

Technical Paper E1 (b)

Energy Projections for Cornwall

Cornwall Council
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Technical Paper E1 (b) Energy Consumption in Cornwall

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1 Overview

- 1.1 This paper sets out some energy projections for Cornwall, based on Department of Energy and Climate Change (DECC) projections for the UK. Understanding the existing and potential future demand is important in terms of developing future policies on energy and renewable energy.
- 1.2 Figures are in kilo tonnes of oil equivalent (ktoe). This is a standard unit of energy and is used by DECC in their energy projections.
- 1.3 Summary figures of projections of energy consumption in the UK and Cornwall are included as Appendix A.

2 Headline messages

- Total final energy demand in the UK (excluding aviation and shipping) is projected to fall by 9% between 2007 and 2030, despite growth in population.
- Consumption of gas and petroleum in the UK are projected to decrease between 2007 and 2030, whilst renewable energy and bio-fuel consumption are projected to increase significantly. Electricity consumption is projected to remain relatively constant.
- Final energy demand in the domestic sector in the UK is projected to decrease by 9% between 2007 and 2030, largely due to energy efficiency measures. Industrial and commercial energy demand is projected to decrease by 7%, and transport energy demand (excluding aviation and shipping) is projected to decrease by 15%.
- UK projections of energy consumption can be applied to baseline information about energy demand in Cornwall. There are some limitations with this approach, however it does provide a useful estimate of future energy demand in Cornwall. Based on the UK projections, total energy demand in Cornwall is projected to decrease from 1,0374 kilo tonnes of oil equivalent (ktoe) in 2007 to 939 ktoe in 2030.

3 UK energy and emissions projections

- 3.1 The Department for Energy and Climate Change (DECC) produce regular energy and emissions projections, with the most recent projections released in 2011.¹ The 20101projections use a base year of 2008, and project emissions and energy demand in the UK to 2030.
- 3.2 The projections reflect revised assumptions of economic growth, carbon prices and policies included within key UK strategy documents.² The projections also take into consideration population change and household projections.
- 3.3 A number of projections of final energy demand are produced, based on a range of assumptions, to represent the uncertainty in making such projections into the future. The central price scenario is referred to within this paper.

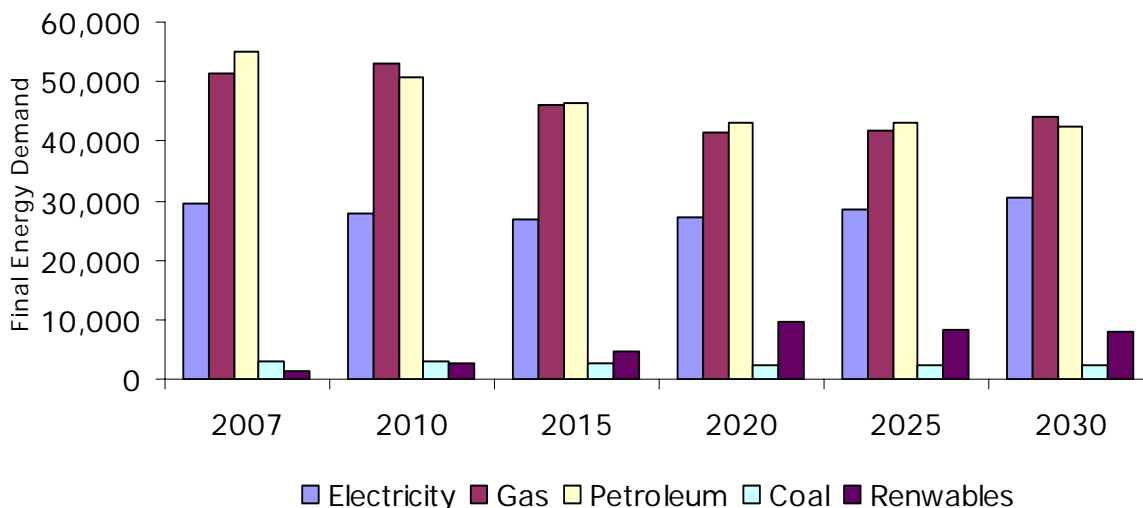
¹ Updated energy and emissions projections (DECC, Oct 2011); available at: <http://www.decc.gov.uk/en/content/cms/statistics/projections/projections.aspx>

² Specifically the Low Carbon Transition Plan (July 2009) and the Household Energy Management Strategy (March 2010). For more information on the assumptions used within the projections, see link above.

