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ABSTRACT

This book is concerned with educating citizen leaders and public officials on matters of transportation energy, industrial and electrical energy, and residential and commercial energy usage. Also included are guidelines on developing a national energy conservation policy and mobilizing citizens for action in energy conservation concerns. A glossary of terms, a short bibliography, and a listing of previous energy publications are at the end of the book. (MA)

CITIZEN ACTION GUIDE TO ENERGY CONSERVATION

2

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INTRODUCTION

In the span of only a few months, energy has become for the first time a subject of critical importance to all Americans. Front-page stories and television news report soaring demand, dwindling supply and other problems, balance of payments, supertankers, oil spills, pipelines, off-shore oil, brownouts, and the need for clean energy.

In addition to this widespread and dramatic coverage, there have been a number of publications with specific suggestions on how the public can help save energy by different driving practices and housekeeping changes. Thus the public is alerted and to some extent aware of approaches to energy conservation, but the Citizens' Advisory Committee on Environmental Quality believes that it is helpful to bring together in one place a factual account of the problem and some well-documented steps to do something about it. The reasons for citizen action are persuasive:

- Enormous amounts of energy are wasted in the United States today. Present methods of energy production cause damage to the environment—in the form of air and water pollution, surface mining, or otherwise. Thus, while a dependable supply of energy is absolutely essential to our society and economy, any waste of this vital commodity means unnecessary degradation of environmental quality.
- The success of any program to reduce energy consumption is dependent upon citizen action. Government and industry must play major roles, but it is the people, finally, who must accept—and ultimately demand—energy conservation and make it a way of life. As a citizen group, the Committee feels that it has both a responsibility and an opportunity to encourage effective citizen action in support of this objective. We believe that our efforts can complement the government program established by the President to foster energy conservation in all sectors of the economy.
- The need for energy conservation is not a temporary condition predicated upon husbanding enough gasoline to get us through this summer or assuring enough fuel oil for next winter. On the contrary, the Committee believes the time has come for Americans to reassess their use of energy. Until very recently, energy has been so relatively abundant and inexpensive that we have given little, if any, thought to its use and misuse on a prodigal scale. Belatedly, and to our chagrin, we now find it to be a definitely limited commodity. The Committee concluded, therefore, that there is need for a citizen action guide which would attempt to put energy conservation in proper perspective—to show that it must become a permanent feature in the living pattern of Americans in the 1970's and beyond.

There are very basic government and industry programs which must be moved forward to conserve energy. We must not put the whole job on citizen action alone, but citizens can do a great deal.

This booklet is directed to citizen leaders, public officials, and others who are in a position to promote understanding of the need for energy conservation and to encourage its practice on a broad scale by the American people. We are convinced that this is an environmental issue in which citizens can make a difference, and this booklet is designed to help them to do so.

Henry L. Diamond

Chairman

TABLE OF CONTENTS

THIS
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CHAPTER 1

CITIZENS CAN HELP SAVE ENERGY

In recent months, a number of puzzling and troubling things have happened to many of us living in the United States.

We have pulled up at gasoline stations to refill the tank of our car, only to be told there is no gasoline for sale. In isolated parts of the country last winter there was not enough fuel available to heat homes, schools, and offices, and newspaper reports predict more widespread shortages are coming next year. In many cities, when the temperature reaches into the 90's, public officials ask us not to use the air conditioners we bought for the very purpose of protecting ourselves against the hot weather, for fear of too large a drain on our electrical power system. And, to our great chagrin, our fuel bills seem to be constantly rising all the time.

Is this the country of affluence and convenience most of us thought it to be? Why can't the system work? We are confused because the technological wonders we have created seemingly have brought unexpected problems. The vaunted consumer goods we have almost casually purchased—the cars, the air conditioners, the washing machines—are things we can no longer take for granted. This is a disturbing thought, one which will become even more glaring if the isolated instances of gasoline shortages and brownouts prove to be a nationwide trend as years go on.

Why has this happened? Simply put, our technological machinery cannot run by itself. It depends upon an outside commodity known as "energy" to make it work for us. Energy, popularly defined, is the commodity which gives to us the capability to do work or to produce temperature changes (that is, to heat or to cool). Our industrial society uses two forms of energy: "primary energy," which comes from the fuel resources of natural gas, oil and its derivatives, coal, and uranium, and "secondary energy," otherwise known as electricity, which we generate by burning the fuel resources or by harnessing falling water. The energy we need, it turns out, is in short supply, and it is getting more expensive all the time.

Opportunities for Citizen Action

In circumstances such as these, the individual citizen often feels powerless to do anything about the problem. He can—and does—complain to his friends, write a letter to his Congressman or newspaper editor, picket an industrial plant, or suffer in silence and pay the price. But somehow the feeling remains that the government and industry "experts" and "policy-makers" are in command, and that the future ultimately depends on what action is—or is not—taken by those nominally in charge of the situation. The concept of individual citizen action impacting upon public policy in a meaningful way—such as getting more gasoline into that service station down the street—seems remote and unrealistic.

