings from national and local transport reduction measures between now and 2022. The total height of each stack represents the current transport energy consumption in each area. If all the measures are implemented in their entirety, then the remaining energy (white bar) represents “baseline” energy. To reduce this further, more radical policies would be needed. Note: Electric vehicles are not a “saving” as such, but represent a switch from petroleum to electric power.

xix http://www.lincsinterconnect.com/timetables/Horncastle-Coningsby-Woodhall_Spa_CallConnect.pdf

7. OPPORTUNITIES FOR RENEWABLE ENERGY GENERATION

CHAPTER SUMMARY: This section assesses the potential for various renewable energy technologies across SW Devon. The analysis is based on drawing together many disparate studies of the area and in some instances where there was an absence of data, simplified high level assumptions. This analysis shows that even if all identified renewable energy resource were utilised – which would require an enormous step-change – present demand for energy in the area would still likely outstrip locally generated supply. Local energy resilience will need to be achieved using a broad mix of technologies, each of which would need to be deployed far more extensively than at present. The technologies with the greatest potential impact are likely to comprise large scale electricity generation, predominantly wind turbines though also PV farms, and building scale renewable heat technologies such as biomass boilers and heat pumps.

7.1. BACKGROUND TO APPROACH

This section draws together many past studies and resource assessments for the area in order to estimate the potential for renewable energy in the area. No explanations are given here for the workings of each technology as they are available extensively elsewhere. A hierarchy approach has been adopted whereby assessments using the government's approved method (SQW[xx]) were prioritised, followed by previous local studies of the area and finally, where specific information was not available, then estimates were made based on a series of assumptions. The full details of this process are stated in the technical appendix. As the data comes from a variety of sources, there will inevitably be differences in quality. Whilst it is not possible to state the exact level of the uncertainty, the intent of this exercise is to present an overall picture of the potential of each technology in the area. In any case, for every technology it is apparent that there is plenty of scope to improve deployment rates above current levels. It must also be stated that in most instances the assessment does not consider specific sites or very local factors (for example land ownership). These would need to be explored in the more detailed stages of the community energy plan. Also, no consideration is given to potential future improvements to technology through innovation. The following sections summarise the potential for each technology in terms of number of installations, capacity and energy generation.

7.2. WIND TURBINES

7.2.1. LARGE SCALE WIND

	Existing Wind Installations			Potential for Large Scale Wind		
	Number	Capacity (MW)	Energy (GWh)	Number	Capacity (MW)	Energy (GWh)
South Hams	23	0.13	0.2	46	115	325
West Devon	13	0.061	0.1	175	437	966
Dartmoor	1	0.006	0.0	0	0	0
SW Devon Area	***37***	***0.191***	***0.3***	***221***	***552***	***1291***

Key Assumptions & Discussion Points:

- Based on potential for large (assumed to be 2.5 MW) turbines undertaken for Wardell Armstrong for Regen SW for each district.

[xx] The assessment in this report has generally focussed on identifying the potential from stages 1-4. As stages 5-7 are rapidly changing, it is difficult to provide meaningful estimates for these impacts which would make this evidence base robust going forward.

- Uses SQW methodology and considers constraints such as wind speeds, designated areas and proximity to dwellings.
- There is a good wind resource and large scale wind has the potential to be the most significant renewable energy technology in the area.
- Current wind energy generation in the area accounts for only 0.025% of the potential identified wind resource from large scale wind.
- A large amount of this potential is in West Devon. There are significant barriers to implementing this number of sized turbines in any single area. For example, the controversial Den Brook wind farm of "just" nine turbines (4% of the total potential in SW Devon) was first proposed almost 10 years ago and has still not been built due to protracted planning and legal processes.

Recommendations:
Large scale wind is highly divisive. If a significant proportion of the area's energy is to be generated locally, then large scale wind could have a big role to play. The SWD CEP should establish a strategic position on this technology. If there is a desire to support it, then a task group should be formed to develop business models and potential sites. Due to their scale, it is not likely that a commercial wind farm of this size could be 100% delivered by a local community, and so partnering with a commercial developer would be required. Experience from Germany has shown that where such a partnership can be used to channel economic benefits to local communities then the chances of success are greatly improved.

7.2.2. Wind Turbines – Community Proposals

	Number	Capacity (MW)	Energy (GWh)
South Hams	6	1.4	2.4
West Devon	3	0.7	1.2
Dartmoor	3	0.7	1.2
SW Devon Area	***10***	***2.3***	***4.0***

Key Assumptions & Discussion Points:
- Not a resource assessment. An indication is given here for the potential impact of 100% community owned turbines following the example of South Brent.
- The calculation assumes each of the 10 community groups within the SWD CEP delivers a 225 kW turbine as at South Brent.
- The output from one large commercial scale turbine is 50% greater than all ten community scale turbines combined.
- The South Brent turbine is an exemplary community project. However, it has taken an enormous amount of time and effort from dedicated volunteers.

Recommendations:
It is very likely that there are many potential sites which could support turbines of this size in SW Devon, and that due to their scale it is also more likely that they could be entirely delivered by communities. However, as they are smaller than large wind turbines they generate far less energy and so focussing more on other measures in the area could be more effective.

7.2.3. Building Scale Wind

	Rural				Urban				Total		
	Assumed size (kW)	Number	Capacity (MW)	Energy (GWh)	Assumed size (kW)	Number	Capacity (MW)	Energy (GWh)	Number	Capacity (MW)	Energy (GWh)
South Hams	6	17257	104	159	1.5	3841	6	5	21098	109	164
West Devon	6	11066	66	102	1.5	2386	4	3	13452	70	105
Dartmoor	6	9475	57	87	1.5	1169	2	2	10644	59	89
Dartmoor & Teignbridge	6	2091	13	19	1.5	1169	2	2	3260	14	21
SW Devon Area	***6***	***30414***	***182***	***280***	***1.5***	***7397***	***11***	***10***	***37810***	***194***	***289***

Key Assumptions & Discussion Points:

- An estimate of potential was made using two data sources. The first of these was a resource assessment by Wardell Armstrong which we believe significantly over-states the potential. The second source was an EST analysis on the technical potential for small scale wind in the UK. We apportioned this down to the study area using a series of assumptions, and arrived at a number of a similar magnitude (though actually marginally higher!). We have presented the EST derived values here, though with a large caveat that they are likely to be an order of magnitude too high.
- The upshot is that the results in the table above would result in a small wind turbine at about one in every two households (freestanding, though associated with a building). The Wardell Armstrong analysis suggests a further refinement could involve removing all properties within council tax band A, and limiting turbines to one per 50m radius. It was not possible to do this here. It would however seem plausible that the total energy generation could easily be under 1/20th of the value presented here. This would make it a relatively minor contributor to the area total.

Recommendations:
Small scale wind should be supported in appropriate locations i.e. where there is an adequate wind resource. They are supported through the FIT scheme. Success stories amongst the partnership should be shared more widely. However, this is not a programme that should necessarily be prioritised.

7.3. Hydroelectricity

	Existing			Potential additional			Total		
	Number	Capacity (MW)	Energy (GWh)	Number	Capacity (MW)	Energy (GWh)	Number	Capacity (MW)	Energy (GWh)
South Hams	11	1	5.7	16	0.2	0.8	27	1	7
West Devon	6	4	16.2	40	1.2	5.6	46	5	22
Dartmoor	4	3	13.7	27	0.7	3.3	31	4	17
SW Devon Area	***17***	***5***	***22.0***	***58***	***1.4***	***6.5***	***75***	***6***	***28***

Key Assumptions & Discussion Points:

- Based on a mix of data sources, though mainly the Environment Agency (EA) mapping exercise (2010) and cross referenced to studies by DARE, SW Water and the Dartmoor Circle.

- The EA study is based on a series of constraints including existing barriers and environmental sensitivity.
- Unusually, this is one technology where a high proportion of the potential resource has already been exploited. This is mainly due to the large SW Water projects, for example at Mary Tavy.
- Exploiting the remaining resource is likely to require delivering a larger number of smaller sized schemes.

Recommendations:
It is not likely that there is a very large significant additional hydro resource to exploit. However, this should not necessarily stop viable schemes from being taken forward. Hydropower can still be a cost effective technology to exploit, although a lot depends on very specific site conditions. There is a high level of hydro expertise in the area and so if there is a will to take forward schemes then this is to be encouraged. It is not however expected that the impact will be high.

