

Estimates of heat use in the United Kingdom in 2011

Introduction

This article presents a summary of the latest information on heat use in the United Kingdom. Data from the three non-transport sectors (domestic, services and industrial) are analysed and interpretations on differences between sectors and general trends in heat energy use are highlighted. The article begins with analysis of heat use compared to overall energy consumption and energy consumption excluding transport by sector and end use. Each sector is then analysed in turn, followed by comparisons of fuel use for heating within the three sectors and is concluded with a short summary. A short methodology note can be found at the end of this article.

The analysis relates to 2011 provisional figures, and is based upon data published in Energy Consumption in the UK, which was updated in July 2012:

www.decc.gov.uk/en/content/cms/statistics/publications/ecuk/ecuk.aspx

Heat data analysis

In 2011, total final energy consumption in the UK was 134,320¹ thousand tonnes of oil equivalent, with consumption for heating purposes at 44 per cent of the total (59,474 thousand tonnes of oil equivalent). Excluding final energy consumption used for transport (55,187 thousand tonnes of oil equivalent), 75 per cent of the remaining final energy consumption was for heating purposes with 25 per cent used for non-heating purposes; for example lighting and appliances, computing and cooling. Of the 79,133 tonnes of oil equivalent used for non-transport final energy consumption; 40 per cent was consumed for heating by the domestic sector, 13 per cent was consumed by the service sector and 22 per cent was consumed by the industrial sector. The following analysis explores further how consumption is split by sector, end use and fuel type.

Energy consumption for heating purposes by sector and end use

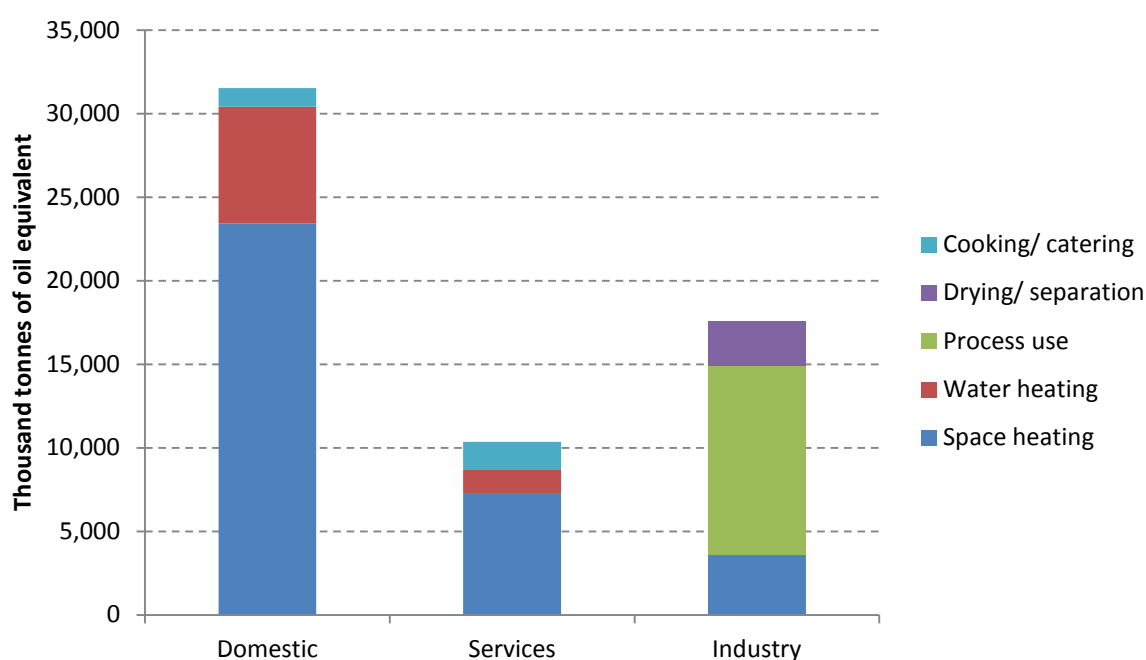
Of the 59,474 thousand tonnes of oil equivalent used for heating purposes in the UK in 2011, across the non-transport sectors, the domestic sector was responsible for 53 per cent, followed by the industrial sector 30 per cent and the services sectors 17 per cent. Space and water heating were the largest contributing purposes of heat use in both the domestic (96 per cent of heat demand) and services sector (84 per cent). However, in the industrial sector, processing (high temperature process and low temperature process combined) was the principal purpose of heat use, contributing 64 per cent of heat energy consumed.

