

PATTERN OF ENERGY CONSUMPTION IN THE UNITED STATES

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The pattern of flows of energy through the economy of the United States is an ever changing one. Major shifts in sources of energy and in the uses to which energy is put have occurred since the beginning of our industrial economy. This paper is limited to an examination of the post-war period. Within this decade and a half (1947-1962) there were factors which created a very different set of energy flows for 1962 from that of 1947. These changes will be examined, hypotheses concerning them will be presented, and projections to 1980 of the pattern will be made. Such an analysis should serve as a useful frame of reference for papers dealing with specific energy sources.

Two views of the energy economy are presented in tables. The first shows total energy resource consumption by consuming sector by source. The second shows energy resource consumption by consuming sector by function. Projections to 1980 are given for each view. The concluding portion of this paper presents a tentative hypothesis concerning competition among energy sources and energy trends.

Energy Consumption by Supplying and Consuming Sector

Tables 1 through 4 present energy balances by supplying and consuming sectors for selected years. Tables are presented for 1947, 1955, 1962, and 1980. Historical data are available for selected years covering the entire period 1947-1962 ^{1/} but the trends are relatively smooth and a good picture can be obtained by examining the years I have chosen to include in this report.

Major shifts in energy consumption by fuel source have occurred between 1947 and 1962 (see Figure 1). Bituminous coal and lignite, which supplied 44 percent of the energy in 1947, dropped to 21 percent by 1962. Anthracite showed an even greater relative drop, declining from 4 percent to less than 1 percent. The decline of coal as a source was offset by increases in use of petroleum and natural gas. These shifts are clearly reflected in the pattern of growth rates by sources over this period. Total energy consumption increased at an annual rate of growth of 2.5 percent over the period. Bituminous coal and lignite showed an average rate of decline of the same amount, 2.5 percent. Anthracite declined at an annual rate of 7.5 percent. Hydropower increased at a 2-percent rate. The most rapidly growing sector was natural gas, showing an annual growth rate of 8 percent, while petroleum showed an annual growth rate of 4.25 percent.

The shifts between the relative size of the consuming sectors was also marked (see Figure 2). When electricity is not distributed to the other three consuming sectors (compare table 1 with table 3), the industrial and transportation sectors declined in relative importance while households increased slightly, but the major gain was recorded by electric generation. When electricity is allocated back to the other three consuming sectors, the picture changes a little. The household and commercial sector now shows a 7-point increase in its relative size, with both industrial and transportation declining (see tables 7 and 13).

^{1/} Morrison, W. B. Summary Energy Balances for the United States--Selected Years 1947-1962. United States Department of the Interior, Bureau of Mines, Information Circular 8242.

