Warwickshire
Energy Statistics

Report for Warwickshire County Council

Climate Change Strategy baseline data

Warwickshire County Council

Working for Warwickshire

Warwickshire Energy Statistics

Baseline data 2003

Report for Warwickshire County Council

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Contents

1.0 Introduction and Key Points

1.1 Introduction

Warwickshire county council are leading the development of a climate change strategy for the county. This study profiles the nature, scale and importance of the energy sector in the county and includes estimates of the energy consumption and related emissions. Unless otherwise stated the report uses 2003 data.

1.2 Key Points

The following key points have emerged:

Coal Industry

- Warwickshire contains Daw Mill, the only active coal mine in the West Midlands.
- Daw Mill is a significant employer - 574 staff.
- The 2.9 million tonnes of coal extracted in 2004 is equivalent to 150% of the county's estimated energy consumption.

Renewables

- Renewables capacity in the county is 17.4MW per annum and is virtually all landfill gas.
- The output is equivalent to 3% of the county's electrical demand which is higher than the national average.
- In the long term it is likely that the amount of landfill gas available and hence the electricity which can be generated from it will decline.

Combined Heat and Power (CHP)

- There is only 2MW in total and there are no large schemes (known) working in the county.
- The known schemes are relatively old and small, which means that they may well not be running.
- The status (and nature) of a Scottish and Southern large scale CHP scheme (mentioned in the National Grid 7 year statement) is not known. If this 115MW scheme is operating it will more than achieve the Warwickshire share (90MW) of the national target for CHP.

Overall Consumption and Emissions

- Domestic energy consumption accounts for just under a third (30.5 percent) of final energy consumption in Warwickshire (total 18,027 GWh).
- Industry and commerce accounts for a further 28 percent and transport accounts for the largest part with over 41 percent.
- The largest fuel type consumed is oil (47.5 percent).
- Carbon dioxide emissions are 4,600 kt per annum.
- To achieve Koyoto targets, this needs to reduce to 4,200 by 2010, 3,600 by 2020 and to 1,900 by 2050.

2.0 Energy Resources

This section describes the amounts of unrefined energy that is first made available for use in Warwickshire as well as the outputs of the facilities where energy is transformed from one form to another. This includes coal, combined heat and power (CHP) and generation of electricity from renewable sources. Unless otherwise stated the figures are for 2003.

2.01 Coal Extraction

Warwickshire contains the Daw Mill coal mine situated 13km to the northwest of Coventry, 2km southeast of the village of Furnace End. A DTI review of the reserves at UK deep coal mines reported that in 2002 the reserves at the mine were 26 million tonnes with a resource of 6.3 million tonnes and a mineral potential total of 43 million tonnes.

In 2004/05 Daw Mill output was 2.9 million tonnes and the mine employed some 574 people (Source: UKCoal). The energy content of this amount of coal is approximately 27,300 GWh which is equivalent to 150% of the estimated energy consumed within Warwickshire.

Coal mine methane is composed of approximately 70% methane, 15% nitrogen and 15% carbon dioxide. It escapes to atmosphere from operating and abandoned mines. As with onshore oil and gas, the DTI lets Petroleum Exploration and Development Licences (PEDLs) to developers who may wish to extract and utilise CMM. A number of PEDLs were let in Warwickshire in previous rounds but none of these licences appear to have been turned into active sites.

2.02 Renewables

Ofgem produce a register of all accredited generating stations and it also publishes the amounts of Renewables Obligation Certificates (ROCs) issued each month (since April 2001) to each station (on the ROC register). One ROC is issued per MWh of eligible electricity generated. The following table lists all the generators of electricity from renewable sources that could be identified.

Table 1: Renewable Electricity Schemes in Warwickshire

Name	Capacity (kWe)	Output (MWh)	Note
Judkins Landfill Site	2,880	6,726	Landfill Gas
Judkins/Tuttle Hill Landfill	1,236	7,759	Landfill Gas
Ling Hall Landfill (Generation Phase 1)	1,003	12,113	Landfill Gas
Ling Hall Landfill (Generation Phase 2)	1,048	-	Landfill Gas
Packington Gas Control Plant	8,250	19,313	Landfill Gas
Ryton Landfill Site	900	13,246	Landfill Gas
Ufton	1,003	5,714	Landfill Gas
Waverley Wood Farm	988	16,432	Landfill Gas
EPIC (Nuneaton)	105	79	Photovoltaic
Total	**17,413**	**81,382**	

Source: Ofgem ROC Register

The following points can be derived from the information.