Table 1 and Chart 1 show the consumption split by sector and end-use for 2011.

¹ Excludes all energy consumption in the agriculture sub-sector, 444ktoe of energy used in construction and 2,590ktoe of fossil fuels where the final consuming sector is unclassified.

Table 1: Energy consumption by sector and end use 2011

End use	Thousand tonnes of oil equivalent					Total	Total excluding transport
	Domestic	Services	Industry	Transport			
Space heating	23,424	7,291	3,640	-		34,354	34,354
Water heating	6,987	1,382	-	-		8,370	8,370
Process use	-	-	11,263	-		11,263	11,263
Drying/ separation	-	-	2,684	-		2,684	2,684
Cooking/ catering	1,117	1,686	-	-		2,803	2,803
Heat total	31,528	10,359	17,587	-		59,474	59,474
Other uses	7,314	5,821	6,524	55,187		74,846	19,659
Total	38,842	16,181	24,110	55,187		134,320	79,133
Percentage used for heating	81%	64%	73%	-		44%	75%

Chart 1: Final energy consumption by use by sector, UK, 2011

The following section provides a more detailed analysis of energy consumption in each of the three non-transport sectors, demonstrating the degree to which fossil fuels are consumed for heating purposes.

Domestic sector

In 2011 energy consumption from the domestic sector was 38,842 thousand tonnes of oil equivalent. Of this it is estimated that 81 per cent (31,528 thousand tonnes of oil equivalent) was used for heating purposes (space heating, water heating and cooking/catering) and the remaining 7,314 thousand tonnes of oil equivalent for lighting and appliances.

The fuel mix for domestic consumption for heat purposes is dominated by gas which was the source of 80 per cent (25,191 thousand tonnes of oil equivalent) of heat consumption. This was the equivalent of 65 per cent of the overall domestic consumption (Table 2). Electricity provided 7 per

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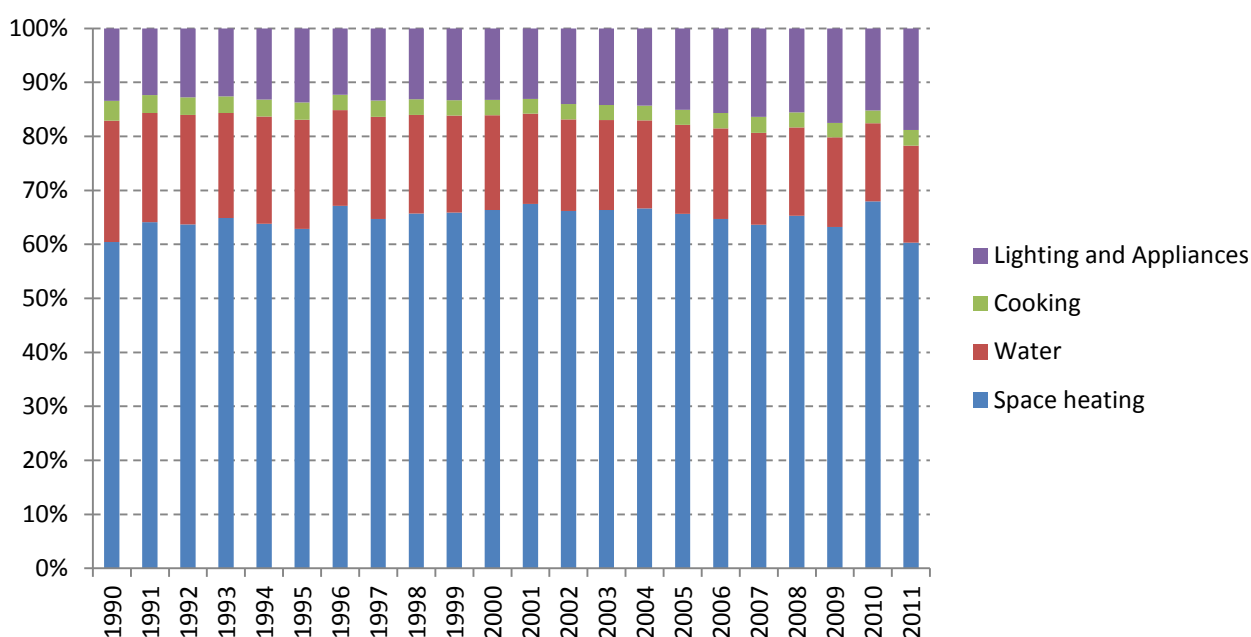
cent of total heat consumption. Electricity for lighting and appliances accounted for 19 per cent of total domestic consumption.