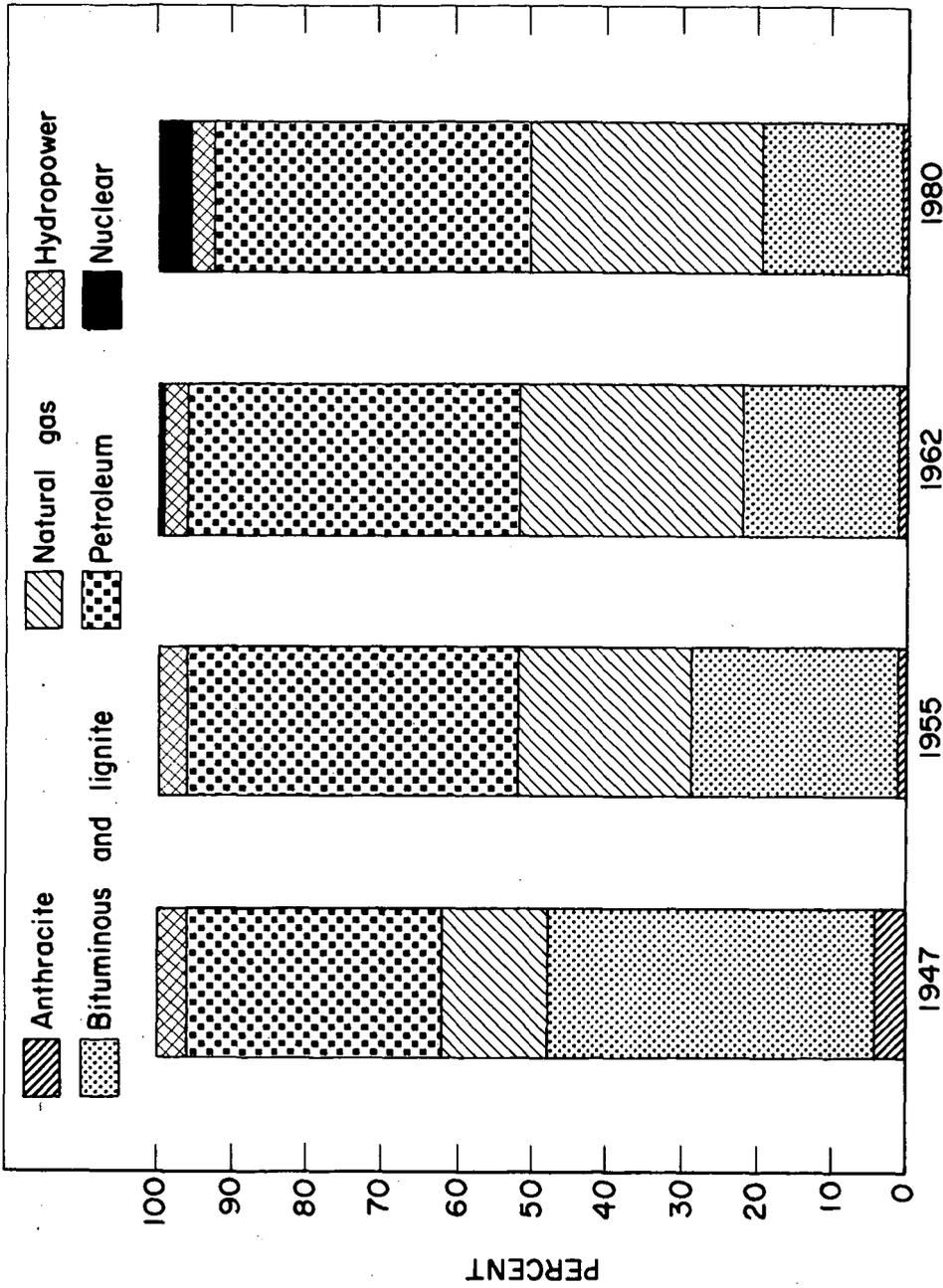


Figure 1.- United States Total Gross Consumption of Energy by Major Sources .