- The renewable capacity is virtually all fuelled by landfill gas. Though this is a source which will remain in the short term, over the longer term it is likely to decline as the fraction of biodegradable waste which is sent to landfill reduces in line with the requirements of the Landfill Directive.
- Output is equivalent to 3% of Warwickshire electricity demand.

The target for the UK is for 10% of all electricity generated to come from renewable sources by 2010. However, the West Midlands Energy Strategy contains a lower and differently phrased target - for 5% of the electricity consumed in the region to come from renewable sources by 2010. The target was reduced due to the relative lack of a wind resource (no uplands or coastline) in the region (in comparison to others) as wind is widely accepted to be the most likely source of growth in renewables capacity in the short term. The phrasing was switched from % of generation to % of use to reflect the relative lack of large scale power stations in the region.

2.03 Combined Heat and Power

A combined heat and power (CHP) unit is an installation where heat energy, present as a by-product of engine-driven electricity generation, is used for space heating or process requirements. This results in a much higher overall efficiency of useful delivered electricity and heat than is the case where electricity and heat are generated separately. The following table lists the largest CHP schemes present in Warwickshire as per the Ofgem register. Information in the last two rows refers to a site under development included in the National Grid Seven Year Statement for 2003.

Table 2: CHP Schemes in Warwickshire

Scheme Location	Site Address	Commissioning Date	CHP Capacity kWe	Max Heat Output kWt
Stratford Upon Avon Foods (believed to have ceased trading)	Stratford Upon Avon	1997	980	948
Hospital of St Cross	Rugby NHS Trust	1991	410	695
Moat House International Hotel	Stratford-Upon-Avon	1993	300	452
Newbold Community Leisure Centre	Royal Leamington Spa	1999	216	0
Ken Marriott Leisure Centre	Rugby	1996	56	103
St Michaels Hospital	Warwick	1995	54	0
Royal Mail Leamington Spa	Leamington Spa	1995	40	0
Abbey Fields Leisure Centre	Kenilworth	1994	38	67
Biddle Air Systems Ltd	Nuneaton	1991	18	55
WJ Findon & Sons	Stratford on Avon	2000	30	Exhaust gas used to promote plant growth in a green-house
		TOTAL	**2,142**	**2,320**
Future Prospect				
Scottish & Southern	Malpas Quarry Rugby	?	115,000	

Source: Ofgem., National Grid Seven Year Statement

The UK target is to have 10,000 MW of CHP capacity by 2010. If the Warwickshire share of this target is calculated from its proportion of national electricity demand (0.9% of the UK total), this equates to a CHP target of 90 MW.

From the above table the following points can be drawn.

- There are no large schemes working in the county.
- The schemes are relatively old and small, this means that they may well not be running.
- The status (and nature) of the Malpas Quarry scheme is not known. If this 115MW scheme is operating it will more than achieve the derived CHP target for Warwickshire (90MW).

It should also be pointed out that the Ofgem register, from which this data is drawn, is known to be incomplete. As a consequence, there may be additional unidentified CHP schemes in Warwickshire.

3.0 Energy Consumption

This section covers energy consumed within the county.

3.01 Natural Gas

This section first presents data on gas consumption by Transco zone. More detailed data is then presented which gives a more accurate reflection of sub-regional gas consumption.

Table 3: Gas consumption in the West Midlands Zone (small vs large customers)

	Consumers			Gas Sales GWh		
	Small	Large	Total	Small	Large	Total
2001	1,884,000	35,000	1,919,000	37,474	29,002	66,476
2002	1,885,000	36,000	1,921,000	37,056	27,353	64,409
2003	1,887,000	38,000	1,925,000	38,272	26,118	64,390

Source: DUKES, 2004

Transco has now made data on gas consumption available by postcode. (www.transco.uk.com). This data is based on estimated consumption for each customer and is shown in the table below.