Table 2: Domestic energy consumption by fuel and end use: 2011

End use	Thousand tonnes of oil equivalent						Total
	Gas	Oil	Solid fuel	Electricity	Heat sold	Bio-energy & Waste	
Space heating	18,697	2,188	704	1,216	52	567	23,424
Water heating	5,901	492	53	541	-	-	6,987
Cooking/catering	593	-	-	524	-	-	1,117
Heat total	25,191	2,681	756	2,281	52	567	31,528
Lighting and appliances	-	-	-	7,314	-	-	7,314
Overall total	25,191	2,681	756	9,595	52	567	38,842

Chart 2 displays the distribution of domestic consumption by purposes between 1990 and 2011, clearly identifying space heating as the dominate heat purpose in the domestic sector, however in recent years there has generally been a decreasing trend partly due to the introduction of energy efficiency measures.

Chart 2: Breakdown of domestic sector fuel by end use, UK, 1990 to 2011



Service sector

In 2011, energy consumption in the services sector was 16,181 thousand tonnes of oil equivalent, with 64 per cent (10,359 thousand tonnes of oil equivalent) of this used for heating purposes.

Similar to the domestic sector, space heating dominated energy consumption for heat purposes, being responsible for 70 per cent of energy consumed (Table 3). Gas was used to deliver 60 per cent of total heat used in the services sector with electricity a further 25 per cent. Lighting remains the main non heating use.

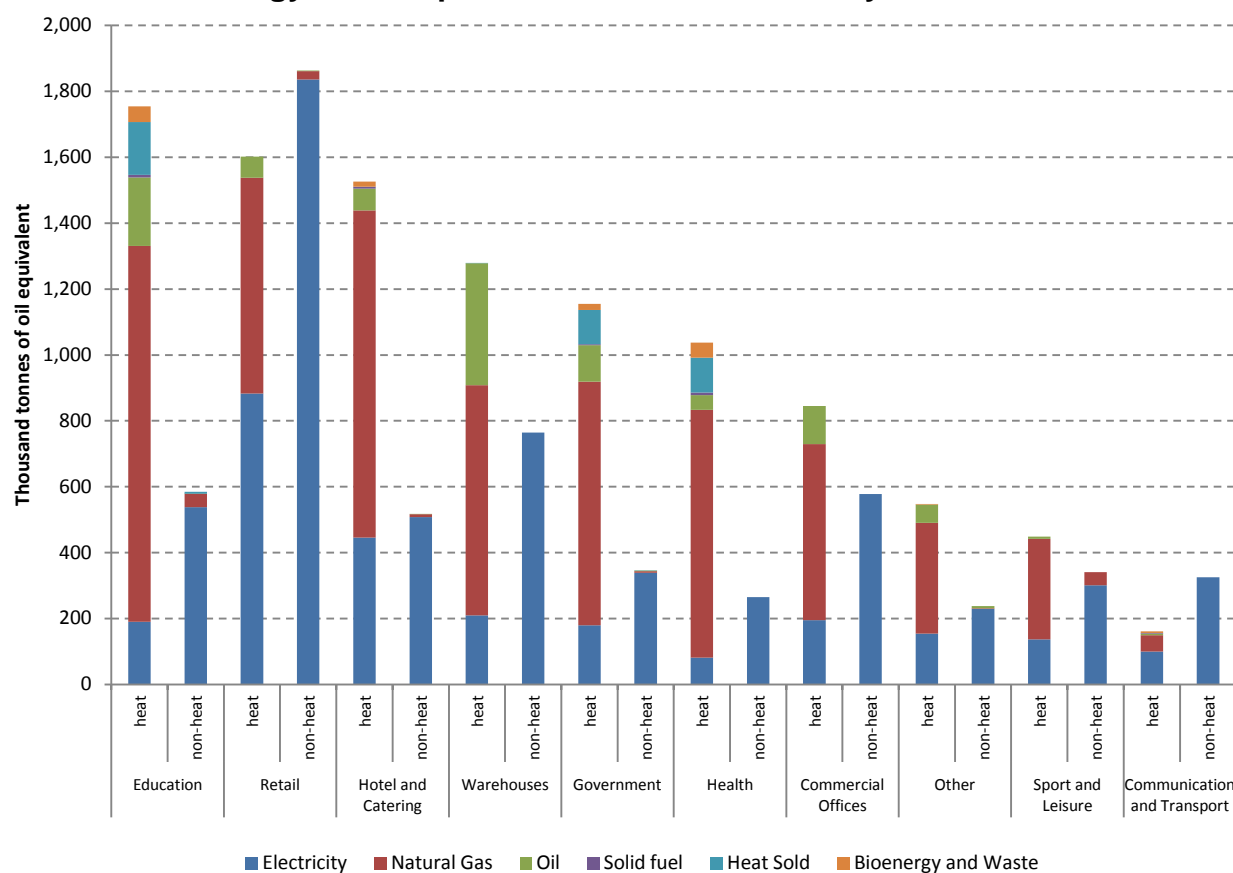
Table 3: Service sector energy consumption by fuel and end use: 2011