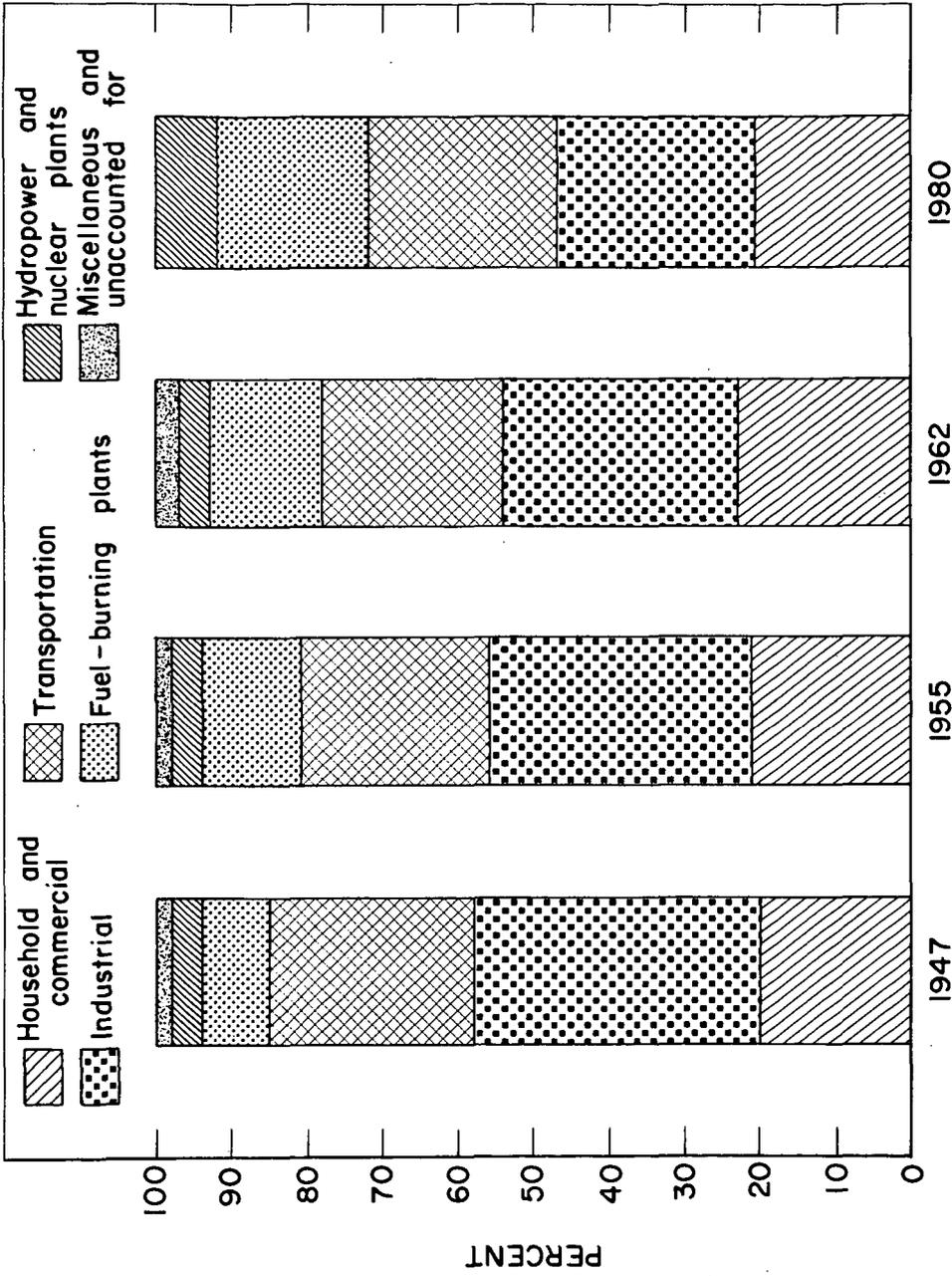


Figure 2.- Percentage Distribution of Total Energy by Consuming Sectors.

Bituminous coal and lignite and anthracite declined as energy sources because they virtually lost two major markets. In 1947, coal accounted for 50 and 34 percent, respectively, of the household and commercial and transportation markets. By 1962 its share of these markets had dropped to 8 percent of the household and commercial market and was negligible in the transportation market. Coal also suffered a severe decline in the share of the industrial market, from 57 to 32 percent. The same time it almost held its own in supplying fuel-burning electric generating plants suffering a relatively minor decline from 71 to 64 percent. But because fuel-generated electricity increased from 67 percent to 79 percent of total utility generation over the period, coal's share of this total actually increased from 47 to 50 percent.

The source of the growth in natural gas was apparently in all sectors. Its share increased from 17 to 44 percent in the household and commercial sector, from 23 to 42 percent in the industrial sector, and from 13 to 28 percent in the fuel-burning electric generating sector. Petroleum also increased its shares in the household and commercial and industrial markets and transportation but showed a decline in the fuel-burning electric generating market.

Energy Consumption by Function and Sector

A breakdown of energy consumption by function and consuming sector is contained in tables 5 through 14 for the same years. These tables are arranged so that the data for each year are presented, and then a percentage distribution by function and by sector follows. One of the highlights of this analysis is the relative stability of the distribution of uses of energy. The tables show, for example, that nonenergy uses have increased only from 4 percent of the total in 1947 to 5 percent of the total in 1962. The shift that occurred was a shift to consumption of energy as electricity. Here we see a change from 15 percent in 1947 to 21 percent in 1962, with a shift also between self-generated and utility electricity.

The series of tables on energy use by function are of most value when one turns to the competitive position of the various competing fuels. We will come back to this point after we take a look at the forecasts for 1980.

Forecasts for 1980

The forecasts for 1980, as presented in tables for that year, were made under certain assumptions. These include no major change in our international relations, an annual rate of growth of 4 percent in GNP and 1.6 percent in population, stability of the real cost of the primary energy sources both relative to each other and to the general level of commodity cost, a continuation of an evolutionary technology rather than a revolutionary one, the assumption of adequate supplies either domestic or imported to meet demands, and finally, the acceptance of the Federal Power Commission and the Atomic Energy Commission forecast that installed electric generation capacity in nuclear plants will reach 70,000 megawatts by 1980.

These forecasts were made after an intensive examination of trends indicated by the energy balances. The magnitude of expected error increases as one moves from the total energy to the energy by consuming sector to the energy by supplying source. The latter has always been the most erratic and can be expected to hold the major surprises in the future. Projections made here, it should be understood, are based upon the explicit assumption of no major new technological breakthroughs except nuclear energy.

It should be emphasized that forecasts made in the context of a total energy balance, and based upon relatively general indicators, are not necessarily the best for any given type of fuel. There is a wide range of competent forecasts for specific fuels, and my results are higher than the general consensus for some fuels and lower for others. The specific fuel forecast contains the highest degree of expected variability, on the order of plus or minus 30 percent. For this reason, these forecasts developed in this paper should not be interpreted as an alternative to specific fuel forecasts made by others, but should be used in the context of an analysis of energy source shifts and the impact of such shifts on a given fuel. The kind of analysis involved, looking at energy as a single commodity, is but one of many types that can be made. The forecasts are a result of this system of analysis, and should be interpreted within the context of the methodology, rather than as firm forecasts for planning.

The methodology of the forecast involved projection of least square trends of historical data and correlation between these data and other indicators.