7.4. Organic and Non-Organic Fuel Supply

Clean Wood	Capacity (MW)	Energy (GWh)
South Hams	69	90
West Devon	92	120
Dartmoor	76	99
Total	***190***	***253***

Treated Wood	Capacity (MWth)	Capacity (MWe)	Heat (GWh)	Electricity(GWh)	Total (GWh)
South Hams	1	0	7	4	11
West Devon	0	0	4	2	6
Dartmoor	0	0	2	1	3
Total	***2***	***1***	***12***	***6***	***18***

Wet Biomass	Capacity (MWth)	Capacity (MWe)	Heat (GWh)	Electricity (GWh)	Total (GWh)
South Hams	1	1	5	4	10
West Devon	1	1	5	4	10
Dartmoor	0	0	1	1	1
Total	***1***	***1***	11	9	***20***

Non-Organic Waste	Capacity (MWth)	Heat (GWh)
South Hams	3.0	25.4
West Devon	1.9	16.1
Dartmoor	1.4	11.6
Total	***5.5***	***46.3***

Key Assumptions & Discussion Points:
- The information here is taken from a resource assessment by the Environment Agency on biomass within each district. In addition, this was supplemented with an estimate of resource from hedges

based on the Cordiale project. As such it is an issue of fuel supply, whereas biomass heating (considered later) makes no assumptions about where the fuel derives from.
- Assumed all clean wood (forestry + arboriculture) is used as wood chip or pellet in biomass boilers with 85% efficiency at 20% load factor.
- Treated wood assumed all municipal solid waste (MSW) and demolition, assumed 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. Capacity is derived using a 90% load factor.
- Wet biomass includes agricultural and organic waste. Energy conversion assumes methane yields indicated with methane (9.4 kW/m^3) being used in gas CHP engines with an electrical conversion of 20% and a heat to power ratio of 1.2:1. Capacity is derived using a 90% load factor.
- Crops grown specifically for biofuels have been discounted on the basis that food or wood fuel production would take precedence.
- Energy crops such as miscanthus have been discounted on the basis that the energy yield is very low compared to alternative forms of renewable energy (e.g. PV) and so these may take precedence. As a very crude indicator, if 3.5% of agricultural land was used for planting energy crops, such as short rotation coppice and miscanthus, this could result in 267 GWh of heat[xxi].
- Non-organic waste assumes residual municipal solid waste e.g. plastics and other industrial waste is treated in an Advanced Thermal Treatment facility, which may not necessarily be sited within the SW Devon area e.g. at Devonport. It is assumed that organic waste and contaminated wood are removed from the waste stream beforehand and treated separately, e.g. using anaerobic digestion.

Recommendations:
Of the various biomass fuels, the one which offers the greatest potential in SW Devon is through producing biomass chips from woodlands and hedges in the area. The SWD CEP should consider establishing a project to exploit the potential of local woods for biomass fuel. There are already a series of local projects, resources and expertise such as Ward Forester[xxii], FOREST[xxiii] and the South West Woodshed[xxiv] which could be used to further exploit the resource. This measure should also provide economic benefit and jobs to the area.

7.5. Geothermal Electricity

Key Assumptions & Discussion Points:
- Every previous resource assessment of the area discounted this technology.
- However, there is a "hotspot" indicating potential for a geothermal power plant in Dartmoor.
- The technology is largely experimental and uncommon in the UK, though there is a new project under construction at the Eden Centre, and a further project which has been granted planning permission in Redruth, Cornwall.
- Based on a 20 MW plant producing electricity only, 169 GWh could be produced annually.
- There are likely to be huge planning barriers to bringing forward such a scheme on Dartmoor. For reference, the annual output for the aforementioned scheme would be similar to about 31 large scale turbines.
- It has been suggested that there may be potential to site a facility at Lee Mill in Ivybridge which would be considerably simpler from a planning perceptive, though the resource at that site would need to be assessed – it appears from the raw resource map that the energy density is lower there than at the Cornish sites.
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[xxi] Based on 2.64 Terawatt hours of energy per year for SW and apportioning this to SW Devon based on ratios of "greenspace".
[xxii] http://wardforester.co.uk/
[xxiii] http://www.forestprogramme.com/
[xxiv] http://www.southwestwoodshed.co.uk/static/

Recommendations:
It is recommended that a "wait and see" approach is adopted, and once performance data is available from the Eden Project scheme then consideration could be given to investigating the potential around Dartmoor in more detail.

7.6. Marine

Key Assumptions & Discussion Points:
- A previous study identified a potential tidal lagoon turbine on the Dart at Sharpham which could generate 0.06 GWh/year, although this was some time ago and it is not clear whether any progress was made.
- The same study also speculated that a marine current turbine array at Start Point could generate 3.5 GWh/year. Since that report was produced the developers of that technology are focussing their efforts off Skye and Anglesea where the resource is much higher than in South Devon.
- Advice from a leading manufacturer of wave power devices would suggest that the wave power around the South Hams coast is too low to generate energy at competitive prices currently using wave power.

Recommendations:
The current evidence would suggest that marine energy is still an emerging technology that is currently being developed and deployed in parts of the UK with a much greater potential than SW Devon. It is not expected that marine power will play a significant part in the area's energy generation in the medium term, though that is not to say that it could not be utilised in the future. It is expected that at present, there would be many more local projects using other technologies with a higher priority.

7.7. Solar Technologies

7.7.1. Large Scale PV

	Number	Capacity (MW)	Energy (GWh)
South Hams	5	21	75
West Devon	7	29.4	105
Dartmoor	0	0	0
SW Devon Area	12	50	180

Key Assumptions & Discussion Points:
- There is no agreed method to establish the potential resource. The potential exploitable resource compared to the physical solar resource will be severely constrained by issues such as access to the power distribution infrastructure and the cumulative visual impact of multiple developments.
- The approach taken here has been to apply the current scale of development in Cornwall – an area which is at the forefront of the UK movement and which has a marginally better solar resource than SW Devon – and to scale it to appropriate parts of SW Devon.
- It is likely that the estimate made here understates the likely potential in the area. For example, there is a current planning application for a 17 MW PV farm near Diptford in the South Hams – the estimate given here is for 21 MW in the whole district.
- Large scale PV could play a significant part of the locally produced mix of energy.

Recommendations:
As with large scale wind, PV farms are divisive although to a lesser extent. Again, and as with large scale wind, the largest scale developments which benefit from economies of scale will be too expensive to be delivered solely by community groups. <u>The SWD CEP should establish a policy position on this scale of</u>

technology and if supported, form a task group to identify sites and to explore business models and partners which could be used to maximise the flow of profits to the local community.

7.7.2. Building Scale PV

	Domestic			Non-Domestic			Total		
	Number	Capacity (MW)	Energy (GWh)	Number	Capacity (MW)	Energy (GWh)	Number	Capacity (MW)	Energy (GWh)
South Hams	10268	21	20	1893	11	11	12161	32	30
West Devon	7111	14	14	1212	7	7	8323	21	20
Dartmoor Total	3856	8	7	764	4	4	4620	12	12
SW Devon Area	***19250***	***39***	***37***	***3446***	***20***	***19***	***22696***	***59***	***56***

Key Assumptions & Discussion Points:

- Domestic installations were assumed to be 2 kWp and achievable on 25% of all existing dwellings (including flats).
- Commercial installations were assumed to be 5 kWp and achievable on 40% of all commercial buildings
- Industrial installations were assumed to be 10 kWp and achievable on 80% of all industrial buildings.
- Domestic PV was assumed to be installed on 50% of new homes.
- Every primary school was assumed to be capable of installing a 10 kWp system and every secondary school was assumed to be capable of installing a 20 kWp system.
- Every public sector building over 1000m^2 was assumed to be capable of installing a 20 kWp system.
- South Hams currently has 11 MW of installed PV, and West Devon 2 MW, representing 34% and 11% of the estimated capacity above. It is likely that the South Hams installed capacity includes larger scale systems.
- Building mounted PV can provide a significant contribution to the area's generation. Interestingly though, with these high penetration rates (23,000 systems in the area), the generated electricity is only a third of that produced by 12 large PV farms.

Recommendations:

With the Feed-in Tariff there is still a compelling "business case" to installing PV on buildings. There are added benefits to this too, for example generating one's own electricity has been shown to have an effect on behaviour. A large volume of systems also provides work for local installers. The SWD CEP should continue to support building scale PV, for example by creating a local supplier register and by sharing experiences of people's installations within the partnership to others, perhaps as part of a wider programme like *Transition Streets*. It should be stated that if all the PV stated above were delivered, then there would be times where generation exceeds current demand[xxv]. However, future energy demand may include a greater emphasis on electricity, for example due to increased electric vehicles. In addition, energy storage may be more widespread. Where there is still an excess of supply, then the energy would be utilised ("exported" – the electricity effectively flows to where it is needed) to areas outside the area. For example, nearby Exeter and Plymouth have high electricity demand and limited potential for large scale PV.

[xxv] This is based on a minimum load in the SW of about 1,500 MW (from Western Power Distribution2009/10 load curves) and assuming SW Devon households are 2.8% of SW (63,664 homes out of 2,264,641) and that this energy load is pro-rated. This results in a minimum load of 42 MW for the SW Devon area.