4 UK projections of final energy demand

- 4.1 Final energy demand is the energy used by consumers, for example households and businesses.
- 4.2 Total final energy demand in the UK (excluding aviation and shipping) is projected to fall by 9% from 140,110 ktoe in 2007 to 127,200 ktoe in 2030.³
- 4.3 The largest decreases in the UK by fuel type are from gas and petroleum, which are projected to fall by 7,607 ktoe and 12,590 ktoe respectively. Renewable and biofuel energy consumption is projected to increase from 1,250 ktoe to 8,039 ktoe.⁴ DECC suggest that about 75% this increase will come from the commercial and industrial sectors, 18% from road transport fuels and 7% from the domestic sector.
- 4.4 It should be noted that the projections assume that by 2020 around 30% of the electricity used by consumers in the UK will come from renewable energy. The renewables and biofuel energy consumption category refers to fuels consumed as a primary fuel (rather than those used to produce electricity). This includes wood, plant based biomass and landfill gas.⁵

Figure 1: Final energy demand by fuel type (ktoe), UK:



- 4.5 The projections also provide a breakdown total final energy demand by sector.
- 4.6 For the purposes of this paper the sectors included in the UK projections are combined to the following sectors: domestic, transport (excluding aviation and shipping) and industrial and commercial. Industrial and commercial includes iron and steel, other industry sectors, public administration, commercial and agriculture.
- 4.7 Final energy demand in the domestic sector in the UK is projected to decrease by 9% between 2007 and 2030, from 44,200 ktoe to 40,377 ktoe. Most of this decrease is attributed to energy efficiency measures.

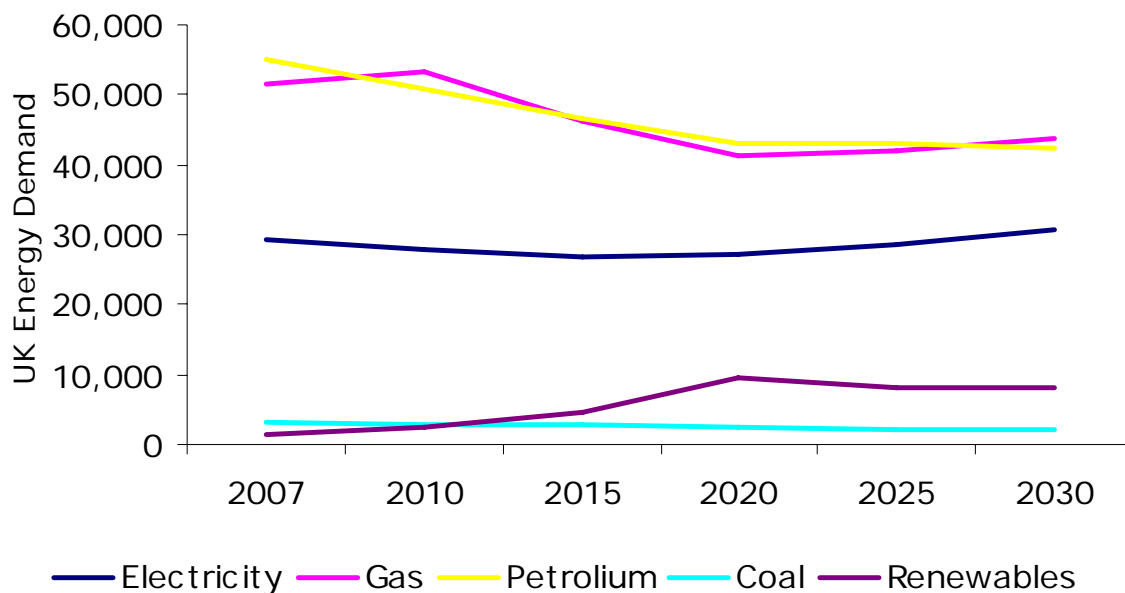
³ Total final energy demand in the UK (including aviation and shipping) is projected to fall by 5%, from 155,600 ktoe in 2007 to 148,065 ktoe in 2030.