An initial estimate was made of the rate of growth of total energy consumption by sector by correlating the various sectors with general economic indicators. The indicators used were GNP (for total energy), population (for the household and commercial sector), a composite variable consisting of new construction, producer, durable and personal consumption expenditures (for the industrial sector), and GNP (for the transportation sector). The electric utilities sector was taken from an advisory committee report (No. 21) for the National Power Survey of the Federal Power Commission. From this analysis, estimates of total consumption and of consumption by consuming sector were determined. These markets were then allocated to energy sources by subjecting the least squares projections of each source to analysis and judgment based on knowledge of the energy industries and markets, consensus of outside experts, and examination of other functional energy forecasts.

The forecast shows that energy is expected to grow at an annual rate of 3.2 percent, considerably above the historical rate of 2.5 percent. All sectors except household and commercial are expected to grow at faster rates than during the historical period. The industrial growth is expected to be 2 percent per annum as compared to an historical 1 percent; transportation, 3.5 percent as compared to 1.75 percent; and electricity, 5.5 percent as compared to 5 percent.

From the point of view of sources of supply, some major shifts are indicated. Bituminous coal, which showed an average decline of 2.5 percent in the historical period, is expected to reverse itself and increase at a rate of 2.4 percent. Petroleum and natural gas are expected to show a decline in growth rate to rates of 3.0 and 3.5 percent, respectively. Hydropower is expected to continue a 2-percent growth rate, and anthracite will continue to decline but at a slower rate, about 2 percent a year. The major new element coming into the picture, becoming significant within a couple of years, is nuclear energy. It is expected to grow from a negligible proportion of the market in 1962 to supply almost 5 percent of the total energy market by 1980. This represents an annual rate of growth of 34 percent per year.

Competition Between Energy Sources

Given today's technology, there are apparently two sectors of energy consumption for which fuels compete on a price basis. These are the electric generation sector and the other heat portion of the industrial sector. This is essentially the boiler-

fuel market. It is not an insignificant one. In 1962 it was 53 percent of the total energy market and by 1980 it is expected to be 56 percent of that market. Prior to the introduction of gas by pipeline into the major residential market, the household and commercial sector was considered a competitive market for fuels. Oil and coal were competing with each other for this market. However, the major technological breakthrough represented by the high-pressure large-diameter pipelines which brought gas to markets quickly altered the picture. Natural gas which supplied 17 percent in 1947 had increased its share to 44 percent by 1962 and, even further, is expected to increase its share to 58 percent by 1980. Today's household and commercial market met by energy in the form of fuel is the province of petroleum and natural gas. Coal is out for reasons that have little to do with price. The transportation market, with dieselization of the railroads, became the sole province of petroleum, although natural gas used in pipeline transportation represents a small but significant percentage of this market.

However, the growth of electricity is placing both the household and industrial markets to some degree again in a competitive position. In 1947 the household and commercial market obtained 30 percent of its energy by electricity. By 1962 this had grown to 36 percent and it is projected to grow to almost 50 percent by 1980. The generation of electricity is a competitive fuel market. A similar trend is recognizable in the industrial market, which got 16 percent of its energy from electricity in 1947, 20 percent in 1962, and a projected 27 percent in 1980. Thus, technology, while closing some markets to competition through a highly efficient production function in which the cost of fuel becomes a minor consideration, is also returning other markets to competition by switching to an energy form which can be supplied competitively from any of the source materials.

A Tentative Hypothesis

Major shifts have occurred among the sources of energy in the United States economy. These shifts have been described in the previous portions of this paper. The shifts between sources have been of much greater magnitude than the shifts in total energy consumption by sector. Therefore, it is obvious that the explanation for the changing demands for a specific mineral source must lie in its substitution by another energy source rather than the changing structure of the market itself. What are the determinants of this substitution? This is the fundamental question in analyzing the demand for a specific energy material and one upon which I want to venture a tentative hypothesis.

The theory of market demand as developed by economists sees three kinds of forces operating on the demand for a commodity. These are the structure of taste of consumers, the level of income of consumers, and the relative prices of the commodities. Given these three factors, one can construct a demand function for the commodity in concern. Such a function, assuming a given taste, will tell you by how much the actual quantity demanded of a commodity will change if incomes change and if prices change. In the case of a raw material, the demand function is derived from that of the finished commodity, and is a function of that demand and relative price. Such an analysis simply does not work for the energy raw materials in our economy. I know because I have tried it. This failure of traditional economic theory to explain the shifting patterns has caused me to put forward an alternative hypothesis. This hypothesis briefly stated is as follows: The shifting demands for energy source material are explained by the changing production functions in the consuming sectors, that is, by technological changes in the consuming sectors.

