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Energy Flow Chart

United Kingdom

DEPARTMENT OF ENERGY

Energy Flow Chart 1974
United Kingdom

The chart illustrates the flow of primary fuels from the point at which they become available from (on the left) home production or imports to their eventual final uses (on the right), either in their original state or after being converted into different kinds of energy by the secondary fuel industries.

All flows are measured in thousands of millions of therms and the widths of the bands on the chart are proportional to their absolute size. Stocks of coal and oil are represented by circles. (The circles are not related to the size of the stocks – and they do not show whether there has been a stock rise or stock fall.) Although the figures relate specifically to 1974 the flows are typical of the UK energy pattern of the last few years.

Primary supplies and primary fuels

As can be seen, most of our primary fuel supply is not finally consumed in the original state in which it is produced or imported. Crude oil is refined to produce petroleum products (eg heavy fuel oil, petrol, jet fuel, gas/diesel oil etc) and conventionally it is these which are described as primary fuels because crude oil itself is not used as a fuel. Moreover, some petroleum products derived from crude oil are used for non-fuel purposes (eg as a raw material for the manufacture of chemicals and plastics, as bitumen for roadmaking etc).

A large proportion of coal flows to power stations and coke ovens where it is transformed into electricity and coke respectively. Similarly, some natural gas is used to generate electricity and some is reformed at gas works to make town gas. Nuclear and hydro electricity are often referred to as primary electricity to distinguish them from that generated at conventional power stations burning fossil fuels, ie coal, petroleum or natural gas. There are many ways in which the output of nuclear and hydro electricity can be measured. In the chart and in all related statistics the electricity generated by these means is expressed in terms of the amount of fossil fuels that would have been needed to generate the same amount of electricity at conventional power stations.

Secondary fuels

The principal secondary fuels are electricity, coke (which in the chart includes other manufactured solid fuels) and town gas. With the exception of town gas which is being steadily displaced by natural gas, secondary fuels are in the main required for specific purposes for which the use of primary fuels is inappropriate. For many uses there is no practical alternative to electricity as a fuel and coke is an essential material for the iron and steel industry.

Losses

This large flow (in dotted grey) shows those losses that occur between primary supplies and deliveries to final users. Each fuel industry consumes energy in the course of its operations and some is lost during its subsequent distribution. Electricity generation in particular involves large losses in converting primary fuels to electricity. The chart does not show the further losses of energy which occur after energy is supplied to final consumers which result principally from the inefficiencies in the multitude of energy using appliances, eg domestic fires and boilers, cars, lorries, aircraft, central heating plant etc. It is estimated that these latter losses could in total amount to almost half of the energy supplied to final consumers.

Final uses

This section of the chart illustrates how energy consumption is distributed between the main final consuming sectors and how the different kinds of primary and secondary fuels are shared between the sectors. For simplicity, and since they are integrated in the gas supply industry, natural gas and town gas are here joined as a single flow.

Statistics

The chart has been prepared by the Economics and Statistics Division of the Department of Energy and is based on statistics taken from the "Digest of United Kingdom Energy Statistics 1975" (Table 8) which is reproduced overleaf.

The flow chart is a simplification of these figures and some of the terms used in the chart are not used in the Table. 'Primary supplies' for example, is a convenient label for supplies whether home produced or imported. Again on the right hand side of the chart the term 'Final uses' corresponds to 'Final consumption by sectors' in the Table. The middle section of the chart, labelled 'Primary Fuels' corresponds to 'Total inland consumption of primary fuels' in the Table.

UK ENERGY FLOWS 1974 (THOUSAND MILLION THERMS)

COAL Imports · CRUDE OIL Imports · PETROLEUM PRODUCTS Imports · NATURAL GAS Imports · TOWN GAS · ELECTRICITY · COKE OVEN PRODUCTS

PRIMARY SUPPLIES · PRIMARY FUELS · FINAL USES

COAL: DEEP MINED 24·7; OTHER 2·5; 0·9; Coal stocks; 29·0

ELECTRICITY: HYDRO 0·5; 2·8 NUCLEAR; 3·3

NATURAL GAS: 0·3; 13·0; 13·3

PETROLEUM: 6·3; 0·2; 48·0; Crude stocks; Product stocks; OIL REFINERIES; 37·9

To primary fuel industries

EXPORTS AND BUNKERS 9·2; NON-ENERGY USES 4·7

99·2

83·5

POWER STATIONS: 15·0; 3·3; 7·0

COKE OVENS: 6·2; 1·0

GAS WORKS: 1·5

7·5; 7·3; 17·6; 4·8; 10·2; 27·2; 25·0

LOSSES IN CONVERSION, DISTRIBUTION & OWN USE

0·1; 0·4; 0·4; 0·3; 0·1; 0·7; 0·4; 0·7

IRON & STEEL 5·5: 3·0; 1·6

OTHER INDUSTRY 18·4: 2·8; 4·7; 2·2; 8·4

TRANSPORT 12·4: 12·3

DOMESTIC 15·1: 3·9; 1·1; 5·4; 3·2; 1·5

OTHER CONSUMERS 7·1: 1·2; 1·4; 3·4

58·5

Availability and consumption of primary and secondary fuels in 1974 (Heat supplied basis)