⁴ Renewable and bio-fuel energy demand are grouped together for the purpose of this paper.

⁵ Renewables and bio-fuel energy consumption includes: Wood waste; wood; poultry litter, meat and bone and farm waste; straw, short rotation coppice and other plant based biomass; sewage gas; landfill gas; waste (municipal solid waste, general industrial waste and hospital waste) and tyres; geothermal and active solar heat; and liquid biofuels.

- 4.8 Industrial and commercial energy demand is projected to decrease by 7% between 2007 and 2030.⁶ There exceptions to this being public administration and agriculture sectors, which are projected to increase.
- 4.9 Transport energy demand (excluding aviation and shipping) is projected to decrease by 15% between 2007 and 2030, from 44,605 ktoe to 37,763 ktoe.⁷
- 4.10 Within the transport sector, petroleum for both road and rail use is projected to decrease by 17% between 2007 and 2030 (from 43,546 ktoe to 35,861 ktoe), whilst biofuel use is projected to increase by 333% by 2030 (from 360 ktoe to 1,561 ktoe in 2030). Electricity use for transport is projected to decrease by 50% between 2007 and 20 (from 696 ktoe to 341 ktoe). It is, however, noted that the vast majority of this decrease happened in 2008 (according to the statistics). The 2011 projections indicate that electricity use is likely to remain relatively constant between 2008 and 2030. The 2011 projections revise the previously issues (2010) figures for 2008, suggesting that the dramatic decrease between 2007 and 2008 is a statistical error (in the 2010 dataset), rather than a representation of actual energy demand.

Figure 2: Final energy demand by sector (ktoe), UK:



⁶ The industry and services sectors in the UK projections have been combined to give an overall 'industrial and commercial' sector to correspond with estimates of current energy demand.

⁷ Transport energy demand (including aviation and shipping) is projected to increase by 2 % between 2007 and 2030.

5 Projections of final energy demand in Cornwall

- 5.1 The UK energy projections can be applied to baseline information about energy demand in Cornwall. There are some limitations of applying UK based projections to a Cornwall baseline, for example the energy consumption of certain sectors may not increase or decrease locally in the same way as predicted nationally. However it does provide a useful estimate of future energy demand in Cornwall.
- 5.2 The UK energy projections provide year on year change in energy demand by fuel type and sector. These yearly percentage changes for growth or decline in each fuel type and sector in the UK can be applied to the 2007 baseline information for Cornwall.⁸

Notes on application of UK projections to Cornwall baseline data:

- Categories of sectors and fuel type matched between final energy consumption data and energy and emissions projections data.
- Categories for which no 2007 consumption data available for Cornwall estimated using national projections.
- Year on year % change calculated by fuel type and sector for national projections. This gives the proportions of growth or decline for each of the fuel types and sectors, from 2007 to 2030.
- % year on year change from national projections applied to Cornwall baseline.

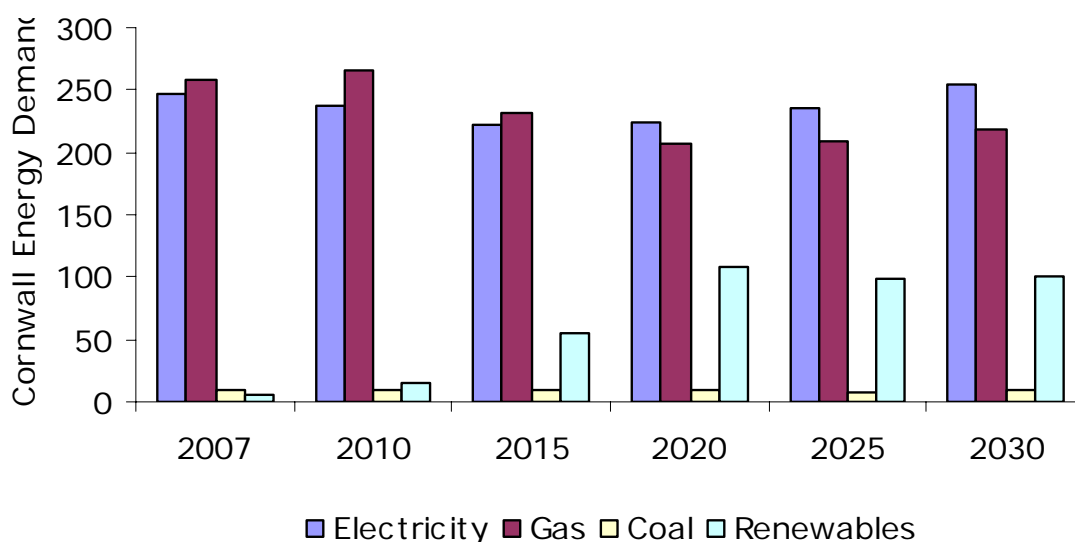
- 5.3 Total final energy demand in Cornwall (excluding aviation and shipping) is projected to fall by 9% from 1,030 kilo tonnes of oil equivalent (ktoe) in 2007 to 939 ktoe in 2030.
- 5.4 Taking into consideration increases in population, final energy demand per person in Cornwall is projected to decrease from 1.954 tonnes of oil equivalent (toe) in 2007 to 1.490 toe in 2030.⁹ Final energy demand per household is projected to decrease from 4.496 toe in 2007 to 3.172 toe in 2030.¹⁰