Table 4: Gas consumption in Warwickshire (domestic vs. industrial use)

	Meter Point Count			Gas Sales GWh		
	Domes-tic	I&C	Total	Domes-tic	I&C	Total
2001	171,620	3,820	175,440	3,394	1,605	4,999
2002	170,085	3,832	173,917	3,413	1,773	5,186
2003	176,101	4,136	180,237	3,618	1,876	5,494
2004	178,359	4,194	182,553	3,732	1,780	5,513

Source: Transco plc

Since 2001, Warwickshire has seen an increase of 7,113 in numbers of gas consumers. This growth has occurred amongst smaller customers (an additional 6,739 customers). The region has seen an increase in gas sales of 514 GWh, which is 10.3% higher than in 2001. Actual consumption by smaller customers has increased, and they represent 67.7 percent of total gas sales. This could be accounted for by the provision of gas to a number of rural areas for the first time over this period.

In 2003 there was some 5,513 GWh of gas sales to 182,553 consumers in Warwickshire. Of these customers 178,359 consumed less than 73 GWh /yr. i.e. all the domestic and small business accounted for 3,732 GWh of the gas sales. This implies that the remaining 4,194 customers (2.3% of the total) used 1,780 GWh (32.3% of total).

The DTI have also prepared a data set which shows regional gas sales. The table overleaf presents this data. The data shows:

- Consumers in Warwickshire represent 0.9% of total consumers in Great Britain, and they consume 0.9% of total gas consumed nationally. As a proportion of the West Midlands consumers and sales, Warwickshire represents 9.8% of all consumers in the West Midlands, yet consume 9.2% of gas consumed in the region.
- The latter under-representation comes from industrial and commercial (I&C) consumers. Warwickshire hosts 10% of the region's I&C consumers. Yet these demand a mere 8.3% of the total I&C gas consumption in the region.
- Average consumption per domestic consumer in Warwickshire is slightly more than the national and regional averages.
- Average consumption per commercial and industrial consumer is much lower in Warwickshire – 650,836 kWh, compared to 729,372 for GB as a whole, and 783,864 in the West Midlands.

Early analysis of national figures by the DTI has indicated a potential trend of lower than expected domestic gas consumption in areas with an active coal mining sector. This may explain the low gas use in Nuneaton and Bedworth which contains the Daw Mill mine.

Table 5: Regional and Local Gas Consumption Statistics 2003

	Domestic consumers		Commercial and industrial		All consumers		Sales per consumer	
Area	**Sales - GWh**	**Number of consumers (thousands)**	**Sales–GWh**	**Number of consumers (thousands)**	**Sales - GWh**	**Number of consumers (thousands)**	**Domestic-kWh**	**Commercial and industrial - kWh**
North Warwickshire	728	34.00	515	0.56	1,243	34.56	21,426	925,572
Nuneaton and Bedworth	650	33.49	296	0.48	946	33.97	19,420	614,655
Rugby	567	27.91	447	0.52	1,014	28.43	20,320	865,024
Stratford-on-Avon	743	35.60	389	0.99	1,133	36.59	20,879	394,036
Warwick	1,160	56.80	808	1.23	1,968	58.03	20,428	657,022
TOTAL WARWICKSHIRE	3,850	188	2,454	4	6,304	192	20,498	650,836
Total Warwickshire as % of WM	10.0%	9.8%	8.3%	10.0%	9.2%	9.8%		
TOTAL WEST MIDLANDS	**38,526**	**1910.78**	**29,641**	**37.81**	**68,168**	**1,948.59**	**20,163**	**783,864**
Total Warwickshire as % of GB	**0.9%**	**0.9%**	**0.8%**	**0.9%**	**0.9%**	**0.9%**		
GREAT BRITAIN	**415,948**	**20,683.00**	**307,795**	**422.00**	**723,743**	**21,105**	**20,111**	**729,372**

Source: DTI

3.02 Electricity

As with gas sales there have been recent efforts to improve the availability of region specific data. The results of this have recently been released by the DTI (on an experimental basis) and are shown in the table overleaf:

A number of interesting points can be noted from this table.