There is no reason why this should be so. Ample opportunities exist for citizens to help solve the problem of assuring that this country has enough energy to make it function in the manner we are accustomed to and expect. Some of these opportunities can be grouped together under a term called "energy conserva-

tion." When applied to us as citizens acting individually or together, it means that we consciously make a decision to limit the amount of energy we consume during our daily lives.

Most people resist changing their lifestyles, and being asked to limit our living patterns in some fashion usually does not produce volunteers. Very often, when a situation reaches "crisis" proportions on a nationwide scale—as we are now told is the case with our energy situation—we are exhorted to act beyond our willingness or capacity to do so. Often it appears as though the solutions are far too overwhelming to grasp and are beyond our reach.

Energy Conservation is Easy to Practice

Energy conservation measures which we can practice do not by and large fall into that category. Many of them actually require little or no change in our basic lifestyles. Most of them will save money for the consumer. All they require us to do is to think a little bit before we act, and to plan ahead so that we will be spending our energy—and thus our money—more wisely.

The aim of this booklet is to point out some things about the use of energy which citizens need to know in order for them to decide what, if any, actions they wish to take. It is a guidebook to participation in an energy conservation effort, and its underlying theme is that all of us must start acting now.

While your personal participation in this effort is needed—and it *will* make a difference—you ought to be aware that individual action cannot be the only route to rely upon. Individual energy conservation is one aspect of a larger solution which must be devised if we as a nation are going to have enough means to satisfy our seemingly insatiable energy appetite. But citizen energy conservation, it must be emphasized, is a *key* part of that solution—particularly because it can be initiated immediately and directly benefit those who participate. When combined with appropriate public and private policies, citizen action can contribute to an easing of what assuredly is a very serious problem.

Much of the public discussion today centers around who is responsible for the current energy shortages and whence the solutions must come. There are sizable differences of opinion as to how great this "crisis" is and how long it will last, and even whether or not there is a crisis at all. It is not the purpose of this booklet either to examine those issues or to propose recommendations for solutions in those areas. Rather, its purpose is to provide citizens with a current, thorough, factual presentation of the many facets of energy conservation. It is hoped that after reading this booklet, citizens will have a clearer understanding of why they must individually conserve energy as well as work together in pressing for appropriate public action—and how that can be done. This booklet also will show you why it makes good economic sense to cut back your energy budget, because in doing so, you will cut back your personal family budget. This information can be very helpful in an era of rising energy prices.

Public Awareness Can Reduce Waste of Energy

A final word on the need for more public awareness about energy conservation and its positive role in environmental protection. There is a great deal of waste in this country; we are surrounded by it everywhere we turn. The very act of obtaining energy for our industrialized nation is a drain on our natural resources. Therefore,

we must consciously recognize that when we waste energy, we are unnecessarily degrading the country we live in.

We should also be aware that using energy is a major cause of environmental degradation and pollution. About 60 percent of air pollution, for example, is related to the use of energy. Thus, if we can cut our energy consumption in conjunction with establishing more environmental protection measures, there will be even greater benefits. All of us have to practice better environmental habits, and energy conservation is one of the most basic steps we can take. This is the message that must become a part—if only a small part—of the American consciousness.

Somehow, attempting to build nationwide public awareness for energy conservation does not seem too onerous a task, or an unreasonable one. We have achieved comparable goals in the past. Some have suggested that the current need for energy conservation be compared to people's willingness to personally ration goods during World War II. Another way to look at the development of a nationwide public campaign for energy conservation is the very simple example of the postal zip code. It is now in widespread use when people address letters for mailing. Who can remember what it was like not to automatically—or consciously, for that matter—put down those numbers?

The lesson of the zip code is an instructive one. Quite simply, people use the zip code because of an almost subconscious expectation that with it their mail will get to its destination faster, or that without it the mail might not even get there at all. This is the kind of message that must be devised for energy conservation.

Surely we all can learn to turn out unnecessary lights automatically in our home and walk around the corner to buy a carton of milk instead of driving to get it. If we do not, the energy to supply those lights and propel that car will become harder and more expensive to obtain.

CHAPTER 2

ENERGY IN THE UNITED STATES AND ITS IMPACT ON THE AMERICAN FAMILY

It is virtually impossible to characterize the American people, but if there is one thing almost everyone in this country has in common, it is a reliance upon a tremendous amount of energy for our daily lives. When we compare ourselves to the rest of the world, we find that Americans are consuming a great deal of the earth's energy resources. Although the United States has only 5.7 percent of the world's population, we consume almost exactly one-third of the world's energy supply. This country leads every other in energy consumption.

Much of this can be related to the high standard of living in the United States. When a country's energy usage is examined, one usually finds a strong relationship between the use of energy and economic affluence. People basically use energy in two ways: to earn their living, and to enjoy the living they've earned. Somehow, as we view what has happened to our supply of energy in this country, it appears as though the second way we use energy—reflected in our large cars, super-cooling refrigerators, and multifloor glass office buildings—has gotten out of hand.

Our affluence is beginning to catch up with us, and we are starting to have to pay the price. In the past, energy has been a fairly inexpensive commodity in the United States, but this is changing dramatically now. Inflation, the actual rise in energy production costs, the price of environmental clean-up, and fuel scarcity have forced prices up, and they will not be going down in the foreseeable future.