⁸ 'Total final energy consumption at local and regional level' (DECC, 2010)

⁹ '2008 based subnational population projections' (ONS, 2010)

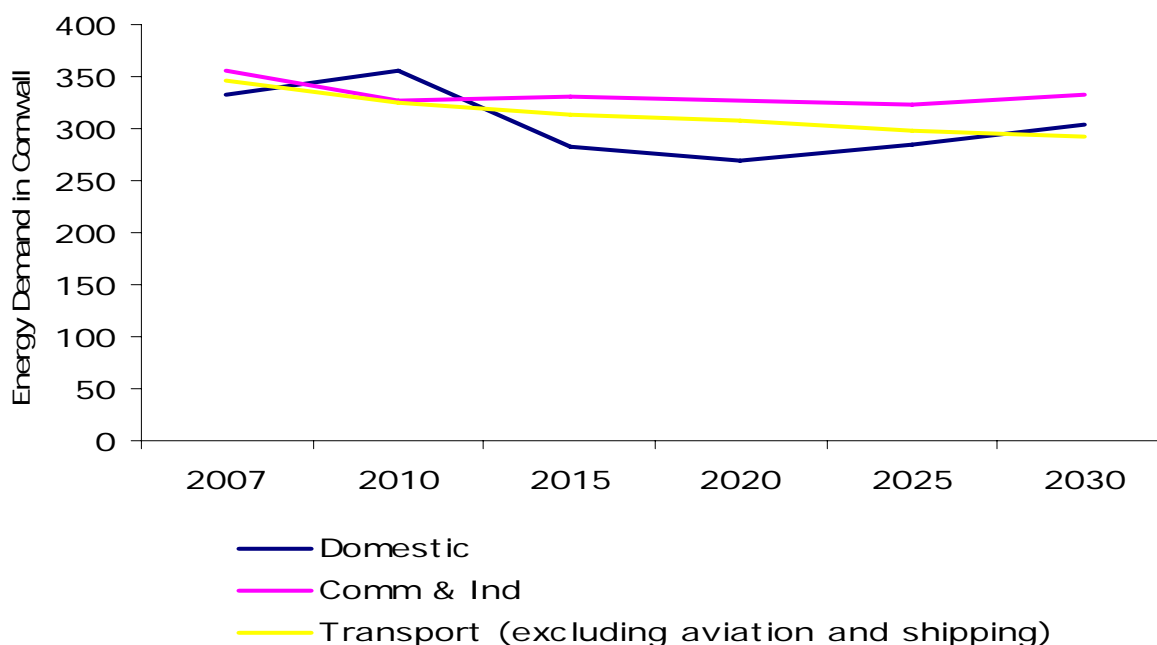
¹⁰ 'Household estimates and projections by district, England' (DCLG, 2009). A 'household' is defined as: one person living alone, or a group of people living at the same address with common housekeeping - that is, sharing either a living room or at least one meal a day.