- The total electricity sales in Warwickshire are 2,728 GWh.
- In Warwickshire the average domestic consumption and the average total consumption is more than the national and regional averages.
- Consumers in Warwickshire account for 9.9% of all consumers in the West Midlands, but account for 12.6% of sales. This over-representation occurs for both domestic and industrial and commercial customers, but is more pronounced for I&C customers which represent 10.5% of consumers and 14.3% of sales.

The data excludes large loads which are served directly from the national transmission system and also excludes system losses.

Table 6: Regional and Local Electricity Consumption Statistics 2003

	Domestic consumers		Commercial and industrial		All consumers		Sales per consumer	
Area	**Sales – GWh**	**Number of MPANs**	**Sales – GWh**	**Number of MPANs (thou-sands)**	**Sales – GWh**	**Number of MPANs (thousands)**	**Average domestic kWh**	**Average I&C kWh**
North Warwickshire	137	26.3	318	2.4	455	28.7	5,197	131,884
Nuneaton and Bedworth	233	51.3	214	3.2	447	54.5	4,548	67,649
Rugby	199	39.1	314	3.3	513	42.3	5,100	95,528
Stratford-on-Avon	303	51.2	277	5.8	580	57.0	5,907	48,148
Warwick	276	55.5	457	5.4	733	60.9	4,980	84,725
TOTAL WARWICKSHIRE	1,148	223	1,580	20	2,728	243	5,140	78,970
Total Warwickshire as % of WM	10.8%	9.9%	14.3%	10.5%	12.6%	9.9%		
TOTAL WEST MID-LANDS	**10,609**	**2,265.0**	**11,062**	**190.0**	**21,670**	**2,455.0**	**4,684**	**58,221**
Total Warwickshire as % of GB	**1.0%**	**0.9%**	**0.8%**	**0.8%**	**0.9%**	**0.9%**		
GREAT BRITAIN	**118,754**	**25,814.0**	**189,523**	**2,432.6**	**308,277**	**28,246.6**	**4,600**	**77,909**

Source: DTI

4.0 Final Use by Sector

This section breaks down energy consumption by the three main energy using sectors Transport, Domestic and Industrial/commercial.

4.01 Transport

Warwickshire had 278,432 cars licensed at the end of March 2005 (DVLA, 2005). This is approximately 1% of the GB total. The following table shows the type of these cars. In total 79 percent of registered cars in Warwickshire are petrol, and a further 20 percent are diesel. This composition has changed over the past 15 – 20 years, as shown in the graph below.

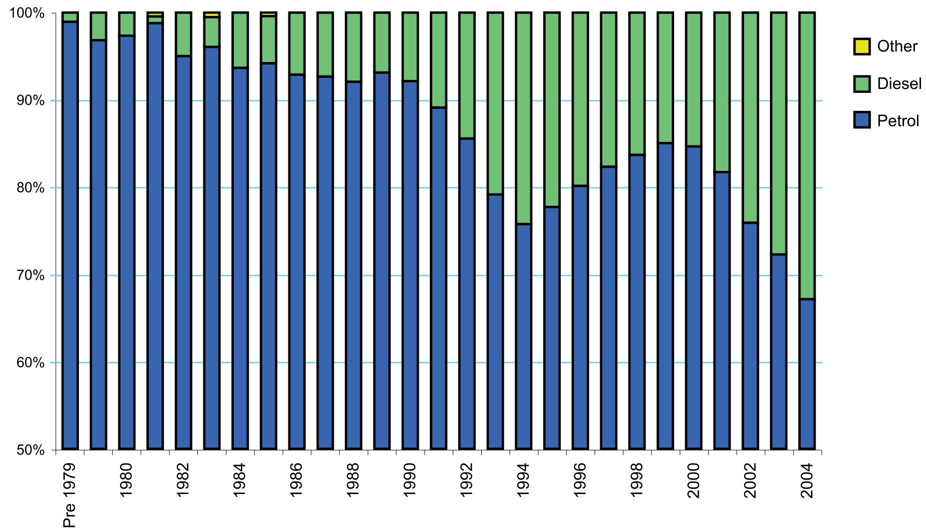
Table 7: Total number of cars registered in Warwickshire up to March 2005

