

# Research Department Federal Reserve Bank of San Francisco

July 5, 1974

## Saving Kilowatts

The inflationary effects of the energy crisis have been felt throughout the price system in recent months. Wholesale prices for fuels and electrical power have risen at a 92-percent annual rate since last fall, and those increases have helped push prices of other industrial commodities upward at a 31-percent annual rate. Soaring fuel costs undoubtedly have played a large role in the series of substantial price boosts announced by such major fuel-using industries as steel, paper and aluminum.

Most of the nation's (and the world's) resources, and not simply energy, are being severely taxed by the long-term growth of the world's population—and by its increased affluence and resultant increase in per capita consumption. To meet the upsurge in effective demand, the economy is being forced to move along an upward curve of increasing real costs. Slowing the long-term inflationary spiral requires the development and application of new technology to increase supplies, plus greater attention to conservation practices to slow demand growth.

### **More efficiency**

The nation produces over 200 trillion British thermal units (BTU's) of energy per day, or the equivalent of eleven kilowatts for every individual. Between 1950 and 1970, U.S. consumption of energy resources doubled, growing at an average annual rate of 3.5 percent, and the growth rate then accelerated to 4.1 percent during the 1971-73 period.

In relation to real GNP, energy usage generally trended downwards for the better part of a half-century. The nation consumed 141 thousand BTU's per dollar of GNP in 1920, and this energy/GNP ratio dropped to 105 in 1940 and to 87 by 1966. But then a dogleg developed in the curve as energy consumption soared—especially after 1970—largely because of the increasing electrification of operations by businesses and consumers. Energy had become so cheap for so long that most consumers had given no thought to using it efficiently. However, the recent unleashing of the price mechanism may be what is needed to reverse the movement of the past half-decade and to force the energy/GNP ratio to resume its historical decline.

The task of using the nation's prodigious energy production more rationally will be a major undertaking. Five-sixths of the energy used in transportation, two-thirds of the fuel consumed to generate electricity, and nearly one-third of the remaining energy supply are thrown off as waste heat. In fact, altogether less than 50 percent of all BTU's consumed in this country end up as useful work, visible light or comfort heat. That figure, low as it is, probably is four times greater than the comparable figure for 1900, but it is clear that considerable room still exists for improving energy utilization. All of the major energy consuming sectors are possible targets—industry, electrical utilities, transportation, households and commercial enterprises.

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## More buses—and insulation

In the transportation sector, which consumes about 25 percent of the nation's total energy, conservation requires a shift from energy-intensive to energy-efficient modes of transportation, measured in terms of BTU's required per ton-mile or passenger-mile. By this standard, railroads are four times as efficient as trucks and 60 times as efficient as airplanes in carrying freight, while buses are twice as efficient as private cars and five times as efficient as airplanes in carrying passengers.

If consumers and businesses were to alter their travel patterns, so that half of all private auto passengers shifted to buses and half of all truck and air freight shifted to rail, energy usage and dollar costs could be reduced perhaps by as much as 22 and 12 percent, respectively, in relation to the actual amounts spent in 1970. (These calculations were prepared for *Science* magazine by Eric Hirst and John Moyers.) Savings in either energy or dollar terms, of course, must be balanced against losses in speed, comfort and flexibility resulting from the shift away from energy-intensive transport modes. Yet, even without such a shift, some savings can be made by design improvements. For example, by reducing the average weight of a car from 3,500 to 2,500 pounds, the U.S. could save as much oil as will be delivered by the Alaska pipeline, or two million barrels a day. As '74 auto sales figures indicate, the recent surge in gasoline prices may bring about just such a result.

In the residential and commercial sector, which accounts for about 20 percent of total energy usage, conservation requires increased emphasis on thermal insulation to reduce the use of energy in space heating. According to the Federal Housing Administration, proper insulation could reduce space-heating requirements in the average home by 40 percent. Even that may be a conservative figure; heat from lights, stoves, and other appliances would provide an increasing share of total heat requirements if added insulation were installed. Further savings could come from a halting of the trend toward all-electric homes, since the electrically heated home requires about twice as much fuel per unit of heat as the gas or oil heated home.