7.7.3. SOLAR HOT WATER

	Domestic			Industrial			Total		
	Number	Capacity (kW)	Energy (GWh)	Number	Capacity (kW)	Energy (GWh)	Number	Capacity (kW)	Energy (GWh)
South Hams	9215	18	13	268	3	2	9483	21	15
West Devon	5681	11	8	128	1	1	5809	13	9
Dartmoor Total	3531	7	5	79	1	1	3610	8	5
SW Devon Area	***16442***	***33***	***23***	***443***	***4***	***3***	***16884***	***37***	***26***

Key Assumptions & Discussion Points:

- Similar method to estimate for building mounted PV
- Domestic installations were assumed to be 2 kWp and achievable on 25% of all existing dwellings (including flats).
- It was assumed that this technology was not suitable for commercial buildings[xxvi].
- Installations were assumed to be 10 kWp and achievable on 80% of all industrial buildings.
- Currently, the installed capacity in the area is approximately 1-1.5% of the total potential.
- Even with these very high take-up rates, SHW has the potential to be a relatively small contributor to the overall mix. No allowance has been made for overlaps between this technology and biomass/heat pumps (indeed, they can be used together) and so the likely potential is lower.
- Nonetheless, due to a high proportion of off gas properties in the area together with the forthcoming RHI, renewable heat technologies such as SHW are more attractive, and would be a driver for jobs.

Recommendations:

SHW is a proven technology that although is unlikely to have a very high impact on energy demand in the area, could be helpful to individual householders, especially those in off gas areas. As with other technologies, success stories amongst the partnership should be shared and promoted. This should be as part of a wider programme of engagement targeted at off gas homes

7.8. RENEWABLE SPACE HEATING: BIOMASS BOILERS AND HEAT PUMPS

Biomass Boilers	Domestic			Industrial			Public Sector			Total		
	Number	Capacity (MW)	Energy (GWh)	Number	Capacity (MW)	Energy (GWh)	Number	Capacity (MW)	Energy (GWh)	Number	Capacity (MW)	Energy (GWh)
South Hams	15299	153	168	34	14	62	38	20	53	15371	187	283
West Devon	10885	109	119	16	7	30	32	10	26	10932	126	175
Dartmoor Total	7151	72	78	10	4	18	17	4	9	7178	80	106
SW Devon Area	***28947***	***289***	***317***	***55***	***23***	***103***	***80***	***33***	***86***	***29082***	***346***	***506***

[xxvi] This assumption was made within the source data, and may hold true for building types with low hot water demand e.g. offices, though understates the potential from non-domestic buildings such as hotels and B&Bs.

Heat Pumps	Domestic			Commercial			Total		
	Number	Capacity (MW)	Energy (GWh)	Number	Capacity (MW)	Energy (GWh)	Number	Capacity (MW)	Energy (GWh)
South Hams	11597	116	132	395	22	67	11992	138	199
West Devon	6521	65	74	261	14	44	6782	80	118
Dartmoor Total	2763	28	31	166	9	28	2929	37	59
SW Devon Area	***19972***	***200***	***227***	***726***	***40***	***123***	***20699***	***240***	***350***

Key Assumptions & Discussion Points:

- Unlike other resource assessments we encountered, here we have attempted to assess the potential for biomass and heat pumps together, by establishing a scenario with the assumption that a property may take only one of these technologies.
- Broadly speaking, all off gas properties assumed to be suitable for a renewable heat technology, along with 75% of on gas homes. All secondary schools and large public buildings assumed to have a biomass boiler, along with 10% of industrial sites. Half of new homes and 10% of commercial buildings assumed to have a heat pump.
- Generally pellet boilers assumed for homes and small buildings, chip boilers for large installations. It is broadly assumed that heat pumps will be air source, although no real distinction is made.
- We have assumed very high potential take-up, and that being the case the potential for these technologies is very high in terms of installations (and jobs) and as a contributor to the energy mix.
- Technologies such as PV which have been incentivised through the FIT could be considered to be closer to "fit and forget" and therefore like a simple financial investment. Unlike PV, replacing a heating system is more complex, disruptive, often occurring at trigger points such as the end of life of a boiler. In the case of biomass boilers and heat pumps there is also a requirement to learn to operate a new system.
- Earlier, we estimated the potential supply of clean wood fuel. This fuel could potentially be used within the biomass boilers proposed here, with non-domestic boilers being more likely as the fuel supply in homes would most likely be as chips rather than pellets. If all the supply and non-domestic potential identified in this report were to be implemented and all the supply used to meet the demand of those boilers in the SW Devon area, then that would leave a net over-supply of 33% which could be exported out of the area. As the fuel source for homes would likely be pellets, at present the fuel would need to come from outside the area unless a pellet manufacturing facility was to be developed in SW Devon.

Recommendations:

Renewable heat technologies such as biomass boilers and heat pumps have a real potential in the area. This will inevitably need to be tied-in with the emerging RHI. The SWD CEP could develop a renewable heat programme aimed at building capacity and improving uptake of these technologies in the area, and in particular publicising success stories and learning lessons. In the first instance, this could be targeted at the high proportion of oil heated homes outside of the main towns.

7.9. FINANCIAL INCENTIVES

Renewable energy technologies are expensive. For this reason, they have historically been supported by additional funding sources. Currently there are three main schemes:

- The Renewable Obligation (RO) is the main support mechanism for renewable electricity projects in the UK. It is aimed at large scale renewable energy generation and requires energy suppliers to source a specified proportion of the electricity they provide to customers from eligible renewable sources. Generators receive Renewable Obligation Certificates (ROCs) from Ofgem which they then sell to suppliers. ROCs are tradeable commodities that have no fixed price. The RO will close to new generators on 31 March 2017. Electricity generation that is accredited under the RO will continue to receive its full lifetime of support (20 years) until the scheme closes in 2037.
- The scheme that covers smaller scale electricity technologies is called the Feed-in Tariff (FIT) and. The FIT was introduced in April 2010. The FIT provides owners of renewable electricity installations with a "generation tariff" for each unit of electricity generated, which is guaranteed for a fixed period of time – 20 years for most technologies with the exceptions of 25 years for PV and 10 years for micro-CHP demonstration schemes. In addition to this revenue stream, if the electricity generated is used by the homeowner, then the cost of purchasing that energy from an energy supplier is avoided. Any electricity that cannot be used instantaneously can be exported back to the grid at a rate of 3 p/kWh. An EPC rating of D or better is needed to claim the FIT for PV panels, otherwise only a lower tariff rate is available.
- The scheme for heating technologies is called the Renewable Heat Incentive (RHI) and was introduced in November 2011 though for non-domestic installations only. The scheme operates in a similar way to the FIT, although for biomass boilers there are two rates of tariff. The higher rate is intended to cover the heat required based on typical heat loads for a property. A second and much lower rate is needed to prevent users simply running a boiler for longer thereby using more energy to earn more income through a tariff. All qualifying heat technologies would receive the tariff for 20 years. It is expected that domestic schemes will be open to claiming RHI from the spring of 2014. In the run-up to the domestic RHI scheme opening DECC are offering grants for solar thermal technology (£300) and for homes not heated by gas from the grid, grants for biomass boilers (£950), and ground source heat pumps (£1,250). The purpose of these grants is for those homeowners in receipt of the grant to feedback useful information which would inform the main roll-out of the domestic RHI. It is also currently proposed that in order to be eligible for RHI, cost effective efficiency measures (as identified through a Green Deal assessment) on a property will have needed to be implemented.

As technology and energy costs have evolved rapidly, the FIT has had to be revised in order to make the whole scheme more affordable (the payments are made by energy companies, and therefore ultimately by its customers). The tariffs are now regularly reviewed and revised depending on uptake. Therefore, specific information on costs and prices are liable to becoming outdated rather quickly. Broadly speaking however, the FIT scheme has been designed to give investors in renewable energy technology a return on their investment of 4.5-8%. The RHI has been designed to provide a rate of return of 12% for all technologies with the exception of solar thermal which has been set at 6% as it is a more established technology and the risk therefore was that a higher return would divert investment at the expense of bringing forward emerging technologies. The exact return will be sensitive to:

- Capital and operating costs of technology (e.g. reliability, replacement components, fuel costs etc.)
- Rates of generation and export tariff and energy prices (which influence avoided energy costs)
- Proportion of energy that can be used
- Energy efficiency of the property (in the case of renewable heat technologies)

An issue that could be worth exploring by SWD CEP is the potential to obtain savings in the cost of installations by using collective purchasing power. For example, the Transition Town group Sustainable

Crediton has negotiated discounts[xxvii] on the cost of purchasing solar PV with a South West supplier. All Sustainable Crediton supporters are eligible for a 5% discount, and then if over 10 householders purchase panels, they will each receive a further rebate of 2.5%, if 20 households purchase the panels then the rebate would rise to 5% each, or 15% if over 50 householders purchase panels. This is just one example of what could be possible through collective bargaining. A priority for the SWD CEP could be to work with local renewable energy suppliers to negotiate discounts on installations if bought in greater volumes. In addition, the Energyshare[xxviii] website lists current additional funding sources for personal and community renewable energy schemes.