There are some hard facts which have to be faced by every American, and they are not just rhetoric. We currently have a limited amount of energy supply available to us, and we can fairly accurately predict where our energy resources are going to come from in the near future. Development of new energy sources or the construction of new facilities for producing more cannot happen overnight. Meanwhile, the rate at which we are consuming energy continues to climb. The total energy consumed in the United States in mid-1973 is 223 percent of the amount used in 1950, well over twice as much.

All of these facts do not mean that our lights are going to go out tomorrow from a massive power shortage or that no one will be able to buy gasoline for the family car. However, we are just beginning to feel the effects of this situation, and we must take some action to slow down our energy consumption.

In order to present a clear idea of where this country stands as to its energy supply and where the demand for energy comes from, this chapter includes some tables and graphs which illustrate the present energy situation and what has been projected through 1985.

Before reading further, you might find it helpful to refer to the glossary on pages 59-61 of this booklet. The language of energy is often very technical, and this list of explanations might be of use. It is also handy to have for scanning advertisements or purchasing appliances.

The theme of this booklet is that it pays to save energy—in terms of both our national energy budget and every American family's budget. We need to save because we have been spending our energy bank account faster than we have been making deposits, and we are constantly facing the problem of drawing out more than we own.

The Supply of Energy in the United States

The United States energy supply comes from six basic sources: petroleum, natural gas, coal, hydropower, nuclear fission, and wood. (Scrap wood is used as a fuel, primarily in wood-processing plants.)

The table below will tell you the amount of each source of supply in mid-1973 as a percentage of the total demand for energy. How much of that supply comes from our own resources is shown in the column headed "Net Domestic Production," and the amount which has to be imported is shown under the column "Net Import."

UNITED STATES ANNUAL GROSS ENERGY SUPPLY AS OF MID-1973: PERCENT OF TOTAL DEMAND

(Total rate of energy consumption is 73.836 quadrillion Btu per year)

Source	*Net Domestic Production (%)*	*Net Import (%)*	*Totals (%)*
Petroleum [a]	29.9	14.5 [b]	44.4
Natural Gas (dry)	30.6	1.4	32.0
Coal	19.6	—2.1 (net export)	17.5
Hydropower	4.0	—	4.0
Nuclear	1.0	—	1.0
Wood [c]	1.4	—	1.4
TOTALS	86.5	13.8	100.3 [d]

a) Includes natural gas liquids
b) Assumption is made that short-fall between demand and supply will be made up by increased oil import.
c) Rough estimate
d) Sum does not equal 100 percent because of rounding last decimal.

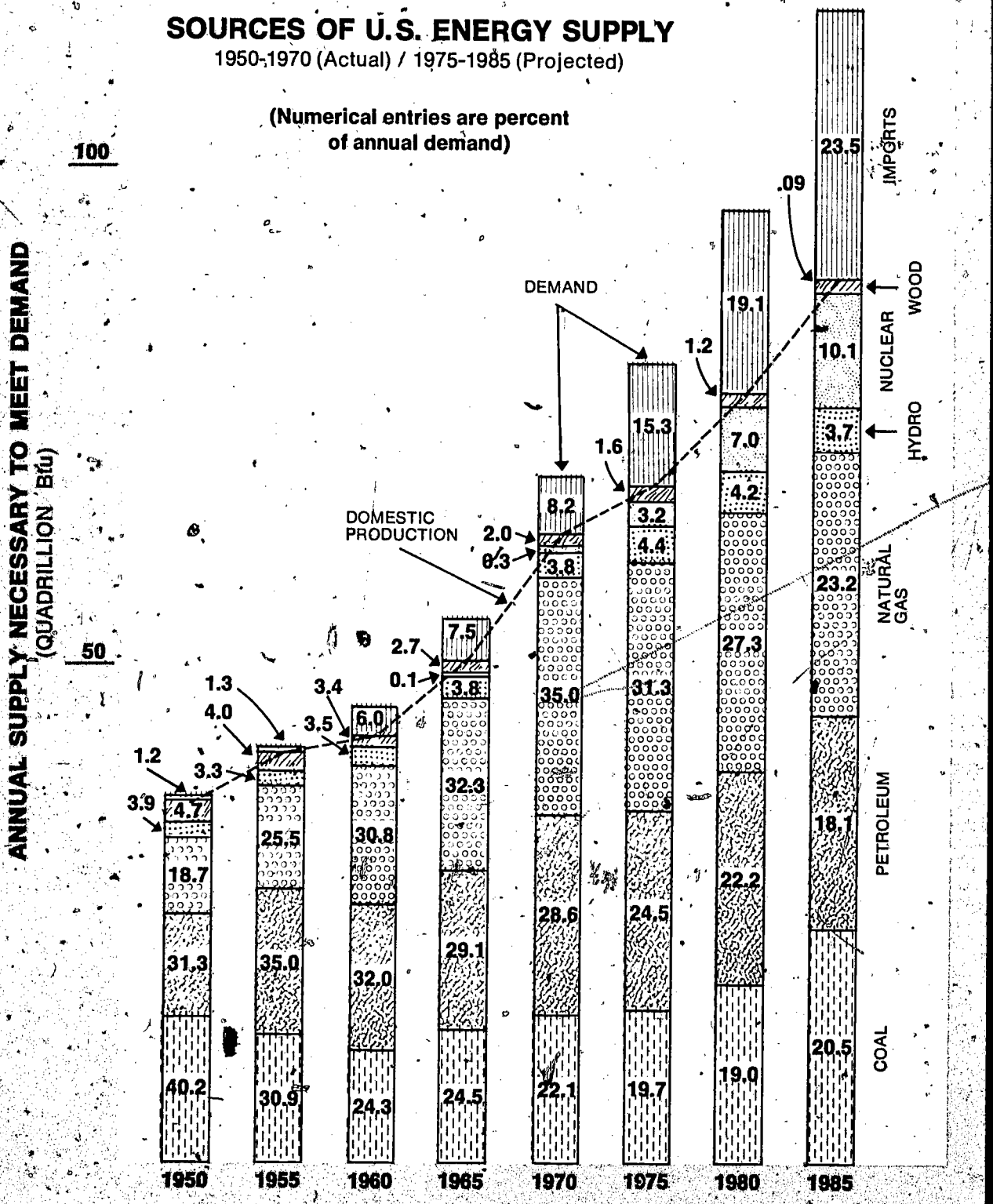
The above table clearly illustrates the fact that petroleum is the major fuel used to meet our energy needs, and it does so at a rate two and a half times more than coal, and one-third more than natural gas. This reflects how much we rely upon our highway vehicles, such as cars and trucks.