Figure 3: Final energy demand by fuel type (ktoe), Cornwall:



5.5 Petroleum energy demand in Cornwall is projected to fall, from 510 ktoe in 2007 to 355 ktoe in 2030. Demand for renewables and bio-fuels is projected to increase in Cornwall from 5 ktoe in 2007 to 101 ktoe in 2030. The amount of this which is bio-fuels is expected to increase from 0 ktoe in 2007 to 7 ktoe by 2030.

Figure 4: Final energy demand by sector (ktoe), Cornwall:



5.6 Final energy demand in the domestic sector is projected to decrease by 9% between 2007 and 2030. Demand is also projected to decrease by 15% in the transport sector (excluding aviation and shipping) and by 7% in the industrial and commercial sector.

5.7 Although overall energy demand in the transport sector is projected to decrease in Cornwall, demand for bio-fuels and electricity for transport use is projected to increase from 0 ktoe in 2007 to 7 ktoe for bio-fuels and 1 ktoe for electricity in 2030 (from 0 ktoe in 2007).

6 Using energy forecast information

- Understanding potential future energy demand alongside existing energy demand is useful to inform future policies on energy and renewable energy.
- Understanding the components of current and future energy demand in Cornwall could help to identify demand which could be met by renewable energy or less carbon intensive fuel types.
- There are some limitations with applying the UK projections to a Cornwall energy demand baseline, but it does provide one estimate of future energy demand. This can be useful as a baseline from which to consider how certain policies may influence future energy demand.
- The energy demand projections for Cornwall should be used with caution. They are based on national rather than local assumptions, such as levels of population and household growth. They also assume energy by fuel type and sector grow or decline at the same rate as projected nationally.

Appendix A -Energy demand by final user in kilo tonnes of oil equivalent, UK and Cornwall

Energy demand by final user in kilo tonnes of oil equivalent, UK

Based on 'Energy and Emissions Projections' (DECC, 2011)

| | | 2007 | 2010 | 2015 | 2020 | 2025 | 2030 |
|----------------------------------|--------------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Domestic | Electricity | 9,893 | 9,761 | 7,713 | 7,379 | 8,031 | 8,981 |
| | Gas | 30,348 | 33,174 | 27,266 | 26,170 | 27,449 | 28,945 |
| | Petroleum | 2,877 | 3,237 | 1,275 | 767 | 817 | 683 |
| | Coal/ Manufactured fuels | 680 | 740 | 703 | 674 | 709 | 885 |
| | Renewables | 400 | 538 | 713 | 986 | 992 | 883 |
| | TOTAL | 44,198 | 47,450 | 37,671 | 35,977 | 37,998 | 40,377 |
| Industrial and commercial | Electricity | 18,771 | 17,693 | 18,867 | 19,496 | 20,192 | 21,317 |
| | Gas | 21,187 | 19,989 | 18,829 | 15,198 | 14,480 | 14,983 |
| | Petroleum | 8,469 | 6,472 | 6,173 | 4,980 | 4,674 | 4,524 |
| | Coal/ Manufactured fuels | 2,394 | 2,241 | 2,051 | 1,711 | 1,549 | 1,406 |
| | Renewables | 489 | 784 | 1,758 | 5,608 | 5,597 | 5,594 |
| | TOTAL | 51,309 | 47,178 | 47,678 | 46,994 | 46,492 | 47,824 |
| Transport | Electricity | 696 | 335 | 340 | 341 | 341 | 341 |
| | Petroleum (Rail) | 700 | 628 | 713 | 713 | 632 | 632 |
| | Petroleum (Road) | 42,846 | 39,739 | 37,471 | 35,674 | 35,917 | 35,229 |
| | Bio-fuel | 362 | 1,231 | 2,016 | 3,021 | 1,585 | 1,561 |
| | TOTAL | 44,605 | 41,933 | 40,540 | 39,750 | 38,474 | 37,763 |
| TOTAL | Electricity | 29,360 | 27,789 | 26,919 | 27,217 | 28,564 | 30,639 |
| | Gas | 51,535 | 53,163 | 46,095 | 41,369 | 41,929 | 43,928 |
| | Petroleum | 54,893 | 50,813 | 46,501 | 43,109 | 43,136 | 42,303 |
| | Coal/ Manufactured fuels | 3,074 | 2,981 | 2,754 | 2,385 | 2,258 | 2,291 |
| | Renewables and bio-fuels | 1,250 | 2,553 | 4,487 | 9,616 | 8,174 | 8,039 |
| | TOTAL | 140,112 | 137,298 | 126,756 | 123,696 | 124,062 | 127,200 |

Notes:

- Central scenario based on central fossil fuel prices, central policy and central growth.
- Industry and services sectors from projections combined to 'Industrial and commercial'.
- Excludes shipping and aviation.