This hypothesis holds that a new technology in a consuming sector is very likely to be of such a nature that the energy commodities are not substitutes within it. A production function is chosen which requires certain characteristics of the energy source, but the cost of the energy meeting these characteristics was probably of very minor or negligible importance in the design of the total production function. For example, the dieselization of the railroads clearly was not made to save fuel cost. Coal lost the railroad market because the entire production function of providing motive power for railroads changed. The entire complex of service was cheaper from diesel-powered locomotives than from steam-powered locomotives. On an energy basis alone, there is no evidence that the fuel costs are any cheaper. The other costs simply outweighed the fuel costs in their entirety. If we look at the household and commercial market which coal has also lost, we find that the development of the technology of transmission of gas and the development of the automatic furnace together forced coal out of this market. The space saving, cleanliness, and convenience features were and are overwhelming. If price of energy were the factor here, we would see the rate of gas penetration slowing, since the price of gas has been rising steadily relative to other fuels for the last 20 years. This is not the case. Once again the technology determines the fuel source, and price changes within the fuel sources themselves cannot reverse this commitment.

To partially substantiate this hypothesis in an indirect way, look at the competitive area of the energy market, the so-called boiler-fuel market. Here the traditional economics apparently do apply and coal has done well in this market. The price relatives have favored coal throughout the entire period and even so, it has lost the major transportation and household and commercial markets.

If my hypothesis is acceptable, it means that analysis of the substitution of energy sources must be based squarely on the technology of and the rate and character of technological change in the consuming sectors. It cannot be based upon an analysis of the energy sources themselves. This forces the analyst interested in energy into an overall look at the entire economy and into the very difficult area of predicting technologic change. This is perhaps discouraging but nevertheless, I believe, true.

TABLE 1.-United States gross consumption of energy by major sources and consuming sectors, 1947 ^{1/}
(Trillion Btu)

Sources	Household and commercial	Industrial	Transportation ^{2/}	Electric generation utilities		Misc. and unaccounted for	Total gross energy
				Fuel-burning plants	Hydropower and nuclear plants		
Anthracite-----	812.8	284.7	23.9	89.5	-----	13.3	1,224.2
Percent contribution-----	12	2	^{3/}	3	-----	3	4
Bituminous and lignite-----	2,585.5	7,013.6	3,006.2	1,994.4	-----	-----	14,599.7
Percent contribution-----	38	55	34	68	-----	-----	44
Natural gas, dry ^{4/} -----	1,125.0	2,874.7	(neg)	386.1	-----	132.6	4,518.4
Percent contribution-----	17	23	-----	13	-----	24	14
Petroleum ^{5/} -----	2,250.9	2,489.7	5,760.5	468.0	-----	397.9	11,367.0
Percent contribution-----	33	20	66	16	-----	73	34
Hydropower ^{6/} -----	-----	-----	-----	-----	1,459.0	-----	1,459.0
Percent contribution-----	-----	-----	-----	-----	100	-----	4
Total gross energy-----	6,774.2	12,662.7	8,790.6	2,938.0	1,459.0	543.8	33,168.3
Percent contribution-----	100	100	100	100	100	100	100
Percentage distribution of total energy by consuming sector-----	20	38	27	9	4	2	100

1/ Gross energy is that contained in all types of commercial energy at the time it is incorporated in the economy whether the energy is produced domestically or imported. Gross energy comprises inputs of primary fuels (or their derivatives) and outputs of hydropower and nuclear power converted to theoretical energy inputs. Gross energy includes the energy used for the production, processing and transportation of energy proper.

2/ Includes bunkers and military transportation.

3/ Less than .05 percent.

4/ Excludes natural gas liquids.

5/ Petroleum products including still gas, liquefied refinery gas, and natural gas liquids.
6/ Represents outputs of hydropower and nuclear power converted to theoretical energy inputs at the prevailing rate of pounds of coal per kilowatt hour at central electric stations. Excludes inputs for power generated by non-utility plants, which are included within the other consuming sectors.

Sources: Compiled by Bureau of Mines, United States Department of the Interior, supplemented by data on hydropower and nuclear power from the Federal Power Commission and the Atomic Energy Commission.

TABLE 2.-United States gross consumption of energy by major sources and consuming sectors, 1955 1/ (Trillion Btu)

Sources	Household and commercial	Industrial	Transportation 2/	Electric generation utilities		Misc. and unaccounted for	Total gross energy
				Fuel-burning plants	Hydropower and nuclear plants		
Anthracite-----	330.7	52.7	11.6	81.5	-----	122.9	598.4
Percent contribution--	4	3/	3/	2	-----	13	1
Bituminous and lignite--	1,443.7	5,796.1	462.1	3,402.1	-----	-----	11,104.0
Percent contribution--	17	42	5	65	-----	-----	28
Natural gas, dry 4/-----	2,849.5	4,675.0	253.8	1,193.6	-----	260.1	9,232.0
Percent contribution--	33	33	3	23	-----	27	23
Petroleum 5/-----	4,001.0	3,329.2	9,109.3	512.2	-----	572.3	17,524.0
Percent contribution--	46	25	92	10	-----	60	44
Hydropower 6/-----	-----	-----	-----	-----	1,497.0	-----	1,497.0
Percent contribution--	-----	-----	-----	-----	100	-----	4
Total gross energy-----	8,624.9	13,853.0	9,836.8	5,189.4	1,497.0	955.3	35,956.4
Percent contribution--	100	100	100	100	100	100	100
Percentage distribution of total energy by consuming sectors-----	21	35	25	13	4	2	100