The graph on the next page shows the trend in our energy supply from 1950 through 1970, and projects the anticipated amount needed to meet demand through 1985.

From the line labeled "Demand" connecting the tops of each bar on the graph, it is clear that our use of energy has been constantly increasing and is

SOURCES OF U.S. ENERGY SUPPLY

1950-1970 (Actual) / 1975-1985 (Projected)



projected to do so in the future. In 1950 our total gross use of energy was 36.5 quadrillion Btu; by 1970 this had climbed to 69.1 quadrillion Btu, and the projected figure for 1985 is 116.0 quadrillion Btu.

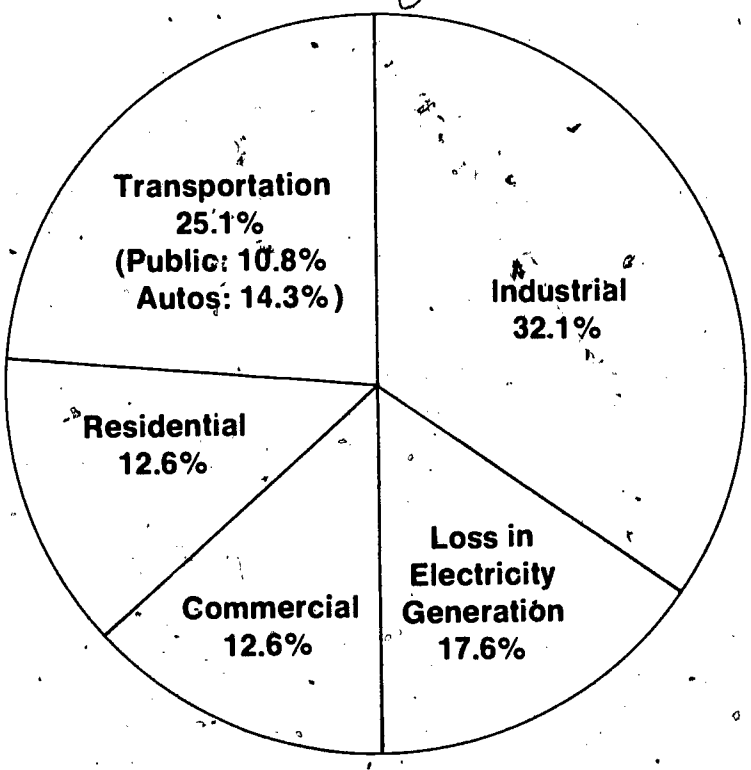
The line on the graph labeled "Domestic Production" shows what percent of our total demand is met by using our own resources; since 1950 that figure has been going down. In 1950 domestic production supplied 98.8 percent of our gross energy use, and in 1960 the total was 94.0 percent. The figure dropped to 91.8 percent in 1970, to 86.5 percent in mid-1973, and the projected amount for 1985 is 76.5 percent. We have made up the difference between the domestic production of our energy supply and our total demand for energy through importation of resources from outside the United States. We currently import 13.5 percent of our total needs, and this number is expected to reach 23.5 percent by 1985. The question of how much of our energy supply should be imported is an extremely difficult one to answer. The importation of large amounts of energy raises serious questions of balance of payments and dependence on foreign sources.

United States Energy Consumption

How is energy used in the United States? It is consumed in five main sectors of our economy:

- Industrial—the manufacturing of goods
- Transportation—automobiles and public transportation, which includes passenger traffic, airlines, freight, and farm vehicles
- Commercial—stores, retail establishments, hotels, schools
- Residential—homes
- Loss in the generation of electricity—the energy lost in producing electricity, i.e., waste heat.

