

# Domestic Sector Energy Requirements: Predicting Demand 2005-2020

## 1. Introduction

- 1.1 The Energy Consumed by the Domestic Sector includes all uses of fuel and electricity in the home. The majority of energy- up to 80% is used for space and water heating, for which the main fuel has become natural gas.
- 1.2 The most recent data for Domestic Energy consumption is for 2003. In 2003, the domestic sector accounted for approximately one third of UK energy consumption, totalling **49** million tonnes of oil equivalent (toe).
- 1.3 Energy Consumption in the domestic sector has been increasing by approximately 2.8% p.a. over the last few decades (figure 1).
- 1.4 Although Houses are becoming better Insulated, and 80% of houses now have central heating, the increase in the number of houses, has compensated for any savings in space heating.

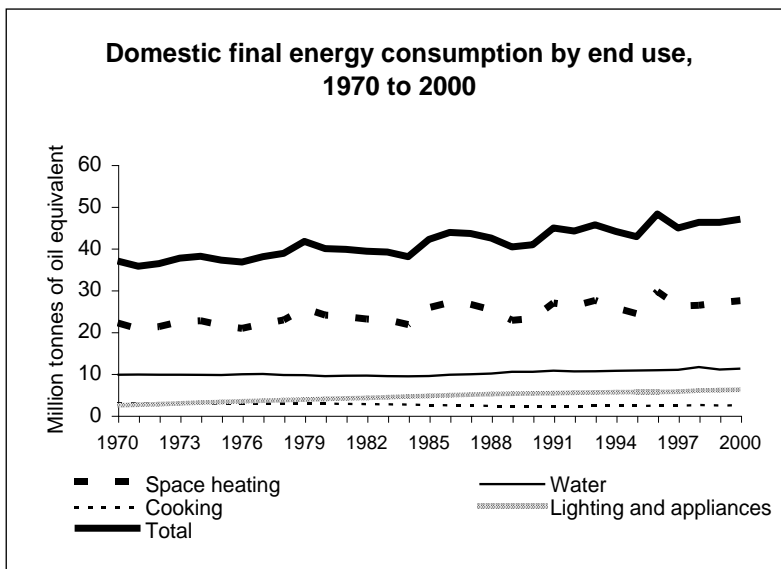
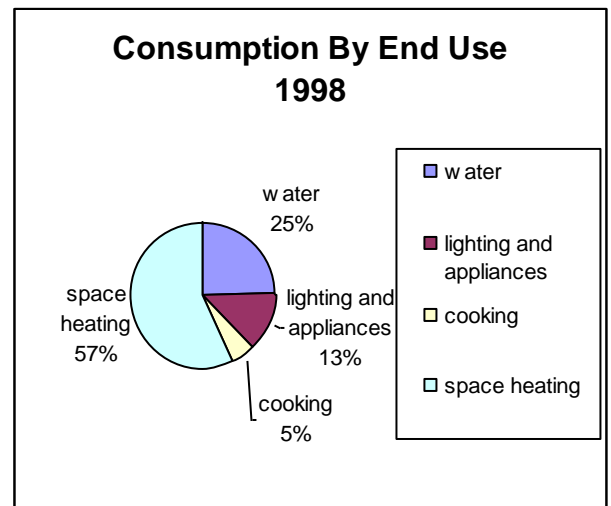


Figure 1.



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- 1.5 At the present rate of Increase, Domestic energy needs will be in the region of **55 mtoe by 2020.** (based on dti data)
- 1.6 The demand for electricity will increase with population.
- 1.7 The demand for central heating fuels should decrease with increased efficiency of homes.

Figure 2.

Conversion chart for values used in this report			
	Thousand toe	TJ	GWh
Thousand toe	1	41.668	11.630
TJ	0.023885	1	0.27778
GWh	0.085985	3.6	1

## 2 Factors Influencing Future Demand

- 2.1 Government policy has been encouraging the use of gas, although the uptake of Domestic Combined Heat and Power (CHP) has declined in recent years, and the government target- to produce 10 000 MW from this technology by 2010, is a long way off as levels waver around 4500 MW. To meet Kyoto Targets, the Domestic sector currently responsible for 22% of Emissions- 41 million tonnes of carbon, must be targeted.
- 2.2 There are a number of factors to consider when predicting how future demand for energy in the home will evolve, we are currently observing a decrease in the amount of energy consumed in cooking for instance as social and economic behaviour is changing and more people are using convenience and takeaway foods. To illustrate this change it is easiest to separate the factors into those causing more demand for energy and those which do not, at least directly (figure 3).

Figure 3.

INCREASING	DECREASING
↑Population	↓Heating
↑↑↑Number of households, (currently 1.2 persons per household).	Better insulation and efficiency of new houses should reduce the figure.
↑Disposable income	↓Relative use for appliances as
↑Entertainment and 'mod cons'	efficiency increases

- 2.3 The housing stock has increased by 30% in the last 30 years, it is predicted that the total number of houses in the UK will be 28.5 million by 2020, compared to 23.5m in 1994, and the largest increase has been in detached houses. The average house hold size has reduced to just less than 2 now, although it was 2.2 in 2000 relevant to the percentages in figure 4. Smaller households do generally use less electricity, but space heating is dependent on a number of other factors; the number of hours in the day in which people are present in the property, therefore have the heating on, the internal area of the property being heated, the external temperatures which vary from year to year and the type of heating system used, thermostatic or timed....