	Number of registrations
Petrol	221,164
Diesel	56,669
Electricity	5
Steam	1
Gas	11
Petrol/Gas	321
Gas/Bi-Fuel	236
Hybrid Electric	25
Total	**278,432**

Source: DVLA, 2005

The following graph shows the proportion of petrol and diesel cars registered each year in Warwickshire, from pre-1979 to 2004. The graph shows the growth in the proportion of diesel cars registered in Warwickshire since 1990. Before 1990 less than 10 percent of cars registered were diesel, this rose to 24 percent in 1994. Between 1994 and 2000 there was a decrease in the proportion of diesel cars, which then rose again to 2004. 2004 saw the highest proportion of diesel cars registered (33 percent of all cars registered in Warwickshire in 2004). The 'other' sector represents a very small proportion of cars in Warwickshire.

Figure 1: Proportion of petrol and diesel cars registered to 2004



Source: DVLA, 2005

In Warwickshire, motor vehicles travelled a total of 8,330 million kilometres in 2002. The total for GB was 485,981 million kilometres and 47,536 million kilometres for the West Midlands. On this basis Warwickshire accounts for 17.5 percent of vehicle miles in the West Midlands and 1.7 percent of all vehicle miles travelled nationally. The DTI have announced that they intend to make regional transport energy use data available on a similar basis (in terms of dis-aggregating national road transport energy use). This method has therefore been used in this study. It is important to bear in mind that the presence of three motorways in the county (with the extensive through traffic this implies) does mean this will give a high figure.

For the commercial consumption of diesel (direct deliveries for use in consumers business, e.g. truck and bus companies with their own diesel tanks) the county percentage (1.1%) of the GB total for jobs in transport, storage and communications has been applied to the national figure for commercial deliveries.

Table 8: Warwickshire Road Transport Fuel (2003)

Total retail deliveries (DUKES)	Ktonnes	Warwick-shire (1.7 %)	Warwickshire Klitre	Warwick-shire GWh
4 star/leaded	183	3	4,250	41
Super unleaded	861	15	19,409	192
Premium unleaded	18,291	311	422,888	4,068
DERV (Retail deliveries)	9,057	154	182,145	1,950
DERV (Commercial consumers: 1.1% of UK)	8,655	95	112,628	1,206
Total - 2003	**37,047**	**578**	**741,319**	**7,457**

Source: DUKES, National statistics

In 2003 we estimate that 578 ktonnes of road transport fuel was used in Warwickshire. This amounted to 7,457 GWh of road transport energy use.

Although not strictly used within the boundaries of the county it is interesting to consider the amount of energy used by the planes refuelling at Coventry airport. In 2002 Coventry airport accounted for 0.28% of UK air movements. If this percentage is applied to the total amount of aviation fuel delivered in the UK it amounts to 375 GWh.

4.02 Domestic

For the UK as a whole, domestic energy consumption accounts for 28.1% of final energy consumption (DUKES 2003). By applying the Warwickshire percentage of national population (0.9%) to this figure, domestic energy consumption for Warwickshire of 4,973 GWh can be calculated. If the national fuel split is assumed, the following figures for energy use by fuel can be calculated:

Table 9: Domestic Energy Use by Percentage of UK Total (2003)

Energy Medium	Annual Consumption (GWh)
Natural Gas	3,465
Electricity	1,039
Petroleum products (non transport)	359
Coal	110
Total	**4,973**

Source: Dukes (2003); National Statistics

4.03 Industrial / Commercial

The following table is derived from the numbers of employees in each of the sectors in 2003.

In Warwickshire, the sector with the highest energy consumption is commercial, which accounts for 20.2% of all consumption by I&C in Warwickshire. Vehicles and public administration are the next highest energy consumers in Warwickshire. As a percentage of the UK total, the vehicle industry accounts for the largest proportion (3.2%) of national energy consumption. By contrast, the chemical industry accounts for 0.2 percent of national energy consumption in that sector.