Thousand tonnes of oil equivalent							
End use	Gas	Oil	Solid fuel	Electricity	Heat sold	Bio-energy & Waste	Total
Space heating	4,759	914	23	1,179	296	121	7,291
Water heating	927	94	3	292	54	12	1,382
Cooking/catering	521	39	0	1,102	23	1	1,686
Heat total	6,207	1,046	27	2,572	373	134	10,359
Computing	-	-	-	499	-	-	499
Cooling and ventilation	20	-	-	734	-	-	754
Lighting	-	-	-	3,365	-	-	3,365
Other	101	11	-	1,084	7	-	1,203
Overall total	6,329	1,057	27	8,255	379	134	16,181

In 2011, the four main heat energy consumers in the service sector were Education, Retail, Hotel and Catering and Warehouses who between them consumed 59 per cent of heat consumption within the sector. For space heating the four main consumers were Education, Government, Retail and Warehouses who between them consumed 58 per cent of total space heating consumption.

Chart 3 shows the distribution of energy consumed for heat in the services sector for each sub-sector by fuel.

Chart 3: Final energy consumption of the service sector by use: 2011



Industrial sector

In 2011, industrial consumption accounted for 24,110 thousand tonnes of oil equivalent, of which 73 per cent (17,587 thousand tonnes of oil equivalent) was consumed for heating purposes.

Thirty nine per cent of heat consumption was for low temperature process, with high temperature process accounting for a further 25 per cent, space heating 21 per cent and drying/separation 15 per cent.