Figure 4

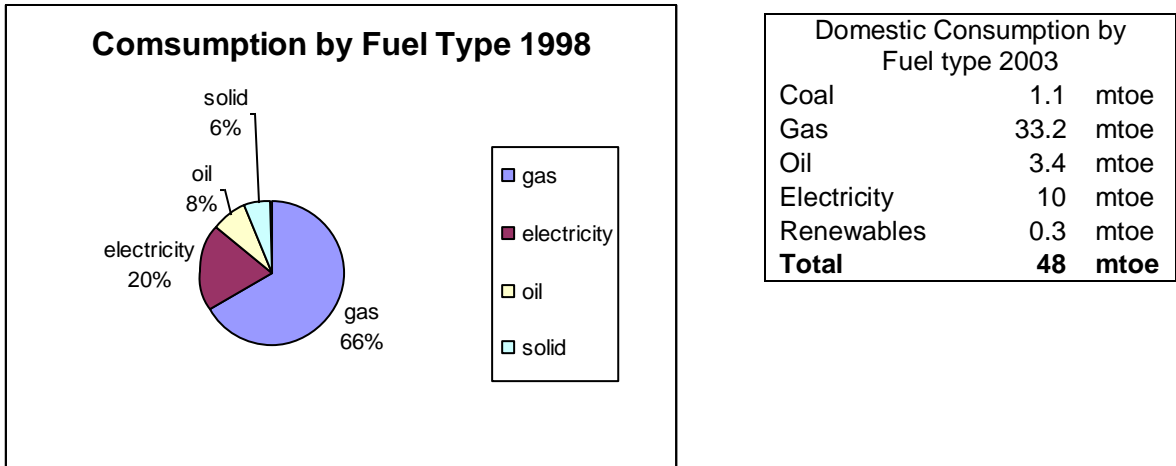
Household Statistics	1970	2000
detached houses	10%	15%
semi-detached		29%
Terraced		28%
Flats		19%
Bungalows		9%

- 2.4 The proportion of Homes with Fridges and Freezers has now reached almost 100%, and electricity consumption has subsequently almost doubled since 1970. This is unlikely to continue at the same rate, however as the proportion of disposable income increases more people may buy extra luxuries such as ice dispensers, frost free freezers, and super-size fridges.
- 2.5 The energy consumed for lighting has also been increasing, from 6% in 1970 to 13% in 2000. This increase is, however, modest considering the increase in number of households during this period. The Home insulation initiatives of the past few years- offering government funding for insulation has also provided hundreds of thousands of households now with 3 energy saving light bulbs, but it is difficult to predict if this may have any impact on future energy needs.
- 2.6 Entertainment Equipment, in contrast to white goods which have come under great scrutiny for energy efficiency, has become increasing draining on electricity supplies, with standby functions using electricity when not in use. However, electricity is only 20% of Domestic Energy Consumption so why worry? It is the main user of fossil fuels and cause of harmful emissions (Tullar 2000). The DTI consider that electricity consumption in appliances will remain at the 1991 level until 2005; according to DECADE it will be 10% higher.

### 3 Fuels

3.1 The following Figure shows the proportion of energy consumed each type supplied, naturally, this was dominated by gas for space heating, but electricity, particularly the need for solid fuel power stations is the main target for reduction to meet the Kyoto target.

Figure 5.



- 3.2 Focusing therefore on the components of electricity supply, figure 5 shows what proportion of available electricity was supplied by which fuels. The main trend has been a reduction in that supplied by oil, and an increase in that supplied by other sources. The proportion supplied by coal fell dramatically during the 1990s but increased again in 2003 to meet the demand of the ‘housing boom’.
- 3.3 This really highlights the importance of Nuclear Power to Electricity Supply, and the need to at least maintain the nuclear resources the UK has at present to bridge the gap between the need to reduce coal consumption and the development of other, renewable resources.

Figure 6.

Availability of electricity by fuel type (TWh)						
Type	1980	1990	2000	2001	2002	2003
Coal	190	208	114.7	125.4	118.6	131.7
Gas	33.9	21.1	5.9	4.8	4.2	4.4
Nuclear	1.6	1.6	145	138.7	148.9	144.9
Hydro	7.3	7.9	4.2	3.2	3.9	2.3
Other			9.2	9.1	10.2	11.6

3.4 An important point to note about electricity is that since privatisation, competition has dramatically reduced the cost of electricity, the average home now spends about £20 per month on electricity and probably a lot more on gas, the low price of electricity gives the public little financial incentive to reduce their consumption of electricity in the home, and little perception of its importance in reducing fossil fuel emissions. It is likely, therefore that demand for electricity will continue to grow regardless of how it is generated.

Figure 7.