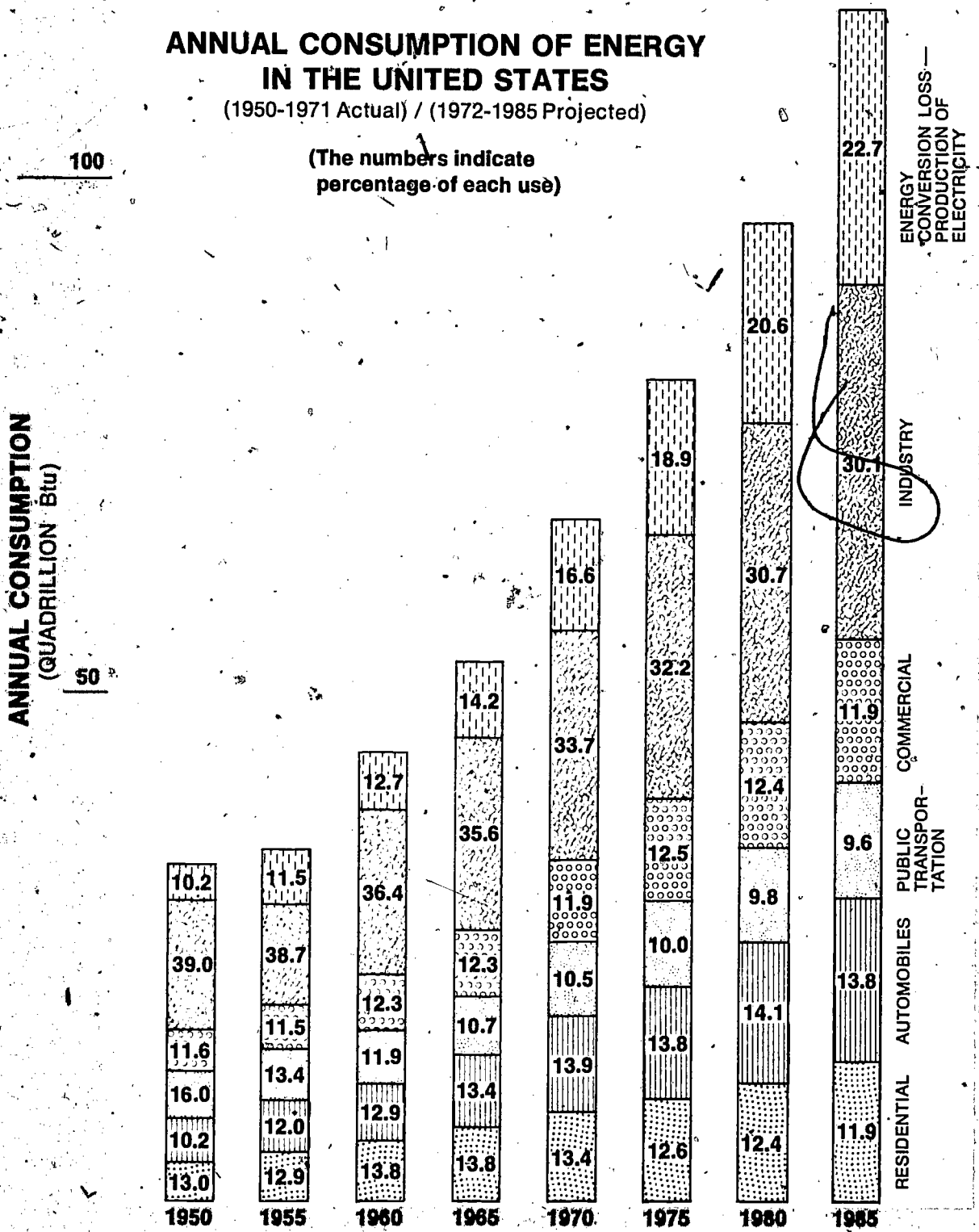
The percentage of the mid-1973 end use consumption of energy of each of these sectors was:



ANNUAL CONSUMPTION OF ENERGY IN THE UNITED STATES

(1950-1971 Actual) / (1972-1985 Projected)

(The numbers indicate percentage of each use)



The bar graph on page 12 illustrates the trends in end use consumption in these five sectors.

The overall percentage increase in energy consumption from 1950 until today has been 123 percent. The five sectors of consumption have increased from 1950 to mid-1973 by the following amounts:

- Industrial—*an 84 percent increase*
- Generation of electricity—*a 285 percent increase*
- Public transportation—*a 53 percent increase*
- Automobiles—*a 214 percent increase*
- Commercial—*a 141 percent increase*
- Residential—*a 116 percent increase*

Per Capita Consumption of Energy

Energy consumption in the United States has been steadily climbing, and projections indicate it will continue moving upward. This is very clearly shown when we look at per capita energy consumption—i.e., the total energy consumed each year divided by the number of people in the United States. In 1971 the per capita consumption of energy in the United States equalled 334.6 million Btu, or the equivalent of 2,677 gallons of gasoline.