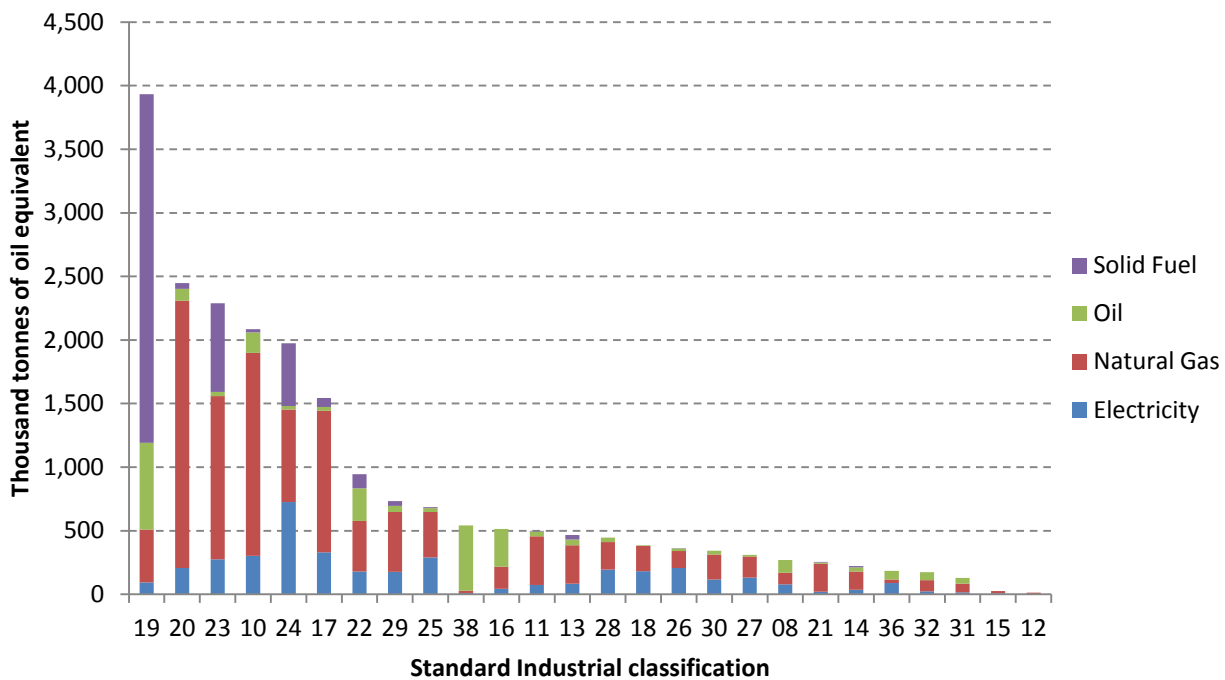
Direct consumption of fossil fuels provided 71 per cent of heat consumption in the industrial sector; with gas consumption dominating the fuel mix for heat, 53 per cent of consumption, followed by electricity (22 per cent), oil (10 per cent) and solid fuel (8 per cent). Three per cent of heat generated within the sector was attributable to bio-energy and wastes.

Table 4: Industrial energy consumption by fuel and end use: 2011

End use	Thousand tonnes of oil equivalent						Total
	Gas	Oil	Solid fuel	Electricity	Heat sold	Bio-energy & Waste	
Space heating	1,172	335	82	676	839	535	3,640
High temperature process	2,162	160	998	1,127	-	-	4,448
Low temperature process	4,222	919	200	1,474	-	-	6,815
Drying/separation	1,683	352	117	533	-	-	2,684
Heat total	9,239	1,766	1,397	3,810	839	535	17,587
Motors	-	-	-	2,873	-	-	2,873
Compressed air	-	-	-	810	-	-	810
Lighting	-	-	-	250	-	-	250
Refrigeration	-	-	-	492	-	-	492
Other	1,266	244	151	439	-	-	2,100
Overall total	10,506	2,010	1,548	8,672	839	535	24,110

The fuel mix of heat consumption varies between the different sub-sectors within the industrial sector as displayed in Chart 4. Chart 4 also identifies the sectors that are more heat intensive. Just over 69 per cent of total energy consumption for heat purposes comes from 7 of the 26 industry sub-sectors at two digit SIC (2007) level.

Chart 4: Fuel energy consumption for heat in the industry sector: 2011



- 08 Other mining and quarrying
- 10 Manufacture of food products
- 11 Manufacture of beverages
- 12 Manufacture of tobacco products
- 13 Manufacture of textiles
- 14 Manufacture of wearing apparel
- 15 Manufacture of leather and related products
- 16 Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
- 17 Manufacture of paper and paper products
- 18 Printing and publishing of recorded media and other publishing activities
- 19 Manufacture of coke and refined petroleum products
- 20 Manufacture of chemicals and chemical products
- 21 Manufacture of basic pharmaceutical products and pharmaceutical preparations
- 22 Manufacture of rubber and plastic products
- 23 Manufacture of other non-metallic mineral products
- 24 Manufacture of basic metals
- 25 Manufacture of fabricated metal products, except machinery and equipment
- 26 Manufacture of computer, electronic and optical products
- 27 Manufacture of electrical equipment
- 28 Manufacture of machinery and equipment n.e.c.
- 29 Manufacture of motor vehicles, trailers and semi-trailers
- 30 Manufacture of other transport equipment
- 31 Manufacture of furniture
- 32 Other manufacturing
- 36 Water collection, treatment and supply
- 38 Waste collection, treatment and disposal activities; materials recovery