7.10. POTENTIAL FOR RENEWABLE ENERGY SUMMARY

Figure 24 gives an indication of the energy split, assuming the generally ambitious take-up levels assumed in the calculations are realised. This chart should be viewed with caution as uncertainty within each technology calculation directly impacts on the size of each wedge of the pie. Nonetheless, it does demonstrate that energy supply will likely be considered as a mix of generation technologies. In addition, the challenges of delivering large scale electricity generation (mainly wind, though also PV) that is broadly supported by the public is a priority. Fuel switching to lower carbon alternative form of heating is also a priority, especially for homes which are not currently heated by gas. Figure 25 breaks down potential supply into the various parts of SW Devon. Standout findings confirm the significance of potential for large wind – especially in West Devon – and also the significance of building scale renewable heat across the area, PV farms outside of designated areas, and the potential of geothermal energy within Dartmoor.

[xxvii] http://sustainablecrediton.org.uk/Pages/Energy/Solarsense%20Agreement.pdf
[xxviii] http://www.energyshare.com/make-energy/funding-and-grants-information/

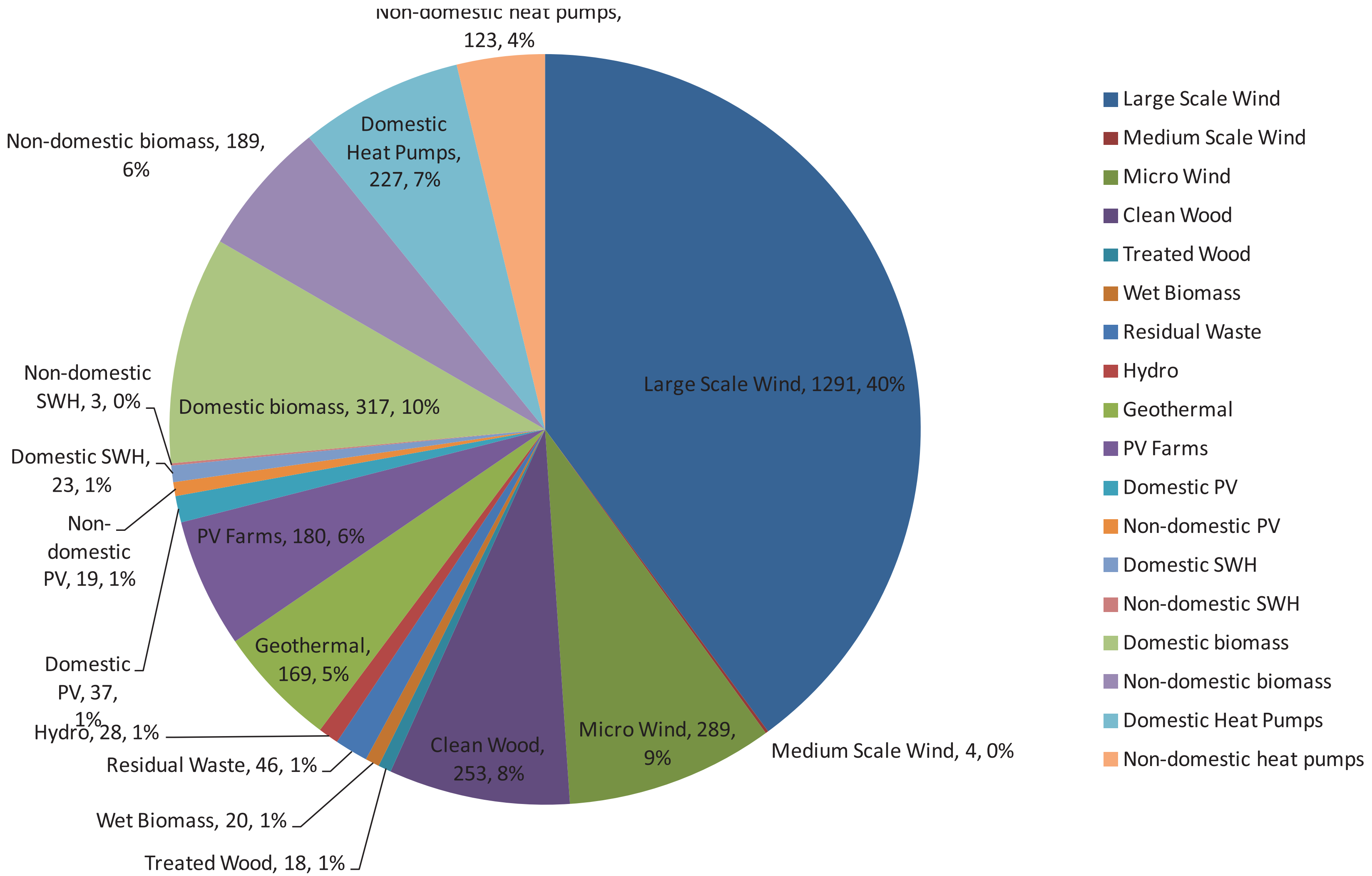


Figure 24: Split of potential energy supply. The graph should be viewed with caution as the large potential sensitivity in the calculations for each technology could result in a totally different actual distribution. In addition, both biomass supply (clean wood, and treated wood) and biomass heating are shown.

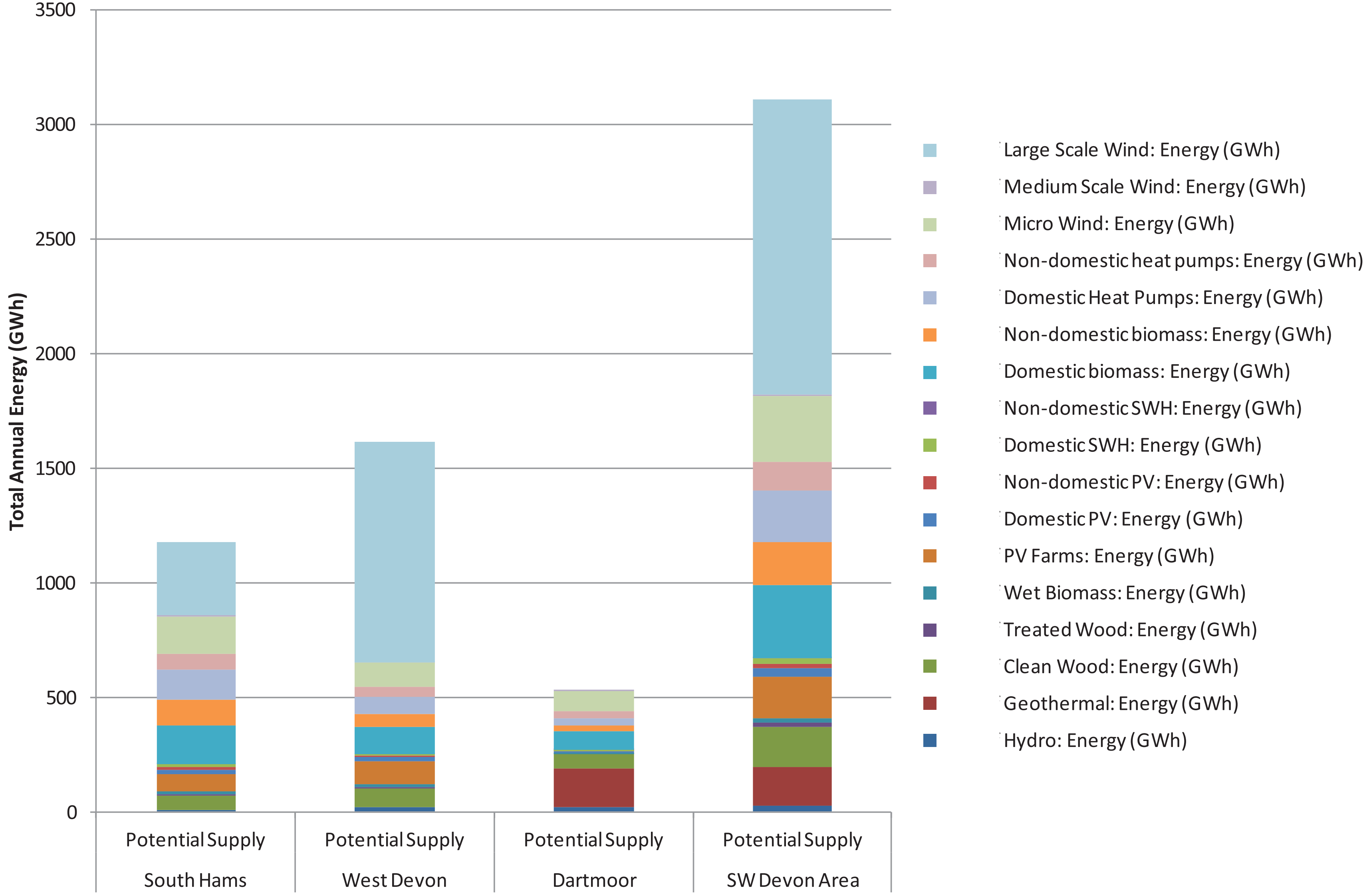


Figure 25: Potential energy supply broken down by area and technology.