The graph on the next page shows actual annual per capita consumption of gross energy for the period 1947-1971 and projections for 1972-1985. The slight dips and rises on the graph between 1947 and 1961 emphasize the correlation between per capita energy usage and the state of the economy. In times of prosperity, a wage earner expends more energy to earn more income and in turn has more money to spend on consumption of energy for his family's enjoyment.

Energy use, however, need not parallel the economic cycle. Although our standard of living may continue to rise, with the wise use of energy, most of our current "lifestyle" can still be maintained with little inconvenience, while at the same time a significant saving of energy can be made. If we can lower our current extravagant ways of spending our energy, the upward climb of the per capita curve would instead be more level.

The Price of Energy

The costs of various forms of energy are usually calculated in different ways, and this makes it difficult for the average consumer to assess the difference between one form and another. When the retail price of energy to the residential consumer is compared on the same basis, the costs are as follows:

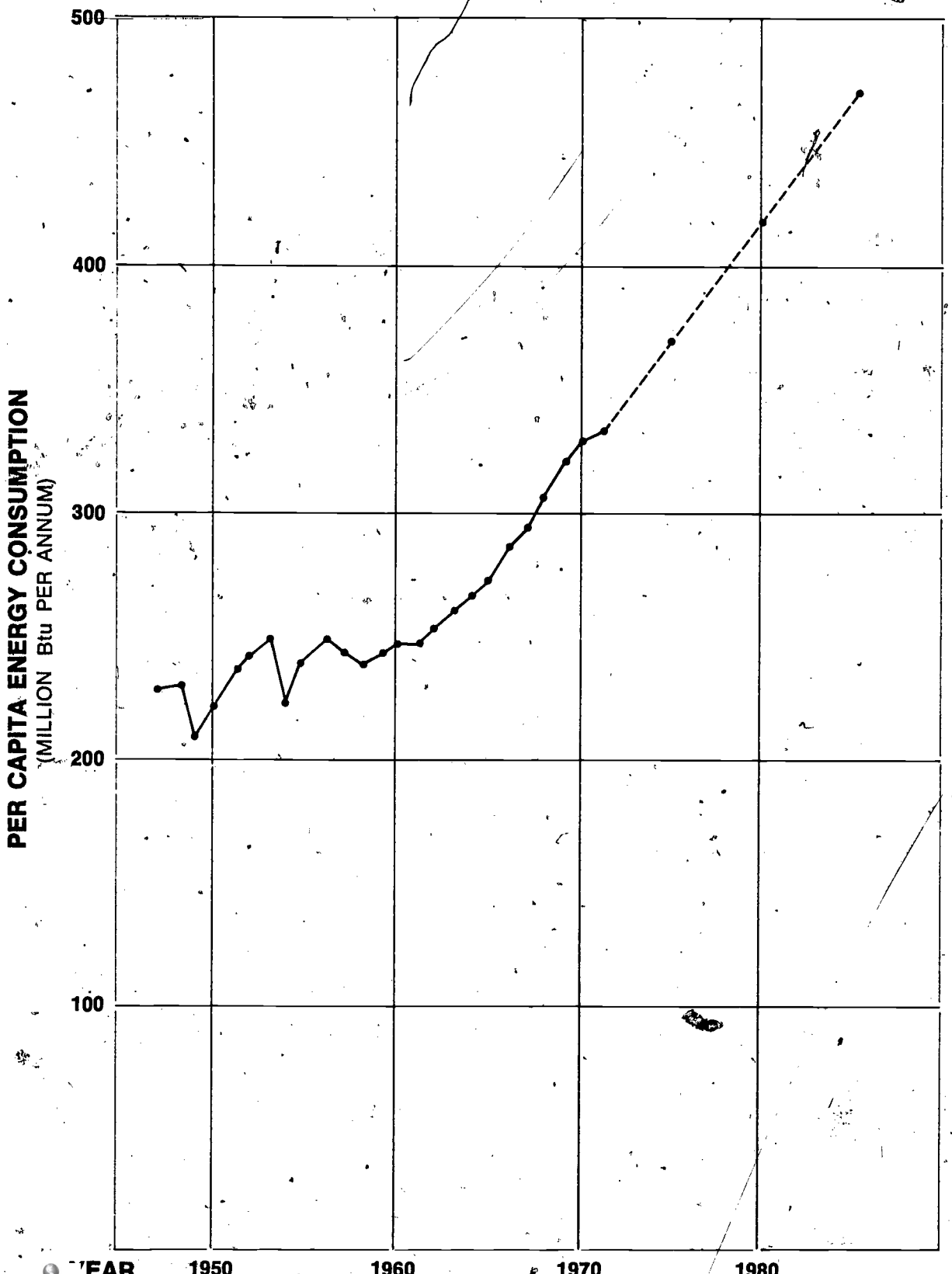
COMPARISON OF RETAIL PRICE TO RESIDENTIAL CONSUMER OF VARIOUS FORMS OF ENERGY*

Form of Energy	*Retail Price Per Million Btu's*
Natural Gas	$1.06
No. 2 Fuel Oil	1.55
Gasoline (regular)	3.02
Electricity	6.96

* National average, mid-1973. Includes all Federal, State, and local taxes.