Table 10: Warwickshire Energy Consumption by Industry and Commerce

Sector	Warwickshire Energy	Warks as % of UK total	Consumption by energy type 2003 (GWh)				
			Coal & manufactured fuel	Petroleum products	Natural Gas	Renewables & Waste & Heat Sold	Electricity
Unclassified	235	0.9	13	199	1	22	-
Iron and Steel	396	1.2	94	3	223	-	76
Non Ferrous metals	245	1.8	15	13	90	-	128
Mineral Products	407	1.5	37	47	206	-	117
Chemicals	160	0.2	1	8	87	25	39
Mechanical Engineering and metal products	352	1.7	1	53	147	2	148
Electrical and instrument engineering	103	0.9	0	6	41	-	56
Vehicles	582	3.2	8	45	353	-	176
Food, beverages and tobacco	199	0.4	4	17	124	0	53
Textiles, clothing , leather and footwear	52	0.4	0	10	29	-	13
Paper, printing and publishing	146	0.5	1	7	74	-	64
Other industries	402	0.6	2	208	65	-	127
Construction	73	0.9	-	33	25	-	15
Public administration	512	0.6	1	39	282	55	135
Commercial	1,039	0.9	-	39	329	-	671
Agriculture	42	0.4	0	16	6	3	17
Miscellaneous	203	0.9	0	10	188	4	-
Total	**5,149**		**178**	**752**	**2,270**	**113**	**1,836**
Percentage of UK	**0.8**	**0.9**	**1.2**	**0.8**	**0.8**	**1.1**	**0.9**

Source: National Statistics. DUKES

5.0 Overall Energy Balances

5.01 Final Energy Consumption and Emissions

The following table sets out final energy consumption for Warwickshire on a sectoral and fuel-type basis.

Table11: Final energy consumption in Warwickshire (GWh)

	Gas	Oil	Electricity	Coal	Renewables	Total GWh
Industry & Commerce	2,454	752	1,580	178	113	5,077
Domestic	3,850	359	1,148	110	26	5,493
Transport	-	7,457	-	-	-	7,457
Total (GWh)	**6,304**	**8,568**	**2,728**	**288**	**139**	**18,027**

National Statistics; Dukes

Domestic energy consumption accounts for just under a third (30.5 percent) of final energy consumption in Warwickshire. Industry and commerce accounts for a further 28 percent and transport accounts for the largest part with over 41 percent. The largest fuel type consumed is oil (47.5 percent).

The CO_2 emissions have been calculated for final energy consumption on a sectoral and fuel-type basis. The following emission factors have been used.

Table 12: Carbon Dioxide Emission factors

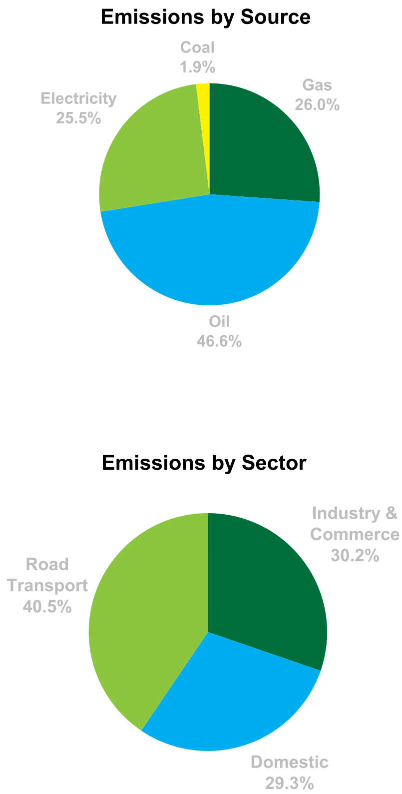
	kg CO_2 /kWh (2002/3)
Gas	0.19
Oil	0.25
Coal	0.3
Electricity	0.43

Source: DEFRA (2002)

Table 13: Carbon Dioxide emissions in kt (thousand tonnes)

	Gas	Oil	Electricity	Coal	Total kt CO_2
Industry & Commerce	466	188	679	53	1,387
Domestic	732	90	494	33	1,348
Transport	-	1,864	-	0	1,864
Total kt CO2	**1,198**	**2,142**	**1,173**	**86**	**4,599**

Figure 1: Emissions by Source and Sector



The road transport sector is the largest emitter of CO_2 in Warwickshire. It accounts for 40.5 percent of all CO_2 emissions in the County. The domestic sector accounts for a further 29.3 percent of CO_2 emissions. Oil emits the largest proportions of CO_2 in Warwickshire with 46.6% of the total.