8. EXAMPLES OF PRECEDENT EXEMPLAR COMMUNITY ENERGY PLANS

CHAPTER SUMMARY: This section presents a quick overview of a few examples of community plans and projects from nearby and abroad. The information contained in this section is intended to give a flavour of what others have done and is by no means intended to be exhaustive. It is recommended that these case studies are explored in further detail using the links provided to understand the detail better.

WREN Renewable Energy
Brief Description including vision or headline targets The Wadebridge Renewable Energy Group (WREN) is based in Wadebridge in North Cornwall and was formed in 2010. WREN is a not-for-profit cooperative organisation that is fully owned and operated by its members. One of the key aims of WREN is to reduce the amount of money leaving the local economy through energy bills, and to use local energy resources to reduce energy bills and to reinvest the profits into the local economy. Members of WREN include the Wadebridge Chamber of Commerce, Local Businesses and Local residents. Residents can join WREN for £1, which entitles them to vote on decisions made by the organisation. WREN operates as an energy company and not as an installer. WREN has a number of complimentary project aims: • To produce 30% of Wadebridge's electricity from renewable sources by 2015. • Reduce reliance on centralised energy • Improve and expand local supply chains • Help local residents to reduce their energy use • Generate renewable energy that will have a 'meaningful' impact on the total renewable energy consumed in the area • Offer advice on energy saving techniques to the local community via an energy shop, where residents can go to get advice from volunteers.
Successful features of plan WREN has been an extremely active and successful initiative and has achieved a lot in a short period of time. The Energy Shop that has been opened by WREN in the town has provided a point of contact for new members to the scheme, as well as a providing a presence on the high street with which to promote energy efficiency as well as renewable energy.
Limitations of plan The aims of the project so far have primarily focussed on electricity generating installations (e.g. wind and solar PV). Given that around the majority of household energy is consumed as heat, it might be challenging to achieve the target of producing 30% of the towns energy from renewable sources by 2015.
Impact of plan • WREN has assisted with the installation of around 1.2 MW of solar PV in the area. Domestic solar systems that have been installed directly through WREN total 288 kW and other installations that have been installed following WREN's promotional activities total around 500 kW. • WREN has worked on repowering St Breock wind farm. If successful, this project is expected to replace 11 wind turbines with 5 larger turbines with a total installed capacity of 12.5 MW. • The group now has 660 members • £5,000 of revenue generated by the group's activities has been distributed to local groups.
Lessons specific to SW Devon The project in Wadebridge has focussed strongly on the economic impact of investment in renewable energy. The membership of WREN also includes those from the business community, which will be important to apply to SW Devon given a significant proportion of energy use is from that sector.
Further Information Details about WREN can be found on their website (*http://www.wren.uk.com/*) with case study information being available at: *http://regensw.s3.amazonaws.com/wadebridge_renewable_energy_network_10b5731d112825f2.pdf*.

Freiburg (SW Germany)

Brief Description including vision or headline targets

Freiburg has a strong environmental history, having fought off plans for a nuclear power station over 30 years ago. What makes Freiburg so special is its unique interplay, known as the ‘Freiburg mix’, of political, economic, geographical and historic attitudinal factors. Through strong policies and investment across the society, the city has won numerous high profile national and international awards for being a leader in sustainable technologies and town planning. Much of the growth in the solar sector has been based around research institutions such as Fraunhofer Institute. Specific targets of the city plan include:

- 25% CO_2 reduction by 2010 (not achieved)
- 40% CO_2 reduction by 2040
- Aim to be zero carbon by 2050

Successful features of plan

- A world leader – very high impact.
- Wide ranging: building insulation, transport, renewable energy, waste, water, nature.
- Cooperation of city authority, businesses, utilities, households, education institutes and media.
- Large awareness raising campaigns
- High rates of sustainable transport trips underpinned by frequent reliable public transport and car management policies.
- Mandatory exemplary building standards for new developments.

Limitations of plan

- The large scale is built on momentum of the city being a world leader – by default, not *every* place can be the world leader, and so arguably the model is not repeatable widely. Clearly though, lessons can be learnt.

Impact of plan

- 12,000 people employed in environmental and solar industries which is 3% of population at 3-4 times the national average, adding 650 million Euro GVA.
- Nuclear power reduced from 60% to 10% of city electricity. Over 50% of the city’s electricity is generated by combined heat and power plants
- Annual grant of 450,000 Euro for the restoration or renovation of old buildings.
- Very high recycling rates, and energy from waste from remainder powering 25,000 homes.
- Training companies on environment management issues in workshops and on-the-spot teaching events.
- From 1982-1999 cycling volume rose from 15% to 27%, car journeys fell 38% to 32%, private car density is 423 per 1000 people
- Modern light railway with 65% of population living within catchment
- No cycle tracks in 1970 – now there are 420 km. Large part of the centre is pedestrian only, and 90% of residents live on streets where speed limit is under 50 km/h.

Lessons specific to SW Devon

- City was very proactive – making choices to promote efficiency and low energy long before it was fashionable or required.
- The incorporation of Freiburg’s outstanding landscape value (forest and green space) has parallels with the landscape value of the SW Devon area.
- Targeting all sectors and engaging all stakeholders vital to make a significant impact.

Further Information

- Green City Freiburg http://www.greencity.freiburg.de/servlet/PB/show/1199617_l2/GreenCity.pdf
- http://www.greencity.freiburg.de/ (in German)
- Green Map http://www.greencity.freiburg.de/servlet/PB/show/1264878_l1/greencitymap_english.pdf
- The Freiburg Experience http://www.push.gov.uk/diane_smith_tcpa_-_181101.pdf

Lynetten Co-operative Denmark
Brief Description including vision or headline targets Lynetten is situated to the north east of central Copenhagen, Denmark. The plan included the installation of 7 x 700 kW turbines in an industrial area near to the coast. Four of the turbines were to be owned by a local energy cooperative (Lynetten Windmøllelaug I/S) and the remaining three by a local power supply company. It was estimated by the windpower manufacturer ('Bonus') that the income to the shareholders is tax free if the income was less than 3000 DKK (just over £300). Wind power projection was 4 GWh per annum (with 3.6 GWh guaranteed by the Bonus). Insurance would cover the losses if they were less than 95% of the guaranteed production. The total cost of installing the four community owned turbines was 15,750,000 DDK (around £1.8m). The profits from the 4 turbines that were to be community owned were divided up on a share-ownership basis. Each 'share' was designed to account for approximately 1000 kWh for electricity annually and was sold for 3,600 DKK (£400).
Successful features of plan Due the perceived low economic risk, the shares in Lynetten Windmøllelaug I/S proved to be popular and cooperative grew to 909 shareholders in 2002. Planning permission was difficult to achieve. However, this was solved by an active local advertising campaign. The board of the project undertook to write about the project in local papers and participated in local events to give local residents further information. A low level of public protest was reported by the board, who cited their efforts to provide information and their participation in public debate as reasons.
Limitations of plan Support required from the Danish Equivalent of the Feed-in Tariff. Based on the assumption that support would remain the same for 20 years (the life of the turbines).
Impact of plan The projected ROI on investment for the shareholders was 13.3% for the initial budget. However, following changes to the Danish Electricity Regulations in 1998-1999, the final ROI was in the region of 6-7%. After installation, the wind turbines have a calculated capacity factor of 20.5%.
Lessons specific to SW Devon The main lessons of the project are related to problems caused by uncertainty over tariffs. The Rules for payments for turbines changed several times during the course of the project – a situation that has been experience since in the UK. A 34% reduction in the expected tariff and larger than expected expenses meant that shareholder income was reduced by around 50%. This meant that instead of a ROI in 10 years, it would take 3 more years until shareholders recouped their initial investment. To attempt to solve this problem, a faster installation of two of turbines was scheduled. Although the economics of the cooperative was healthy, the shareholders eventually only received only 50% of their expected returns.
Further Information A case study related to the Lynetten cooperative can be found at: http://www.welfi.info/case/Lynetten.pdf