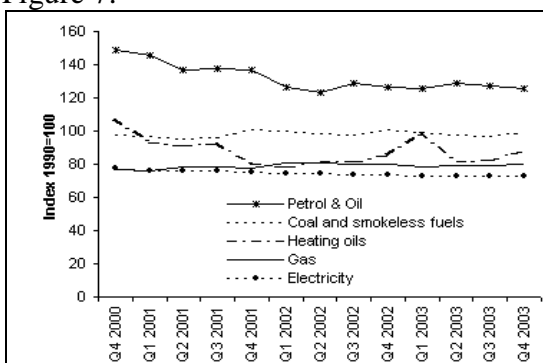


Figure 7 highlights the relative cost of electricity compared with other domestic fuels. (dti 2005)

#### 4 Predicting Domestic Energy Consumption 2005- 2020.

4.1 There is no clear trend here visible by looking at domestic electricity consumption in more detail from the last years recorded, but the overall direction could still be increasing.

Figure 8

Detail Electricity Consumption 1999-2003 (GWh) . dti 2005					
	1999	2000	2001	2002	2003
Domestic consumption	110,308	111,842	115,337	114,534	115,761

4.2 Given the factors affecting Consumption, Improvements to Efficiency of homes, but Increases in disposable income and the total number of homes, Domestic Energy Consumption is unlikely to stop increasing as in the Industrial Sector, but the rate at which it is, currently about 2mtoe p.a. may reduce marginally over the next 15 years.

Figure 9.

UK DOMESTIC ENERGY NEEDS 2005-2020							
ALL FUELS (MTOE)				ELECTRICITY ONLY (GWh)			
YEAR	OPTIMISTIC	PRESENT RATE	PESSIMISTIC	YEAR	OPTIMISTIC	PRESENT RATE	PESSIMISTIC
(2005)		(49)		(2005)	?	117,600	?
2010	50.5	51	50.75	2010	?	119,100	?
2015	52	53	52.5	2015	?	120,600	?
2020	53.5	55	54.25	2020	?	122,100	?

4.3 Figure 7 shows also shows how different energy resources may play a role in providing for this increase in Domestic energy consumption.

4.4 Demand directly from the consumer for electricity from renewable resources is slowly increasing, as is the potential for supply by these resources. So as north sea gas supplies become diminished, and gas therefore becomes more expensive over the next 15 years, will clean electricity be used in its lieu? This is one reason why there are two alternatives for electricity and other- to address the short fall.

Figure 10.

Total Domestic Energy Needs by Resource (Mtoe) 2005-2020 (Pessimistic Scenario)				
YEAR	Gas	Oil	Electricity	Other
2005	32.5	4	9.8	3.2
2010	34	3.5	9.6/ 10.2	3.65/ 3.05
2015	30	2.8	9.4/ 12.1	10.3/ 7.6
2020	25	2.2	9.2/15	17.85/12.05

Domestic Electricity Demand by Resource (Gwh) 2005-2020					
YEAR	Coal	Gas	Nuclear	Renewables	Total
2005	?				120000
2010		?			160000
2015			?		185000
2020					300000

4.5 The Environmental change institute suggest that increased efficiency of appliances may bring electricity use down to an average of 2900 Kwh per household by 2020. However they predict higher short term use than the DTI.

Predicted Domestic Energy Consumption in PJ				
YEAR	Gas	Oil	Electricity	Other
2005	1354	167	408	10
2010	1417	146	425	127
2015	1250	117	504	317
2020	1042	92	625	502

Figure 11.

For these predictions I have assumed that the emphasis on gas will continue to increase for some time, but by 2015, the use of solar power for hot water and greater use of electricity for cooking and perhaps even heating will start to bring the consumption of gas down to lower levels, with the use of renewables growing too.

4.6 The Specific needs within electricity supply are important because they require a greater degree of national planning, while other, primary uses of energy are more reliant on consumer choices, the growth of demand for 'other' refers to the increasing use of solar water heating systems in the home. Unfortunately, more detailed information was needed to complete this section,

4.7 In 2004 Domestic Consumption of primary fuels increased by 7.2%, while total UK electricity generation fell by 2.6%. are these predictions realistic in light of this recent data? It is difficult to predict whether as electricity becomes 'cleaner' it will be used more willingly in the home for heating purposes for example.

## 5. Conclusion

5.1 Domestic Energy Consumption is the second highest demand for Energy in the UK, just less than that consumed for Transport, However, Transport is beginning to consume less of a proportion of Energy, and by 2020, it is likely that Domestic and Transport Requirements are more equal if not reversed.

5.2 Domestic Energy needs are to increase at a steady rate, with the remote possibility of levelling off towards 2020, While changes in the structure of consumption will change, the importance of basic heating uses becoming less at the gaining importance of uses for entertainment.

5.3 The demand, both through choice, necessity and legislation, for renewable sources of domestic energy, will increase.

## References:

<http://www.risingtide.org.uk/pdfs/domestic%20action.pdf>

<http://www.eci.ox.ac.uk/lowercf/cadence.html>

<http://www.dti.gov.uk/statistics/energy/info.report.pdf/>