A prime candidate for conservation efforts is air conditioning, a relatively small but nonetheless important user, especially since it is a heavy contributor to the annual summertime peak load for utilities. Increased insulation could make an important contribution in this area, just as in the space-heating field, with electricity savings of as much as 18 percent in the electric home, or even more in the gas home. Improvements are also possible through the use of better-quality products, since the least-efficient machine on the market consumes about 2.6 times as much electricity per unit of cooling as the most efficient product. Thus, by raising the efficiency of the typical unit

from 6 BTU's to 10 BTU's per watt-hour, the amount of electricity required for cooling could be reduced by 40 percent. (Some conservationists have added a revolutionary suggestion—opening more windows.)

Numerous architectural improvements have been suggested in recent years. Shifting the axis of the common slab-like high-rise building away from the direct rays of the sun could reduce its normal energy consumption as much as 30 percent. Another important step is reduced lighting; after all, the recommended light levels of 15 years ago were as much as two-thirds lower than the present recommendations of the Illuminating Engineering Society. (Less lighting also would require less cooling, since every two extra watts of light require one extra watt of cooling.)

The manufacturers of only a few basic materials—aluminum, paper, steel, cement, and petroleum—account for almost 40 percent of the industrial consumption of energy. Therefore, increased recycling of their energy-intensive products deserves more emphasis. Also, production of packaging materials—paper, metal, glass, plastic and wood—requires about 4 percent of the nation's total energy budget. This suggests the need for a better choice of materials and design of products to increase packaging use and reduce energy costs per unit of production.

### **Price impact**

Until recently, a typical American family spent about 5 percent of its annual budget on electricity, natural gas and motor fuel, while the energy costs of the typical manufacturer amounted to 1½ percent of the value of total shipments. The nation has been a prodigal consumer of energy, at least partly because of the declining price of energy relative to other commodities. In the quarter-century ending in 1972, the price of oil, which accounts for roughly one-half of all energy consumption, increased only 30 percent compared with the 74 percent rise in the general wholesale price level. This shift encouraged manufacturers to substitute energy for other production inputs, such as labor.

The downward trend in the relative price of energy has finally been reversed, because of the failure of domestic supply to keep up with soaring demand due in turn to the rising cost of developing new reserves and constructing new energy-conversion facilities (power plants and oil refineries). Now we are witnessing a fascinating, if painful, experiment in price elasticity. The impact of soaring energy prices on demand is still difficult to assess, in part because of the suddenness with which the era of low-cost energy came to an end, but it is safe to conclude that significant changes in our life styles, production processes, and transportation and building designs will become more evident, as adaptations are made to increased energy costs.

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**BANKING DATA—TWELFTH FEDERAL RESERVE DISTRICT**  
 (Dollar amounts in millions)

Selected Assets and Liabilities Large Commercial Banks	Amount Outstanding 6/19/74	Change from 6/12/74	Change from year ago	
			Dollar	Percent
Loans (gross) adjusted and investments*	83,123	- 353	+9,464	+ 12.85
Loans gross adjusted—	64,962	- 149	+8,738	+ 15.54
Securities loans	1,194	- 633	- 88	- 6.86
Commercial and industrial	23,176	+ 106	+3,004	+ 14.89
Real estate	19,374	+ 107	+2,853	+ 17.27
Consumer instalment	9,315	+ 34	+ 858	+ 10.15
U.S. Treasury securities	5,132	- 30	- 625	- 10.86
Other Securities	13,029	- 174	+1,351	+ 11.57
Deposits (less cash items)—total*	78,799	- 83	+7,304	+ 10.22
Demand deposits adjusted	21,640	- 840	+ 570	+ 2.71
U.S. Government deposits	970	+ 643	- 17	- 1.72
Time deposits—total*	54,627	- 198	+6,254	+ 12.93
Savings	17,835	+ 6	- 309	- 1.70
Other time I.P.C.	27,152	- 215	+6,679	+ 32.62
State and political subdivisions	6,811	- 86	- 286	- 4.03
(Large negotiable CD's)	13,915	- 223	+4,427	+ 46.66
<b>Weekly Averages of Daily Figures</b>	<b>Week ended 6/19/74</b>	<b>Week ended 6/12/74</b>	<b>Comparable year-ago period</b>	
<b>Member Bank Reserve Position</b>				
Excess Reserves	63	21	-	2
Borrowings	259	72		235
Net free (+) / Net borrowed (-)	- 196	- 51		-237
<b>Federal Funds—Seven Large Banks</b>				
Interbank Federal funds transactions				
Net purchases (+) / Net sales (-)	+1,607	+1,963		+509
Transactions: U.S. securities dealers				
Net loans (+) / Net borrowings (-)	+ 496	+ 904		+608

\*Includes items not shown separately.

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