Eskdale Woodfuel Study
Brief Description including vision or headline targets The community-led energy project in Eskdale (Lake District National Park) was initiated in 2004 by an existing resident-led group, which was previously formed in 2001. The community that was to be served by the community plan included the Eskdale Village and surrounding areas, which included farms and small clusters of dwellings. The area covered by the project included around 300 of the local population and accounted for around 150 dwellings. The primary aim of the group was to develop a local market for wood fuel heating. There were also specific initial objectives to install three 'demonstration' wood fuel boilers in the valley and to set up a community energy supply company (ESCo), which would own, operate and supply fuel to the boilers, along with selling heat to property owners. In the long term, it was envisaged that the ESCo could supply, install and maintain boilers. The rationale for undertaking the project was to make use of timber from neglected forest and woodland areas around Eskdale and to supply both employment and lower cost fuel through the supply of wood (there was no mains gas in the area, therefore wood was a cost effective option for heating).
Successful features of plan There have been numerous successful features of the plan. One of the key measures for obtaining local support was the demonstration boilers, where locals could see the technology working. In addition to local support, the project in Eskdale has had valuable support and advice from a local energy advice service (whose funding has since been cut), the Lake District National Park' Association's sustainable development fund and Cumbria Woodlands.
Limitations of plan The installation of wood boilers was severely constrained by the higher capital cost of boilers, despite fuel costs being lower. Turnover for West Cumbria Wood Fuel products was in the region of £25k for the financial year 2010-2011[xxix]. Given that one of the companies stated aims was to increase employment it is difficult to see how this limited income could supply sufficient employment and economic development in the area. It is suggested that the impact of the plan is limited.
Impact of plan Two demonstration boilers (at St Begas Primary School (40 kW log boiler) and Eskdale Youth Hostel) were installed along with a micro-district heating system serving a small number of private properties in Eskdale Green. West Cumbria Wood Products Ltd. is a not for profit company which was formed in 2006 to supply wood. The primary school saves around 12 tCO_2 annually.
Lessons specific to SW Devon The scheme took place in a rural area within a National Park serving homes that were off the gas network and mainly heated by oil. This is very similar to SW Devon. Significantly increasing the number of homes heated by wood fuel will be crucial to improve energy resilience in SW Devon. The main barrier at Eskdale was the high capital cost of boilers. Since then, the RHI has been developed and so this will need to be promoted within SW Devon to help increase local uptake. In addition, demonstration of technologies that are often misunderstood by residents can help reduce scepticism and potential opposition to local energy schemes. Interviews conducted during the project showed that relatively few residents were aware of the potential of biomass technology before the project, though this improved following the installation of the demonstration boilers. One resident stated *"I know somebody who was opposed to it in the valley, and when he actually started talking to the engineers and what have you, from the firms, his son now runs a business in [place name], has a biomass heater, and yeah, they're happy with it."*
Further Information • 'Low Carbon Lake District: Responding to Climate Change in the National Park', Willis, June 2009 (http://www.lakedistrict.gov.uk/__data/assets/pdf_file/0017/170342/low_carbon_lake_district_report_16_june_2008.pdf) • 'Social impacts of community renewable energy projects: findings from a woodfuel case study', Jennifer C. Rogers *et. Al.*, Energy Policy 42 (2012) 239–247.

[xxix] Source: Companies House.

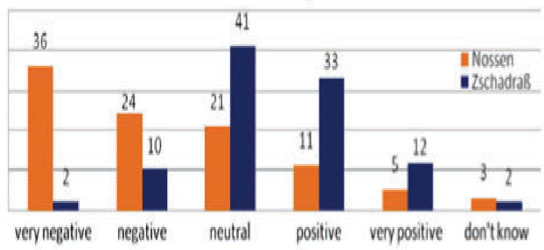
Zschadraß, Germany

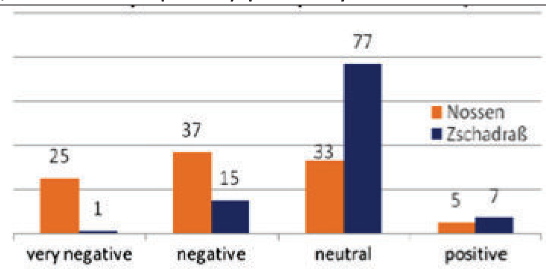
Brief Description including vision or headline targets

Zschadraß (East Germany) is a community of just over 3000 residents with a large wind turbine installation that is co-owned by the community and a PV installation that is fully owned. The community ownership of both these installations is via a community club and a foundation. The residents are not directly involved financially. The wind farm consists of 3 x 1.5 MW turbines and 1 x 2 MW turbines with a total estimated annual production of 8 GWh. The turbines are 80% owned by Windstromer GmbH and 20% (€640,000) by community organisations, of which three quarters is owned by foundation and the remaining 25% to the club, 'Rural Life'. Profits from the wind turbine are used to reduce fees for the local nursery. The PV installations generate €17,000 annually with input from the German Equivalent of the UK's Feed-in Tariff. Profits from the PV installation are invested back into the local community in the form of allowances for school lunch for children from low-income families.

Successful features of plan

The project was honoured by the German Renewable Energy Agency in 2010 as 'the renewable community of the month'. In 2011, the wind turbine and PV installations now offset 24% of the total energy demand of Zschadraß. Furthermore, there is strong evidence to suggest that the financial involvement of the community in this project has lead to stronger support of renewable technology when compared to similar communities in the area. The graphs below shows the attitude towards wind energy (left graph) and the impact of the turbines on the landscape (right graph) in Zschadraß compared to a nearby community in Nossen, where similar renewable energy installations exist, but are completely privately owned.





Limitations of plan

Residents of Zschadraß have stated that they have some problems with noise from the wind turbines, and the shadows that they cast on the local highways. Whilst most respondents were neutral about the scheme, negative respondents still outnumber positive ones.

Impact of plan

4 MW of installed commercial scale wind turbine with an annual output of 8 GWh.

Lessons specific to SW Devon

The projects in Zschadraß have had tangible outputs for the local community. Although these outputs did not result in direct profits for the residents, the investment of profits in the local community (i.e. investment in school meals for the financially disadvantaged and allowing for a reduction in fees for the local nursery) has resulted in strong support for the renewable energy measures. Commercial scale wind is likely to be the biggest opportunity for meaningful energy generation in SW Devon. The involvement of local communities and feeding back profits from such schemes has been shown to significantly improve the likelihood of acceptance and success.

Further Information

- Local acceptance of renewable energy—A case study from southeast Germany, Fabian David Musall, Onno Kuik, Energy Policy 39 (2011) 3252–3260
- Video (in German though shows scale) http://www.youtube.com/watch?v=VpqoKQisOxA
- http://www.thewindpower.net/windfarm_en_13513_zschadra-bockwitz.php

The following list of resources provide summaries of multiple community schemes which could be consulted to learn more lessons which could be applied in the SW Devon area.

Name	**Community Power Empowers, Urban Forum**
Content	Analysis of 13 successful community energy projects across 5 European countries with drawing out of applicable lessons for the UK. Positive and empowering document that has direct application to SW Devon.
Link	http://www.wcmt.org.uk/reports/687_1.pdf

Name	**Community energy in the UK, UEA 3S Working Paper 2012-11**
Content	Report summarising the nature and governance of UK community groups together with a picture of the current network of community energy networks and survey covering operation and perceived performance.
Link	http://www.3s.uea.ac.uk/sites/default/files/3S%20WP%202012-11%20CISE.pdf

Name	**Low Carbon Lake District**
Content	Summary of performance of Lake District and a series of small projects. Although from 2008, some potential interest for application to Dartmoor and the SW Devon area in general.
Link	http://www.lakedistrict.gov.uk/__data/assets/pdf_file/0017/170342/low_carbon_lake_district_report_16_june_2008.pdf

Name	**Low Carbon Communities Challenge: Evaluation Report** and... **The Low Carbon Communities Challenge Findings from the engagement support by Dialogue Design**
Content	Analysis of the workings and challenges facing community groups based on evaluation of 22 test bed community projects across the UK
Link	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48458/5788-low-carbon-communities-challenge-evaluation-report.pdf https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48150/2403-lccc-findings-final-report-july-2011.pdf

Name	**A movement of the people: community climate action in the SW**
Content	Summary of community climate action groups in the SW, though from 2008.
Link	http://www.foe.co.uk/resource/briefing_notes/south_west_climate_change0.pdf

Name	**Co-operative renewable energy in the UK: A guide to this growing sector**
Content	Summary of renewable energy co-operatives in the UK including summary data on schemes, technical details and costs.
Link	http://www.rebeccawillis.co.uk/wp-content/uploads/2011/12/Co-operative-Renewable-Energy-in-the-UK-FINAL-web.pdf

Name	**Local Government Unit: The power book**
Content	A series of essays on the benefits of community power schemes, with examples. It is estimated that community renewable energy schemes could be worth around £6 billion in the UK, with installed capacity of 3.5 GW, the equivalent of three or four conventional power stations.
Link	http://serauk.files.wordpress.com/2012/10/powerbook.pdf

Name	**Dti: Co-operative energy: lessons from Denmark and Sweden**
Content	Lessons from the very strong community energy sectors in Denmark and Sweden (on bio-energy). Although from 2004, the study of mature renewable energy sectors is valuable.
Link	http://bec.divydovy.com/wp-content/uploads/2010/11/DTI-report-on-Denmark-and-coop-involvement-with-wind-turbs.pdf

9. Indicative Priority Areas

CHAPTER SUMMARY: This section summarises the entire identified potential for energy demand reduction and renewable supply within SW Devon, and discusses emerging key themes and priority areas.