1/ Gross energy is that contained in all types of commercial energy at the time it is incorporated in the economy whether the energy is produced domestically or imported. Gross energy comprises inputs of primary fuels (or their derivatives) and outputs of hydropower and nuclear power converted to theoretical energy inputs. Gross energy includes the energy used for the production, processing and transportation of energy proper.

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Sources: Compiled by Bureau of Mines, United States Department of the Interior, supplemented by data on hydro-power and nuclear power from the Federal Power Commission and the Atomic Energy Commission.

TABLE 3.-United States gross consumption of energy by major sources and consuming sectors, 1962 ^{1/}
(Trillion Btu)

Sources	Household and commercial	Industrial	Transportation ^{2/}	Electric generation utilities		Misc. and unaccounted for	Total gross energy
				Fuel-burning plants	Hydropower and nuclear plants		
Anthracite-----	121.1	49.0	(neg.)	58.2	-----	152.7	381.0
Percent contribution--	1	3/	-----	1	-----	12	1
Bituminous and lignite--	798.6	4,761.6	19.5	4,580.0	-----	-----	10,159.7
Percent contribution--	7	32	3/	63	-----	-----	21
Natural gas, dry ^{4/} -----	4,849.2	6,293.2	395.8	2,034.4	-----	548.2	14,120.8
Percent contribution--	44	42	4	28	-----	43	30
Petroleum ^{5/} -----	5,227.1	3,879.7	11,000.9	579.0	-----	580.3	21,267.0
Percent contribution--	48	26	96	8	-----	45	44
Hydropower ^{6/} -----	-----	-----	-----	-----	1,943.0	-----	1,943.0
Percent contribution--	-----	-----	-----	-----	99	-----	4
Nuclear ^{6/} -----	-----	-----	-----	-----	25.9	-----	25.9
Percent contribution--	-----	-----	-----	-----	1	-----	3/
Total gross energy-----	10,996.0	14,983.5	11,416.2	7,251.6	1,968.9	1,281.2	47,897.4
Percent contribution--	100	100	100	100	100	100	100
Percentage distribution of total energy by consuming sector-----	23	31	24	15	4	3	100

^{1/} Gross energy is that contained in all types of commercial energy at the time it is incorporated in the economy whether the energy is produced domestically or imported. Gross energy comprises inputs of primary fuels (or their derivatives) and outputs of hydropower and nuclear power converted to theoretical energy inputs. Gross energy includes the energy used for the production, processing and transportation of energy proper.

^{2/} Includes bunkers and military transportation.

^{3/} Less than .05 percent.

^{4/} Excludes natural gas liquids.

^{5/} Petroleum products including still gas, liquefied refinery gas, and natural gas liquids.

^{6/} Represents outputs of hydropower and nuclear power converted to theoretical energy inputs at the prevailing rate of pounds of coal per kilowatt hour at central electric stations. Excludes inputs for power generated by non-utility plants, which are included within the other consuming sectors.

Sources: Compiled by Bureau of Mines, United States Department of the Interior, supplemented by data on hydropower and nuclear power from the Federal Power Commission and the Atomic Energy Commission.

TABLE 4.-United States gross consumption of energy by major sources and consuming sectors, 1980 ^{1/}
(Trillion Btu)

Sources	Household and commercial	Industrial	Transportation ^{2/}	Electric generation utilities		Misc. and unaccounted for	Total gross energy
				Fuel-burning plants	Hydropower and nuclear plants		
Anthracite-----	50.0	50.0	(neg.)	150.0	-----	-----	250.0
Percent contribution--	^{3/}	^{3/}	-----	1	-----	-----	^{3/}
Bituminous and lignite--	200.0	3,475.8	-----	12,416.0	-----	-----	16,091.8
Percent contribution--	1	16	-----	71	-----	-----	19
Natural gas, dry ^{4/} -----	10,366.8	11,537.5	693.0	3,918.3	-----	-----	26,515.6
Percent contribution--	58	52	3	23	-----	-----	31
Petroleum ^{5/} -----	7,362.2	7,167.9	20,649.7	861.7	-----	-----	36,041.5
Percent contribution--	41	32	97	5	-----	-----	42
Hydropower ^{6/} -----	-----	-----	-----	-----	2,674.5	-----	2,674.5
Percent contribution--	-----	-----	-----	-----	38	-----	3
Nuclear ^{6/} -----	-----	-----	-----	-----	4,361.0	-----	4,361.0
Percent contribution--	-----	-----	-----	-----	62	-----	5
Total gross energy-----	17,979.0	22,231.2	21,342.7	17,346.0	7,035.5	-----	85,934.4
Percent contribution of total energy by consuming sector-----	100	100	100	100	100	-----	100
	21	26	25	20	8	-----	100