United Kingdom

Million therms

Primary fuels	Coal (1)	Petroleum (2)	Natural gas and colliery methane (3)	Nuclear electricity (4)	Hydro electricity (5)	Total (6)
Primary energy						
Production	27,178	268(1)	13,040	2,788(2)	491(2)	43,765
Arrivals	875	54,275(3)	243	—	27(2)	55,420
Shipments	392	6,769(3)	—	—	21(2)	7,182
Bunkers	—	1,954	—	—	—	1,954
Stock changes (4)	+1,504	−2,040(3)	—	—	—	−536
Statistical differences	−117	−1,189(5)	—	—	—	−1,306
Total inland consumption	29,048	42,591	13,283	2,788	497	88,207
Non-energy consumption						
Feedstocks for petrochemical plant	..	3,303(6)	..	..	..	3,303
Other	..	1,410(7)	..	..	..	1,410
Total	..	4,713	..	..	..	4,713
Inland consumption of primary fuels						
Directly consumed	7,519	27,193	10,217	—	—	44,929
Used by primary fuel producers	291(8)	3,047	62	—	—	3,400
Input to secondary fuel producers (9)						
Electricity supply industry	14,981(10)	7,052	985	2,788	497	26,303
Gas supply industry	31	586(11)	1,299	—	—	1,916
Coke ovens	5,178	—	2	—	—	5,180
Other manufactured fuel plants	1,048	—	—	—	—	1,048
Total	21,238	7,638	2,286	2,788	497	34,447
Losses in distribution of primary fuels	..	..	718	..	..	718
Total inland consumption of primary fuels	29,048	37,878	13,283	2,788	497	83,494
Losses of primary fuels in conversion to secondary						
Electricity supply industry	10,132	4,769	666	1,641(12)	355(12)	17,563
Other secondary fuel producers	701(13)	76	243	—	—	1,020
Total	10,833	4,845	909	1,641	355	18,583

(1) Crude petroleum (37 million therms) natural gas liquids (137 million therms) and products derived from coal marketed by the petroleum industry (94 million therms).
(2) Fossil fuel input equivalent of primary electricity.
(3) Crude and process oils and petroleum products.
(4) Stock fall (+), stock rise (−).
(5) Including losses in transformation at petroleum refineries (515 million therms) and unidentified disposals of some miscellaneous products.
(6) Including natural gas liquids (33 million therms).
(7) Industrial and white spirits, lubricants, bitumen and wax.
(8) Excludes coal-derived electricity sold by collieries to the electricity supply industry (6 million therms).

Million therms

Secondary fuels	Coke and breeze (1)	Coke oven gas (2)	Town gas (3)	Electricity (4)	Other(14) fuels (5)	Total (6)
Secondary fuels						
Production						
Electricity supply industry	—	—	—	8,740(10)	—	8,740
Gas supply industry	4	—	1,589	—	—	1,593
Coke ovens	3,596	994(15)	30	—	50	4,670
Other manufactured fuel plants	14	—	—	—	847	861
Total	3,614	994	1,619	8,740	897	15,864
Net imports and stock changes (4)	—39	—	—	—	+10	—29
Used by fuel producers	111(16)	540	7	845	—	1,503
Losses in distribution	—	67	93	613	—	773
Inland consumption by final users	3,464	387	1,519	7,282	907	13,559

Final consumption	Iron and steel industry (1)	Other industries (2)	Transport (3)	Domestic (4)	Other final consumers (5)	Total (6)
Final consumption by sectors						
Direct primary fuels						
Coal	99	2,795	24	3,932	669	7,519
Natural gas	388	4,503	—	4,345	981	10,217
Petroleum	1,648	8,433	12,295	1,482	3,335	27,193
Total	2,135	15,731	12,319	9,759	4,985	44,929
Secondary fuels						
Coke and breeze	2,620	194	—	328	322	3,464
Coke oven gas	337	50	—	—	—	387
Town gas	7	189	—	1,035	288	1,519
Electricity	345	2,244	92	3,157	1,444	7,282
Other fuels (14)	37	47	—	772	51	907
Total	3,346	2,724	92	5,292	2,105	13,559
Total final consumption	5,481	18,455	12,411	15,051	7,090	58,488

(9) The input of primary fuels in original units of measurement was:

	Coal (Million tons)	Petroleum (Million tons)	Natural gas (Million therms)	Nuclear and hydro electricity (GWh)
Electricity supply industry	66·0	16·9	985	37,762
Gas supply industry	0·1	1·3	1,299	—
Coke ovens	18·1	—	2	—
Other manufactured fuel plants	3·7	—	—	—

(10) Including coal derived electricity purchased from collieries (6 million therms).

(11) Including petroleum gases (116 million therms).

(12) Notional conversion losses calculated as though nuclear and hydro electricity is generated at contemporary conventional steam stations.

(13) Including coal derived products marketed by the petroleum industry (94 million therms).

(14) Other manufactured solid fuels and creosote/pitch mixtures.

(15) Excluding coke oven gas sold to the gas supply industry (30 million therms) which is shown in col. 3.

(16) Includes blast furnace gas used at coke ovens (45 million therms).