Energy demand by final user in kilo tonnes of oil equivalent, Cornwall

Calculated using 'Total final energy consumption' (DECC, 2009) and 'Energy and Emissions Projections' (DECC, 2010)

| | | 2007 | 2010 | 2015 | 2020 | 2025 | 2030 |
|----------------------------------|--------------------------|--------------|-------------|------------|------------|------------|------------|
| Domestic | Electricity | 116 | 114 | 90 | 87 | 94 | 105 |
| | Gas | 146 | 160 | 131 | 126 | 132 | 139 |
| | Petroleum | 65 | 73 | 29 | 17 | 18 | 15 |
| | Coal/ Manufactured fuels | 5 | 5 | 5 | 5 | 5 | 7 |
| | Renewables | 0 | 4 | 28 | 35 | 36 | 37 |
| | TOTAL | 332 | 356 | 283 | 270 | 285 | 303 |
| Industrial and commercial | Electricity | 131 | 123 | 132 | 136 | 141 | 149 |
| | Gas | 113 | 107 | 100 | 81 | 77 | 80 |
| | Petroleum | 102 | 78 | 74 | 60 | 56 | 54 |
| | Coal/ Manufactured fuels | 5 | 5 | 4 | 4 | 3 | 3 |
| | Renewables | 5 | 8 | 18 | 57 | 57 | 57 |
| | TOTAL | 356 | 327 | 331 | 326 | 323 | 332 |
| Transport | Electricity | 0 | 1 | 1 | 2 | 1 | 1 |
| | Petroleum (Rail) | 10 | 9 | 10 | 10 | 9 | 9 |
| | Petroleum (Road) | 336 | 312 | 294 | 280 | 282 | 276 |
| | Bio-fuel | 0 | 3 | 9 | 16 | 6 | 7 |
| | TOTAL | 346 | 325 | 314 | 308 | 298 | 293 |
| TOTAL | Electricity | 247 | 238 | 223 | 225 | 236 | 255 |
| | Gas | 259 | 266 | 232 | 207 | 209 | 219 |
| | Petroleum | 513 | 472 | 407 | 367 | 365 | 355 |
| | Coal/ Manufactured fuels | 10 | 10 | 9 | 9 | 8 | 9 |
| | Renewables and bio-fuels | 5 | 15 | 55 | 108 | 99 | 101 |
| | TOTAL | 1,034 | 1001 | 926 | 916 | 917 | 939 |

Notes:

- Percentage year on year change in energy demand (by energy type and sector) calculated from UK energy projections and applied to Cornwall energy consumption in 2007.
- Renewable energy consumption in the domestic sector estimated for Cornwall using total for domestic sector minus totals for domestic consumption of electricity, gas, petroleum and solid/manufactured fuels.
- Electricity and bio-fuels composition in the transport sector estimated for Cornwall using total for transport sector minus total consumption of petroleum. This figure is then attributed to either electricity or bio-fuels based on UK proportions.
- UK central scenario based on central fossil fuel prices, central policy and central growth.
- Industry and services sectors from projections combined to 'Industrial and commercial'.
- Excludes shipping and aviation.

Energy demand by final user in tonnes of oil equivalent, Cornwall (per person and per household)

Energy sources: 'Total final energy consumption' (DECC, 2009) and 'Energy and Emissions Projections' (DECC, 2010)

Population and household sources: '2008 based sub-national population projections' (ONS, 2010) and 'Household estimates and projections by district, England' (DCLG, 2009)

| | 2007 | 2010 | 2015 | 2020 | 2025 | 2030 |
|-----------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Population projections (Cornwall) | 529,300 | 537,500 | 559,500 | 583,100 | 607,600 | 630,300 |
| Total energy per person | 1.954 | 1.862 | 1.655 | 1.571 | 1.509 | 1.490 |
| Household projections (Cornwall) | 230,000 | 249,000 | 251,000 | 266,000 | 280,000 | 296,000 |
| Total energy per household | 4.496 | 4.020 | 3.690 | 3.444 | 3.275 | 3.172 |

Notes:

- Population and household projection years matched to energy projection years.