5.02 Predictions of Future Energy Consumption

The following table is based on the predictions of future energy use (applied to the baseline data for Warwickshire) as used in the West Midlands Energy Strategy. It is important to note that at a national level the predictions of future energy use have since been modified and will continue to evolve over time as policies change.

The future predictions of sectoral use are based on the impact of all known policy measures. This is the reason for the reduction in the short to medium term with an apparent flattening off of consumption from 2015-20 onwards - when the current suite of policy measures will have finished. It is safe to assume that new (and/or extensions of existing) policies will be introduced over time to attempt to reduce the emissions in line with long term targets.

The split between industry and services has been based on the same split as was derived for the West Midlands Energy Strategy.

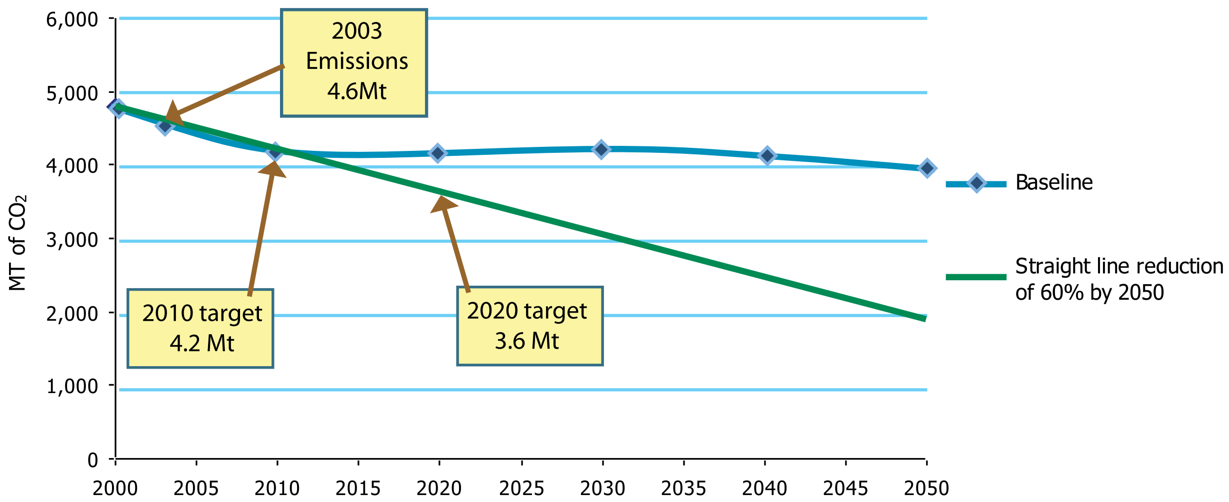
Table 14: Current, Past and future Predictions of Warwickshire CO_2 Emissions in kt (thousand tonnes)

	1990	2000	2003	2010	2020	2030	2040	2050
Industry	1,037	1,039	972	816	739	661	581	500
Services	454	440	415	355	402	448	483	518
Domestic	1,561	1,445	1,348	1,122	1,155	1,187	1,145	1,103
Transport	1,827	1,870	1,864	1,864	1,864	1,864	1,864	1,864
Total	4,878	4,794	4,599	4,158	4,159	4,160	4,073	3,985
Target								60%
Straight line reduction		4,794		4,219	3,644	3,068	2,493	1,918

Source: West Midlands Energy Strategy

The graph below illustrates the gap between the projected emissions and the path emissions needed to take to reach the target of a 60% reduction of 2000 emissions by 2050 (the target set in the Energy White Paper).

Figure 2: Future Predictions of Warwickshire Emissions and Target Reductions



Annual carbon dioxide emissions are 4,600kt. To achieve Koyoto targets, this needs to reduce to 4,200kt by 2010., 3,600kt by 2020 and to 1,900kt by 2050.

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