The previous sections have established the current energy use in SW Devon, the potential impact of growth and government policy, and the potential for further energy reduction based on a series of assumptions. This is shown in Figure 26. From this, we can see that if every energy saving and generation measure was to be implemented, then the area could be entirely self-sufficient (in net terms), although it would take West Devon to become a net exporter of clean energy to offset a net demand in South Hams and Dartmoor. From the evidence gathered in this report, the following sections describe potential priority areas to be taken forward by the SWD CEP.

9.1. Domestic Retrofit

What? Improve the energy efficiency of existing dwellings, generally through fabric measures such as insulation.

Why? Reducing energy use from homes is perhaps the single biggest opportunity to reduce energy use through both national and local policy measures. A broad range of retrofit measures could significantly reduce energy use in SW Devon, with the most significant of these being insulation of solid walled properties. Improving the efficiency of existing homes will require undertaking a high volume of interventions, which could be advantageous to the local economy, if local supply chains are used.

How? The main government policy aimed at tackling the efficiency of existing buildings is the recently launched Green Deal. This replaces a much simpler scheme which provided subsidised or even free insulation. The Green Deal has the advantage that it can be applied to a range of different measures, and in combination with the accompanying ECO policy could provide significant benefit to the area through tackling Hard to Treat homes. However, there are many obstacles to a wide-scale take-up of the offer. One of the main risks is the likelihood of the public to effectively take out financial loans at commercial interest rates which in theory result in no immediate savings. A critical role that SWD CEP can play is in working with existing organisations such as the Energy Savings Trust to promote and support the Green Deal. The SWD CEP is already making good progress here, and has already established a retrofit task force. Several existing buildings in the area have been retrofitted, for example funded through the 2012 DECC LEAF project. There are also initiatives within the area such as *Transition Streets*[xxx] and the energy ambassador project through providers such as South Devon Energy centre[xxxi]. SWD CEP should continue prioritising this theme with a strong focus on raising awareness of retrofitting homes and potential benefits, including sharing lessons and site tours. The EST *Home Analytics* tool could be helpful in targeting priority areas, though this would need to be discussed further with EST. The parallel focus should be on ensuring local supply chains benefit from the potential installations, and so linking RegenSW's *Ready for Retrofit* programme[xxxii] with local suppliers and installers should be prioritised.

[xxx] http://www.transitiontowntotnes.org/groups/energy/transition-streets/
[xxxi] http://southwestenergycentre.co.uk/community
[xxxii] http://www.regensw.co.uk/projects/sector-development---business/business-support/supporting-your-business-to-be-retrofit-ready

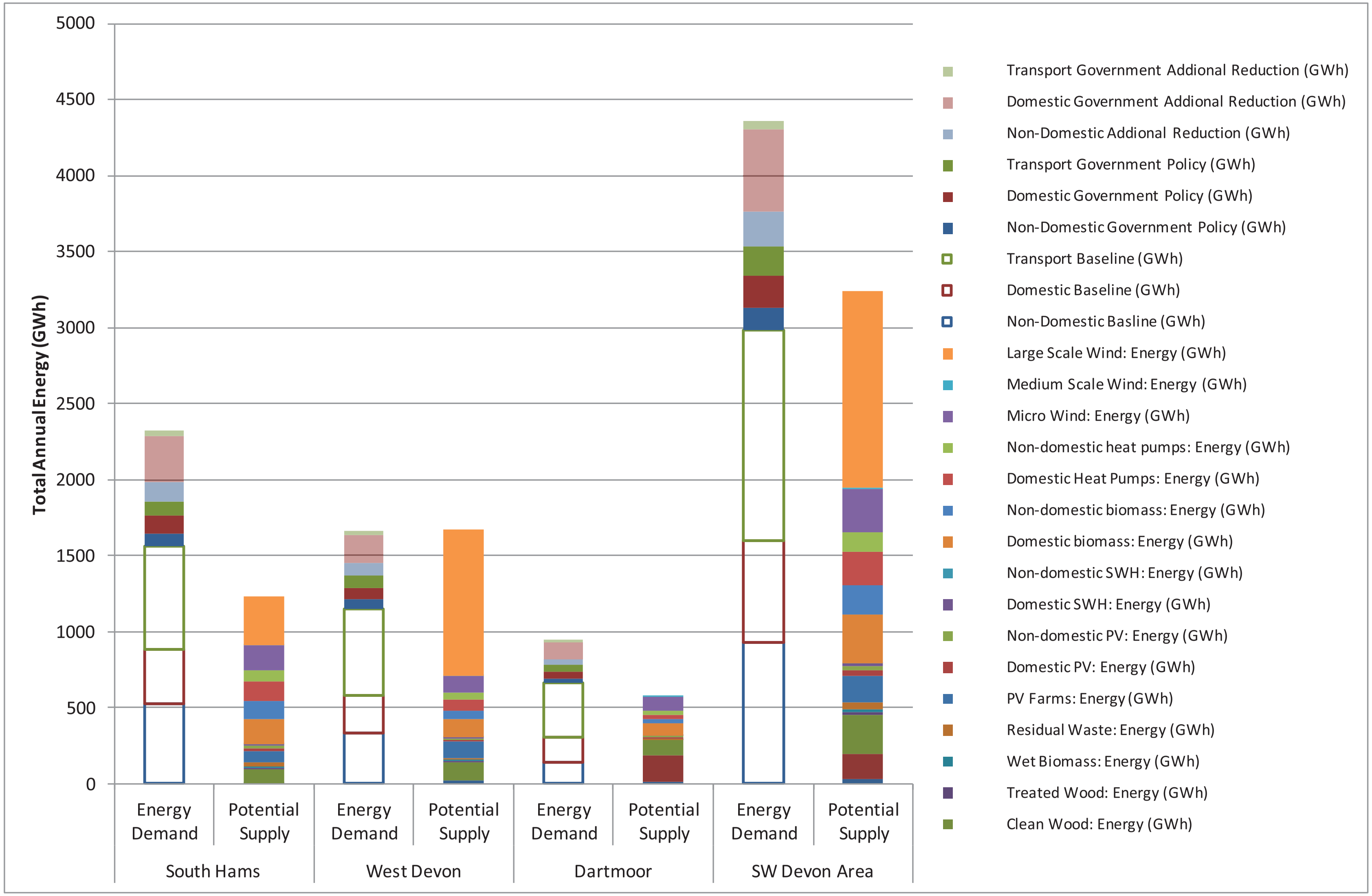


Figure 26: Total energy demand and supply in SW Devon and within, based on current usage and potential demand reduction and clean energy supply based on assumptions made within this report. The white bars represent a baseline in non-domestic, domestic and transport energy use once all demand-side measures have been implemented.

9.2. Domestic Behaviour

What? Encouraging behaviour measures to reduce energy use in the home, especially around issues of thermal comfort.

Why? Implementing simple energy saving measures has a decent potential to reduce energy demand from homes. Whilst the impact might not be as great as insulating solid wall properties, actions such as reducing heating set-points or making different purchasing choices might not cost anything and are potentially non-disruptive. For this reason, they can also "payback" immediately in some cases.

How? There are a number of broad measures that people can take to reduce energy use in their homes. Gaining an understanding of where energy is used within the home should be the first step. The SWD CEP can facilitate this by providing information through the local groups within its membership, and can expand on this through local initiatives such as loaning out plug-in energy meters. Specific behaviour measures, mainly around simple efficiency improvements (changing light bulbs), purchasing choices (e.g. selecting the most efficient white goods) or comfort choices (e.g. reducing central heating set-points) have been tested, and it is likely that the biggest impact measure is in reconsidering comfort choices, where appropriate. There are many different ways for how this could be achieved, and it could depend very much on the specific ways in which people and households organise their lives. In simple terms this could involve reducing heating set-points, though it could involve implementing individual room control e.g. using thermostatic radiator valves (TRVs), or more complex emerging control systems. Given the potential large number of "under-occupied" homes in the area, there could be even greater savings to keeping parts of those buildings below normal comfort expectations. For an initiative around this theme to be successful, it will need to engage with the majority of the population in the area. As with many of the other priority areas, this should be promoted through local groups which comprise the partnership, with models such as that used by *Transition Streets* being well suited to spreading the message across local communities.

9.3. New Development

What? Developing local policy so the benefits of new development are realised locally, especially around promoting exemplary self-builds and the emerging "allowable solutions" policy.

Why? New development will be built to at least the minimum requirements of the building regulations, which themselves are subject to improvement every three years. "Building in" better energy performance from the outset is more cost effective than attempting to revisit the performance of the building later on.