UNITED STATES ANNUAL PER CAPITA GROSS ENERGY CONSUMPTION

1947-1971 (Actual) / 1972-1985 (Projected)



A Family Energy Budget

Other than when you pay the monthly utility bill or calculate your income tax, have you ever stopped to think what your total energy costs are? The figures and charts on the preceding pages show the energy budget for the Nation. Here is an annual energy budget for an average American family. It shows energy end use and the form of energy consumed by that use. It shows the amount of energy consumed in two ways: by the standard energy measurement, the Btu, and its equivalent in gallons of gasoline, so that it will be more meaningful to you. It will also show you that an average family spends about $743 a year for energy—about 7 percent of its average income.

ANNUAL HOUSEHOLD ENERGY BUDGET IN MID-1973

ENERGY END USE	FORM OF ENERGY	ENERGY PER YEAR		DOLLAR VALUE d) ($)	EQUIVALENT AMOUNT OF GASOLINE (Gallons)
		Percent	Million Btu		
Automobile	Gasoline	28.2	113.9	344.63	911
Space Heating	Natural Gas, Oil, & Electricity	27.8	112.1	165.69	897
Major Appliances	Electricity	2.7	11.0	76.20	88
Water Heating	Natural Gas, Oil, & Electricity	6.2	25.1	48.25	201
a) Air Conditioning	Electricity	1.6	6.6	45.78	53
Lighting & Other Electrical	Electricity	1.4	5.7	39.07	46
Cooking	Natural Gas, & Electricity	1.9	7.5	16.27	60
b) Miscellaneous Household & Recreation	Gasoline	0.6	2.5	7.57	20
Public Transportation (Inter-city; Non-Business Trips)	Jet Fuel, Diesel, & Electricity	1.7	6.8	—	54
(Intra-city Trips)	Diesel & Electricity	0.1	0.6	—	5
Waste Heat, Electricity Power Generation	Coal, Oil, Natural Gas, & Nuclear	21.8	87.9	c)	704
Refinery Loss In Gasoline Production	Petroleum	5.9	24.0	c)	192
Totals		100%	403.7 Million Btu	$743.46	3,231 gallons of gasoline

NOTES

a) For households so equipped.
b) Lawn Mowers, Boats, Motorcycles, etc.
c) Included in Price of Product.
d) Based on a weighted average of fuels supplying each item.

In terms of where a family spends the most money, the automobile is obviously in first place. Next comes space heating—what it costs to keep homes warm in winter. Space heating requires almost as much energy as the family automobile but costs a little less than half as much. Note the similarities in dollar cost between water heating and air conditioning, but there is a much greater energy cost for water heating. From these figures, then, we can conclude that the dollar cost of energy does not automatically reflect the intensity of its use. Finally, when you think about the difference between the automobile and public transportation, you will see why more public mass transportation is needed in the United States.

One other column of this budget shows what percentage of the total family energy use is for a particular purpose, such as air conditioning or cooking. On June 29, 1973, in a Statement on Energy, the President urged each individual to help meet a national goal of reducing personal energy use by 5 percent over the next 12 months. If we are going to meet that goal, we must start taking stock of how we can actually begin to do this.

Take a careful look at this budget, and compare it to your everyday energy budget. Then think about how you can personally cut back your activities to achieve that 5 percent goal. Finally, look again at the last column, and you will discover it will save some money in your own family budget.

CHAPTER 3

CONSERVING OUR TRANSPORTATION ENERGY

The United States is a country on the move. Slightly more than one-quarter of our energy is consumed by various modes of transportation: automobiles, trucks and buses, railroads, aircraft, agricultural vehicles, ships, and boats. Although transportation does not represent the largest single category of energy consumption, it is an extremely important one. Other sectors of our economy literally depend upon this network, and the rise in transportation energy consumption reflects this. Between 1950 and today, transportation's requirements from the energy market increased by 84 percent.

This growth does not mean we are also making more efficient use of the energy we consume for transportation. Just the opposite is true. This decrease in efficiency can be attributed to a shift to less energy-efficient transport modes, a decline in the energy efficiency of the individual transportation modes used, and an increase in traffic congestion.

Some studies have shown that it requires four times as much energy to get a person from his home to his office by car as by bus, nine times as much to move a passenger by plane as by high-speed train, four times as much to carry cargo by truck as by rail. Nonetheless, for a variety of reasons, ranging from convenience to speed and flexibility, our energy consumption in the transportation sector has increasingly reflected a dependence upon the least energy-efficient, most energy consumptive, and most expensive modes of travel. Highway vehicles—cars, trucks, buses—consume 75 percent of the transportation energy, and aircraft use approximately 10 percent. Almost all of the energy required by the transportation sector is gasoline or other petroleum products.

Transportation is one of the prime target areas for citizen action in energy conservation. Its increasing consumption growth rate obviously reflects consumer choice and lifestyle—particularly in the use of the automobile, which consumes more than half of the gasoline fuel used by all modes of travel. If even small changes were made by individual citizens in their transportation energy consumption habits, substantial savings in energy use could occur. These changes do not necessarily require alterations of our daily lifestyle. They can, however, reduce our total consumption of energy, be environmentally sound, and save you, the consumer, some money.

Here are some facts you ought to know, and some suggestions on what you can do about it.