^{1/} Gross energy is that contained in all types of commercial energy at the time it is incorporated in the economy whether the energy is produced domestically or imported. Gross energy comprises inputs of primary fuels (or their derivatives) and outputs of hydropower and nuclear power converted to theoretical energy inputs. Gross energy includes the energy used for the production, processing and transportation of energy proper.

^{2/} Includes bunkers and military transportation.

^{3/} Less than .05 percent.

^{4/} Excludes natural gas liquids.

^{5/} Petroleum products including still gas, liquefied refinery gas, and natural gas liquids.

^{6/} Represents outputs of hydropower and nuclear power converted to theoretical energy inputs at the prevailing rate of pounds of coal per kilowatt hour at central electric stations. Excludes inputs for power generated by non-utility plants, which are included within the other consuming sectors.

Sources: Compiled by Bureau of Mines, United States Department of the Interior, supplemented by data on hydropower and nuclear power from the Federal Power Commission and the Atomic Energy Commission.

TABLE 5.-United States gross consumption of energy by function and consuming sector, 1947 (Trillion Btu)

Function	Household and commercial	Transportation	Industrial	Total function
Space heat-----	3,994	94	439	4,527
Other heat-----	2,454	--	10,462	12,916
Total heat-----	6,448	94	10,901	17,443
Utility electricity-----	2,880	70	1,447	4,397
Self-generated electricity--	0	0	732	732
Total electricity-----	2,880	70	2,179	5,129
Motive use-----	---	8,697	---	8,697
Non-energy uses-----	326	--	1,030	1,356
Total sector-----	9,654	8,861	14,110	33,168 <u>1/</u>

1/ Parts do not add to total because miscellaneous category left out; about 2% of total; 544 in 1947.

TABLE 6.-Percent distribution of gross consumption of energy of each sector by function, 1947

Function	Household and commercial	Transportation	Industrial	Total function
Space heat-----	41	1	3	14
Other heat-----	26	0	74	39
Total heat-----	67	1	77	53
Utility electricity-----	30	1	11	13
Self-generated electricity--	--	--	5	2
Total electricity-----	30	1	16	15
Motive use-----	0	98	0	26
Non-energy uses-----	3	0	7	4
Total sector-----	100	100	100	100 <u>1/</u>

1/ Parts do not add to total because miscellaneous left out; 2% of total in 1947.

TABLE 7.-Percent distribution of gross consumption of energy
by each function by sector, 1947

Function	Household and commercial	Transportation	Industrial	Total function
Space heat-----	88	2	10	100
Other heat-----	19	0	81	100
Total heat-----	37	1	62	100
Utility electricity-----	65	2	33	100
Self-generated electricity--	--	-	100	100
Total electricity-----	56	1	43	100
Motive use-----	0	100	0	100
Non-energy uses-----	24	0	76	100
Total sector-----	29	27	42	100 <u>1/</u>

1/ Parts do not add to total because miscellaneous category left out; 2% of total in 1947.

TABLE 8.-United States gross consumption of energy
by function and consuming sector, 1955
(Trillion Btu)

Function	Household and commercial	Transportation	Industrial	Total function
Space heat-----	4,987	104	532	5,623
Other heat-----	3,023	---	11,470	14,493
Total heat-----	8,010	104	12,002	20,116
Utility electricity-----	4,393	46	2,247	6,686
Self-generated electricity--	0	0	761	761
Total electricity-----	4,393	46	3,008	7,447
Motive use-----	---	9,733	---	9,733
Non-energy uses-----	615	---	1,090	1,705
Total sector-----	13,018	9,883	16,100	39,956 <u>1/</u>

1/ Parts do not add to total because miscellaneous category left out; about 2% of total; 955 in 1955.

TABLE 9.-Percent distribution of gross consumption of energy of each sector by function, 1955

Function	Household and commercial	Transportation	Industrial	Total function
Space heat-----	38	1	3	14
Other heat-----	23	0	71	36
Total heat-----	61	1	74	50
Utility electricity-----	34	<u>1/</u>	14	17
Self-generated electricity--	--	-	5	2
Total electricity-----	34	<u>1/</u>	19	19
Motive use-----	0	99	0	25
Non-energy uses-----	5	0	7	4
Total sector-----	100	100	100	100 <u>2/</u>

1/ Less than .5%.