How? It will be challenging to obligate developers to significantly improve on the minimum requirements of the building regulations, although where development comes forward in more contentious locations then there could be an opportunity to demand higher standards. Experience has shown that it is difficult to make the case for tougher standards. A "fabric first", beyond the minimum requirements of the emerging building regulations, should definitely be promoted. There is also a need to stimulate demand for very low energy buildings such as Passivhaus, which cost more upfront though are likely to payback over their lifetime. Volume house builders – who are responsible for the lion's share of new domestic development – will respond where there is a market for their properties. A drive towards more aspirational new build standards could also be helped by increasing the amount of new development by self-builders. A big challenge here is the availability of affordable land. Perhaps the biggest opportunity is in developing local planning policy to identify schemes in SW Devon which could come under the emerging Allowable Solutions mechanism. We have estimated here that this could be worth around £16 million of investment in carbon reduction schemes in the area from 2016 to 2026.

9.4. NON-DOMESTIC ENERGY

What? Reducing energy use from the non-domestic sector.

Why? The non-domestic consumes about 30% of all energy in the area. The factor which has the greatest impact on this energy use is the prevailing economic climate. It has been shown that the recession has been quite effective at curbing non-domestic energy use, and associated transport use from goods vehicles. Improving energy efficiency of the non-domestic sector will improve the competitiveness of the private sector, and will help limited resources in the public sector go further. There is also a wider point about measuring energy consumed by the sector (supply side) whereas the output from the sector (goods and services) is used to provide goods and services. Therefore there is an argument that assessing the demand for these goods and services is equally important, though much harder to do.

How? Currently the non-domestic sector is barely represented in the SW Devon community energy partnership. The Carbon Trust estimates most businesses can reduce their energy consumption by up to 20% at little cost. The analysis of electricity consumption has also revealed almost 60% of all electricity is used by the 2% biggest users. This implies that finding those large users and reducing energy consumption there would have a higher impact than indiscriminately targeting the sector. There should be an immediate focus on forming links with non-domestic organisations, and in particular businesses, for example through local business forums and the Heart of the South West Local Enterprise Partnership (HotSW). The partnership also includes the two district authorities, and these organisations should lead by example and share lessons with businesses in the area. There are schemes such as Enhanced Capital Allowances and the Green Deal which offer solutions to enable businesses to improve their buildings' efficiencies. There are also opportunities to obtain funding through schemes such as Knowledge Transfer Partnerships and research calls from the Technology Strategy Board. There are also a number of funded organisations offering free support to businesses in the region, for example the Centre for Business and Climate Solutions. In the first instance, representation from business and the public sector should be established on the partnership, and a specific task group set up to establish a list of potential opportunities, signpost those opportunities to businesses in the area, implement measures and share lessons. Consideration could also be given to getting local non-domestic organisations to commit to or "pledge" a certain annual energy reduction, perhaps through a scheme promoted through the partnership. This could have potential synergies with the idea of a local currency, as has been adopted in Wadebridge, which would also have benefits for the local economy.

9.5. REDUCING SINGLE OCCUPANT CAR TRAVEL

What? Reducing energy use from the transport sector by targeting journeys in private cars with single drivers.

Why? Transport uses 38% of all energy in SW Devon and is responsible for over half of all spending on energy. The area is very rural with a low population density, making it difficult to provide cost effective high quality public transport. Therefore private car ownership is high, and a large number of journeys are made by individuals in those private cars, often with only the driver in the vehicle. Surveys across the whole SW Devon area have highlighted that transport, and specifically traffic congestion and public transport, is one of the issues that people have a problem with. Energy use can be reduced by cutting the total number of journeys through avoiding journeys either by sharing with others or by reconsidering the need for those journeys e.g. working from home.

How? The analysis suggests that the largest potential savings from transport are through the improvements in efficiency to vehicles, as new efficient vehicles gradually replace older ones. This is effectively a national measure. Even with quite ambitious levels of take-up, making additional savings through encouraging modal shifts, eco-driving courses, car sharing and home working is only likely to have a relatively small impact. Nonetheless, at the moment transport energy use is not a major focus of the partnership. There is good reason to believe it should be. The *Dartmoor Circle Low Carbon Plan* identified a range of transport initiatives in the area which broadly fit the "Smarter Choices" label. In the first instance, a group should be established to collate information about how to promote these schemes. At present, they are all very small scale, and if they are to have any real impact they need to operate at much greater scales. Many of the measures require significant behaviour changes, and the SWD CEP offers an excellent opportunity for local people to gather together to debate specific local needs, and to learn from each other. If a scheme in the vein of *Transition Streets* were to be considered appropriate for adoption more widely, then the requirement for transport and how single car journeys can be reduced should feature strongly.

9.6. LARGE SCALE RENEWABLE ENERGY

What? To establish the appropriateness of large scale renewable energy generation in SW Devon, and to maximise local benefit where it can be deployed.

Why? There is a huge potential resource in SW Devon to generate a significant proportion of the area's total demand from large scale renewable energy. This is mainly from large commercial-scale wind turbines, though also from PV farms.

How? These schemes are highly emotive and divisive. It is not credible however, to consider the overall energy strategy for the area without considering what part these large technologies could play. Therefore as a first step, SWD CEP should establish a position on these technologies, which should be mindful of emerging Local Authority and National Park Authority planning policy on developing such schemes. The partnership has the advantage that it comprises local people who have the potential to directly engage with people who are likely to oppose such schemes. The partnership should aim to positively engage with everyone in the local area, and especially with those who are likely to comprise the loudest opponents. The analysis which took source data from elsewhere did not detail the potential down to site level. A priority for the members of the SWD CEP others, such as RegenSW to explore the potential in more detail and refine the understanding of likely areas of search – for both wind and solar. The experience of the South Brent community turbine would suggest that raising 100% community capital for these larger schemes is unlikely to be realistic. It is therefore important that business models are considered where local communities could benefit from developments of this scale through partnering with commercial developers. The case studies highlight that public acceptance is likely to be much higher where the local community has an active financial stake in the scheme. However community scale energy is taken forward, an important role of the partnership will be to disseminate experience though case studies and to take forward proposals through emerging community and neighbourhood plans

9.7. Renewable Heat

What? Promoting and implementing renewable heat technologies in buildings.

Why? The area has a high proportion of homes not heated using natural gas. These are more expensive to run (and result in higher carbon emissions). There is an opportunity to replace some of these systems with renewable technologies such as biomass boilers or heat pumps. In the case of the former, this could also help stimulate and make use of local wood fuel.

How? It is likely that the most likely time that fuel switching will take place is at the natural point of replacement of existing older heating systems. It is also likely to be strongly driven by the Renewable Heat Incentive. The RHI is currently open to non-domestic buildings, and there is a scheme in place offering a cash subsidy for homeowners until the policy is launched for homes in the Spring 2014. As with retrofitting homes – or perhaps as part of this theme – a task group should be established to promote these heating schemes and to showcase examples of successful installations within the area. In the case of heat pumps, it is important that the efficiency of existing buildings is improved prior to their installation, as they operate at competitive efficiencies only when the system temperature is low. This can only be achieved where heat demand is relatively low, for example having been reduced through improvements to heat loss through walls, and reductions in draughts. This task must also relate to the sustainable supply of wood fuel, and stimulating local supply chains such as through partnering with schemes such as Ward Forester.

9.8. Renewable Futures Group

What? Keeping abreast of potential opportunities for the area due to new innovations and improvements to emerging technologies.

Why? The analysis suggested there could be potential for energy generation from other means which could potentially contribute a significant amount of energy, though are likely to be medium to longer term measures. This includes potentially geothermal energy on Dartmoor. There are also other smaller schemes such as a marine current turbine array at Start Point.

How? As this is likely to be a lower priority measure compared to other themes, in the first instance this could simply involve interested parties committing to keep abreast of the outcomes from schemes which are paving the way and that have been deployed in locations in the UK with a better natural resource. For example, this could include understanding the performance of the two geothermal schemes in Cornwall, or the performance of marine current turbines and improvements to the technology at schemes off Skye and Anglesea. Specific scope for this group could include horizon scanning (e.g. an annual update on technology, funding, etc developments alongside an annual monitoring report reviewing data); responding to key policy initiatives and consultation opportunities; lobbying and briefing – political and interest groups and opportunities arising through preparation of new local plans in West Devon and South Hams.

ABBREVIATIONS

ATT	Advanced Thermal Treatment
BRE	Building Research Establishment
CCC	Committee on Climate Change
CEE	Centre for Energy and the Environment
CEP	Community Energy Plan
CSCO	Carbon Saving Community Obligation (ECO)
DCC	Devon County Council
DNPA	Dartmoor National Park Authority
ECO	Energy Company Obligation
EST	Energy Savings Trust
GWh	Gigawatt hour
HGV	Heavy Goods Vehicle
HHRCO	Home Heating Cost Reduction Obligation
kWh	Kilowatt hour
kWp	Kilowatt peak
LGV	Light Goods Vehicle
MSW	Municipal Solid Waste
MWh	Megawatt hour
MVHR	Mechanical Ventilation with Heat Recovery
Odt	Oven dried tonnes
SEACS	Sustainable Energy Across the Common Space
SHDC	South Hams District Council
SWD CEP	South West Devon Community Energy Partnership
WDBC	West Devon Borough Council
WID	Waste Incineration Directive