Appendix B - Energy demand in Cornwall – notes on data sources for demand forecasts

Data sources and notes:

| | |
|--|---|
| <p>Total final energy consumption (DECC, 2009)</p> | <p>DECC produce a dataset for local and regional total energy consumption. This data aggregates four main datasets for gas, electricity, road transport and remaining fuels.</p> <p>Notes:</p> <p>Electricity</p> <ul style="list-style-type: none"> ▪ Annualised consumption data is obtained by DECC from electricity suppliers, who collate electricity consumption levels for each customer meter or MPAN (meter point administration number). ▪ The geographical location of the meter points is obtained from a meter postcode address file. ▪ The geographical and electricity consumption data are then merged together to enable consumption data to be mapped to postcodes and aggregated to LLSOA, MLSOA, local authority and regional levels. ▪ DECC then produce a domestic/non domestic split, based on information about the meter type. In addition, some of the large consumers classified as domestic are reallocated to industrial/commercial if annual consumption is greater than 100,000 kwh. <p>Gas</p> <ul style="list-style-type: none"> ▪ Annualised consumption data is published by DECC from gas sales data made available by the company responsible for the collation of gas consumption. ▪ The data are weather corrected by National Grid, to enable comparison (altered to reflect what annual consumption might have been if the weather during the year had been the same as the average for a long-term period). ▪ The geographical location of the meter points is mapped using the National Statistics Postcode Directory. ▪ The gas industry uses a 73,200 kwh level as the cut off point for defining customers as either domestic or commercial. ▪ In addition, a considerable amount of consumption relating to power stations and some very large industrial consumers is not covered by the datasets, as it is considered that this would be disclosive. <p>Road transport</p> <ul style="list-style-type: none"> ▪ Estimates of energy consumption for road transport are produced for DECC by AEA Energy and Environment. The dataset estimates fuel consumption by type of vehicle (bus, motorcycle, petrol car, diesel car, HGV, petrol LGV and diesel LGV). ▪ The estimates are produced using CO2 emissions data from NAEI, road consumption factors and traffic flow data from the Department for Transport. ▪ The road transport estimates are modelled rather than real consumption estimates, and are based on the use of a number of different information sources. ▪ The estimates are based on where the fuel was consumed rather than where it was purchased in order to the make the dataset more comparable with both the electricity and gas datasets based on consumption from individual meters. |
|--|---|

| | |
|---|--|
| | <p>Other fuels</p> <ul style="list-style-type: none"> ▪ Local and regional estimates for the remaining fuels are produced by AEA Energy and Environment for DECC and are calculated from a number of different information sources. ▪ 'Other fuels' (fuels other than electricity, gas and road transport petroleum) includes the consumption of domestic and industrial coal and manufactured solid fuels, petroleum consumed for non road transport purposes and combined consumption of renewables and wastes. ▪ The datasets are based on modelled rather than real data. <p>The data is categorised into the following sectors: industrial and commercial (including heat generation, energy industry use, industry, public administration, commercial, agriculture and miscellaneous), domestic, road transport and rail transport.</p> |
| <p>Energy consumption in the UK (DECC, 2011)</p> | <p>DECC provide a range of datasets relating to domestic, transport, industry and services energy consumption in the UK.</p> <ul style="list-style-type: none"> ▪ The domestic datasets includes Table 3.7 ('Domestic energy consumption by end use and fuel 1990 to 2008'), which describes what energy in the domestic sector is used for. ▪ The transport datasets include Table 2.11 ('Transport energy consumption re-allocated to domestic, industrial and service sectors 1990 to 2008'), which describes how the total energy consumed by transport is split between sectors. |
| <p>Household estimates and projections by district, England, 1981- 2031 (CLG, 2009)</p> | <ul style="list-style-type: none"> ▪ Estimates to 2006 are based on ONS mid-year population estimates and projected rates of household formation from trends in Census and Labour Force Survey data. ▪ All projections are 2006 based. ▪ The 2006-based household projections are linked to the Office for National Statistics 2006-based Population Projections, and are not an assessment of housing need or do not take account of future policies. They are an indication of the likely increase in households given the continuation of recent demographic trends. |