Comparison of the sectors

In 2011, gas was the main fuel used for heating purposes in all sectors. In the domestic sector gas for heating contributed to 65 per cent of energy consumption. The respective proportions for the services and industry sectors were both 38 per cent.

Use of oil for heating comprised 7 per cent of total energy consumption in both the domestic and industrial sectors and 6 per cent in service and industry sectors respectively. Solid fuels were the least common energy source in all sectors but were mainly used by the domestic and industrial sectors accounting for 2 and 6 per cent of total energy used for heat within each sector respectively.

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In general primary consumption of fossil fuels (gas, oil and solid fuel) were the main energy sources for heating purposes. The use of those fuels made up 91 per cent of heat energy consumption in the domestic sector, 70 per cent in the services sector and 71 per cent in the industrial sector.

Use of electricity made up 7 per cent of heat energy consumption in the domestic sector. The respective figures for services and industry sectors were 25 and 22 per cent.

Ninety seven per cent of gas consumption, 96 per cent of oil, 94 per cent of solid fuel and 33 per cent of electricity was used for heating purposes.

Total renewable final energy consumption (bio-energy and wastes) was 2,364 thousand tonnes of oil equivalent in 2011, which accounted for 2 per cent of total energy consumption. Heating use of bio-energy and wastes accounted for half, 52 per cent, of the total. Table 5 shows the split of bio-energy and waste consumption for each sector. Nearly all bio-energy and waste heat is used for space heating across the three sectors.

Table 5: Bio-energy and Waste consumption by sector: 2011

	Thousand tonnes of oil equivalent		
	Domestic	Services	Industry
Bio-energy & Waste	567	134	535
<i>Percentage of total heating demand</i>	2%	1%	3%
<i>Percentage of total energy consumption</i>	1%	1%	2%

Summary

The data presented in this article highlight the significant role of heat use within overall energy consumption. An understanding of the fuel used for heating purposes as well as the energy efficiency improvements is important in order to gain a full knowledge of the heat market. Important factors are not only the amount of energy consumed, but also the type of fuel used.

Methodology

For both the services and industrial sectors, the information regarding the end-use of energy consumption was derived from historic data supplied to DECC by the Building Research Establishment (BRE). For the domestic sector Cambridge Architectural Research have provided the modelled data since 2009. This has resulted in a discontinuity in all domestic end-use tables between 2008 and 2009 due to some different modelling assumptions. The article is centred around the end use of fuels and does not include the consumption of fuels as an input to electricity generation. Direct consumption refers to the fuels being consumed directly for heating purposes and not those that were consumed to make electricity. Heat sold and bio-energy & waste are specifically identified within overall energy consumption. The heating purposes vary depending on the sector.

For both the domestic and services sectors heat purposes include:

- *space heating;*
- *water heating;*
- *cooking/catering.*

In the industrial sector heating purposes cover:

- *space heating;*
- *high temperature processes* - coke ovens, blast furnaces and other furnaces, kilns and glass tanks;

- *low temperature processes* - process heating and distillation in the chemicals sector; baking and separation processes in food and drink; pressing and drying processes in paper manufacture; and washing, scouring, dyeing and drying in the textiles industry;
- *drying and separation* - which is important in paper-making.

Industrial sector heat purposes do not include water heating as the focus is on industrial usage and not office usage.

While the data in this article provide a good estimate of the main trends in heat use, the data are modelled and therefore it is not possible to confidently report slight movements in year-on-year heat use. As such, the heat estimates provided should only be viewed as indicative.

User feedback

We welcome all feedback from the users of this data, therefore if you would like to comment on these or on the content of this article, please contact Victoria Thompson using the contact details below.

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