2/ Parts do not add to total because miscellaneous left out; 2% of total in 1955.

TABLE 10.-Percent distribution of gross consumption of energy by each function by sector, 1955

Function	Household and commercial	Transportation	Industrial	Total function
Space heat-----	89	2	9	100
Other heat-----	21	-	79	100
Total heat-----	40	<u>1/</u>	60	100
Utility electricity-----	66	1	33	100
Self-generated electricity--	0	0	100	100
Total electricity-----	59	1	40	100
Motive use-----	--	100	--	100
Non-energy uses-----	36	--	64	100
Total sector-----	33	25	40	100 <u>2/</u>

1/ Less than .5%.

2/ Parts do not add to total because miscellaneous category left out; 2% of total in 1955.

TABLE 11.-United States gross consumption of energy by function and consuming sectors, 1962 (Trillion Btu)

Function	Household and commercial	Transportation	Industrial	Total function
Space heat-----	6,793	133	685	7,611
Other heat-----	3,399	0	11,982	15,381
Total heat-----	10,192	133	12,667	22,992
Utility electricity-----	6,279	46	2,895	9,220
Self-generated electricity--	0	0	747	747
Total electricity-----	6,279	46	3,642	9,967
Motive use-----	0	11,283	0	11,283
Non-energy use-----	804	0	1,570	2,374
Total sector-----	17,275	11,462	17,879	47,897 <u>1/</u>

1/ Parts do not add to total. Miscellaneous category not included; 1,281 trillion Btu, 2.6% of total.

TABLE 12.-Percent distribution of gross consumption of energy of each sector by function, 1962

Function	Household and commercial	Transportation	Industrial	Total function
Space heat-----	39	1	4	16
Other heat-----	20	0	67	32
Total heat-----	59	1	71	48
Utility electricity-----	36	<u>2/</u>	16	19
Self-generated electricity--	0	0	4	2
Total electricity-----	36	<u>2/</u>	20	21
Motive use-----	0	99	0	23
Non-energy use-----	5	0	9	5
Total sector-----	100	100	100	100 <u>1/</u>

1/ Parts do not add to total. Miscellaneous category not included; 1,281 trillion Btu, 2.6% of total.

2/ Less than .5%.

TABLE 13.-Percent distribution of gross consumption of energy of each sector by function, 1962

Function	Household and commercial	Transportation	Industrial	Total function
Space heat-----	89	2	9	100
Other heat-----	22	0	78	100
Total heat-----	44	1	55	100
Utility electricity-----	68	1	31	100
Self-generated electricity--	0	0	100	100
Total electricity-----	63	2/	37	100
Motive use-----	0	100	0	100
Non-energy use-----	34	0	66	100
Total sector-----	36	24	37	100 1/

1/ Parts do not add to total; miscellaneous category not included; 2.6% of total.

2/ Less than .5%.

TABLE 14.-United States gross consumption of energy by function and consuming sectors, 1980 (Trillion Btu)

Function	Household and commercial	Transportation	Industrial	Total function
Space heat-----	9,780	150	872	10,802
Other heat-----	6,199	---	16,381	22,580
Total heat-----	15,979	150	17,253	33,382
Utility electricity-----	17,504	70	6,807	24,381
Self-generated electricity--	0	0	1,108	1,108
Total electricity-----	17,504	70	7,915	25,489
Motive use-----	---	21,193	---	21,193
Non-energy uses-----	2,000	---	3,870	5,870
Total sector-----	35,483	21,413	29,038	85,934

TABLE 15.-Percent distribution of gross consumption of energy of each sector by function, 1980

Function	Household and commercial	Transportation	Industrial	Total function
Space heat-----	28	1	3	12
Other heat-----	17	0	57	26
Total heat-----	45	1	60	38
Utility electricity-----	49	<u>1/</u>	23	29
Self-generated electricity--	--	-	4	1
Total electricity-----	49	<u>1/</u>	27	30
Motive use-----	0	99	0	25
Non-energy uses-----	6	0	13	7
Total sector-----	100	100	100	100

1/ Less than .5%.

TABLE 16.-Percent distribution of gross consumption of energy by each function by sector, 1980

Function	Household and commercial	Transportation	Industrial	Total function
Space heat-----	91	1	8	100
Other heat-----	27	0	73	100
Total heat-----	48	<u>1/</u>	52	100
Utility electricity-----	72	<u>1/</u>	28	100
Self-generated electricity--	0	0	100	100
Total electricity-----	69	<u>1/</u>	31	100
Motive use-----	0	100	0	100
Non-energy uses-----	34	0	66	100
Total sector-----	41	25	34	100

1/ Less than .5%.