Energy projections for Cornwall - notes

Data sources and notes:

| | |
|--|---|
| <p>Total final energy consumption (DECC, 2009)</p> | <p>See notes above.</p> |
| <p>Energy and emissions projections (DECC, 2011)</p> | <ul style="list-style-type: none"> ▪ Each year DECC publishes updated energy projections, which project future energy use and carbon dioxide emissions in the UK. ▪ The projections are based on assumptions of future economic growth, fossil fuel prices, UK population and other key variables. ▪ The projections produced in 2010 assume the impact of the package of policies set out in the Low Carbon Transition Plan (LCTP) and the Household Energy Management Strategy (HEMS). ▪ The projections produced in 2010 are based on 2008 data. |

- Demand for energy in the projections is considered on final energy demand or primary demand basis. Final energy demand is energy used by final consumers (households, businesses etc). Primary energy demand is energy from raw fuels that has not been subjected to any transformation (for example fuel used to produce electricity).
- A number of projections of final energy demand are produced, based on a range of assumptions, to represent the uncertainty in making such projections into the future. The projections include a baseline scenario (this excludes all policies in the LCTP) and four scenarios which focus on different future fossil fuel price assumptions (low, central, high and high-high).

Methodology:

The UK energy projections can be applied to baseline information about energy demand in Cornwall. There are some limitations of applying UK based projections to a Cornwall baseline, for example the energy consumption of certain sectors may not increase or decrease locally in the same way as predicted nationally. However it does provide a useful estimate of future energy demand in Cornwall.

The UK energy projection used is the central price scenario. This scenario includes policies within the Low Carbon Transition Plan (July 2009) and the Household Energy Management Strategy (2010), as well as assumptions of economic growth, population change, household projections and carbon prices.

Note: UK projections in the steps below refer to the 'central price scenario' data.

1. Sector and fuel type categories were matched between final energy consumption data and emissions projections data.

Notes: The categories used in the data sources generally match, but there are a few exceptions:

- 'Aviation fuel' and 'petroleum (shipping)' data within the projections were excluded from analysis to match energy consumption data.
- Data for the 'iron and steel', 'other industry sectors', 'public administration', 'commercial' and 'agriculture' sectors were combined in the projections to match the 'industrial and commercial' sector in the consumption data.
- 'Coal' and 'manufactured fuels' from consumption data are combined to the category 'solid/manufactured fuels'.
- 'Biofuels' and 'electricity' are included in the transport sector, as per the projections.

2. 2007 energy consumption data for Cornwall altered to combined categories (as identified in step 1) – this gives a 2007 baseline for Cornwall projections.

Notes: There are a couple of categories for which no data are available at this point: domestic - renewables; transport - electricity; transport - biofuels.

[See worksheets: Consumption_Altered]

3. UK projections data altered to combined categories – this gives reworked national projections to be applied to the Cornwall baseline.

[See worksheets: Consumption_Altered]

4. Year on year % change calculated by fuel type and sector for reworked national projections (as established in step 3). This gives the proportions of growth or decline for each of the fuel types and sectors, from 2007 to 2030.

[See worksheets: UKproj%change and UKproj%change_Summary]

5. Categories for which no data available (as identified in step 2) estimated.

Notes:

For domestic – renewables:

- Apply UK year on year % change to fuel types. Also apply to total for domestic sector.
- Add all other fuel types in domestic sector for each year (electricity, gas, petroleum, solid/manufactured fuels) and subtract from domestic sector total for each year.
- Attribute the remaining amount of ktoe in the domestic sector to renewables.

For transport – electricity and transport – biofuels:

- Apply UK year on year % change to fuel types. Also apply to total for transport sector.
- Add all other fuel types in domestic sector for each year (road petroleum and rail petroleum) and subtract from transport sector total for each year.
- Calculate mix of biofuels and electricity for each year of UK projections and apply proportions to remaining ktoe attributed to Cornwall transport sector to provide split between biofuels and electricity.

[See worksheets: CornwallProj_ScenarioA]

6. % year on year change from national projections applied to Cornwall baseline (as calculated in step 3 and finalised in step 5)

[See worksheets: CornwallProj_ScenarioA]