The Automobile: America's Thirsty Machine

America is the land of the automobile. This country has only 5.7 percent of the world's population, but 46.1 percent of the world's cars. Right now, there are 97,650,000 privately owned registered passenger cars consuming 75.3 billion gallons of gasoline and traveling an estimated 1,005 billion miles a year. The figures also affirm something we know every time we refill our gasoline tank: The automobile is a very thirsty piece of technology. Of the total petroleum supply in

the United States, 29.3 percent goes to quench that thirst, which is 12.9 percent of our gross energy supply. Every year for each passenger car, the average amount of energy consumed is 772 gallons of gasoline, which averages out to 13.3 miles per gallon.

Other aspects of our commitment to the automobile also bear mentioning here. It takes a great deal of energy to manufacture one automobile—about 150 million Btu of energy. This is equivalent to 1,200 gallons of gasoline, enough to run a car for about 16,000 miles. We expend energy in the process of shipping cars from factories to showrooms, displaying them for sale, making replacement parts for repairs. One out of six jobs in the Nation is associated with the automobile business. About 2 gallons of gasoline are consumed in the process of making every 10 gallons pumped into an automobile's gas tank. The impact on land use of building highways and parking lots is tremendous. It has been estimated that we have paved over 21,000 square miles of this country's surface, most of it to accommodate the automobile. The automobile is also the largest contributor to our Nation's air pollution problem, and a very serious one, because most of its pollutants are emitted where people are—i.e., our large metropolitan areas. The estimated annual total energy cost of passenger cars in the United States—which includes fuel consumed directly, petroleum refining loss, automobile manufacturing, and retail sales and repairs—is 147.2 billion gallons of gasoline. Total automotive energy thus consumes 25.2 percent of gross United States energy.

We Misuse Our Transportation Energy

Leaving aside the great impact nationally which would occur if everyone seriously practiced conservation, stop and think about your own casual use of the automobile. There are numerous situations where better planning and awareness could really make a difference in energy savings and dollars. When you consider that the automobile uses the largest percentage of energy in an average American family's energy budget and almost half of the dollars, the impetus for savings is tremendous. Here are three examples of the way we use our cars too casually and why better planning can make it possible—and relatively easy—to change this pattern.

Organizing Car Pools

Eighty-two percent of working Americans commute to their jobs in automobiles; more than half of them drive alone. What would happen to a family's pocketbook if people who work or live near each other formed a car pool instead of driving by themselves? The chart on the next page will show you how a family could save $220 a year this way.

If everyone in the country formed a similar three-man car pool, there would be a national savings of 87.8 million individual automobile trips a year, equivalent to 11.2 billion gallons of gasoline costing more than $4 billion. This amount of gasoline represents 14.9 percent of our current gasoline consumption.

Better Scheduling of Family Trips by Automobile

Americans like to use their automobiles. In fact, 54 percent of all car trips in this country are less than five miles. Doesn't that seem unnecessary when frequently

we could use public transportation, a bicycle, or walk? Interestingly enough, traveling on family business—going to the doctor or dentist or going shopping—accounts for 31.4 percent of all passenger car trips and averages 5.5 miles one way.

What would happen if each family took one less trip a week—e.g. seven instead of eight—by planning ahead to combine the errands and appointments so that the car did not have to be used that one time? An average family would save $74 a year. This may not be impressive enough on a family scale to some, but if every family did this, we would save nationwide:

- 38 billion miles of driving.
- 2.9 billion gallons of gasoline. That is enough fuel for 13 million one-way car trips per year from New York to San Francisco—a distance of 3,025 miles.
- $1.1 billion.

AVERAGE DOLLAR SAVINGS PER FAMILY FROM CAR POOLING TO WORK*

	Existing Habits	*Using Three-Man Car Pool*	*Average Savings Per Family*
Average Occupants/Trip	1.4	2.8	—
Average Car Trips/Year	360	180	180 trips
Average Car Miles Traveled/Year	3384 miles	1692	1692 miles
Gas Used (@ 13.3 miles/gallon	254 gallons	127	127 gallons
Gas Costs (@ 37.8¢/gallon)	$96	$48	$48/year
Other costs of Operation (@ 10.16¢/mile)	$344	$172	$172/year
Total Savings Per Family	—	—	$220/year

* Assumes a car pool of three people; allows for average absences of each person 17 days a year.

Buying a Smaller Car

Americans are buying more cars than ever this year, and most of them are large, heavy, and complete with extra electrical features which eat up more energy. Only about one-fifth of the cars sold in this country today can be classified in the small or compact range.

Most car buyers do not consider the energy consumption rate of the new machines they purchase. It would be worth something if more buyers did, because larger cars consume more fuel than smaller ones in direct proportion to their weight. This size factor translates itself into a bigger budget for fueling the family car. Very often, people do not stop to think that they may be buying a larger car than they really need, given the potential use to which it will be put.

Assuming that each average household drives 12,150 miles a year, the gasoline savings from operating a "compact" car rather than a "medium" sized car will be $132.00.

DOLLAR SAVINGS PER HOUSEHOLD FROM OPERATING A COMPACT CAR 12,150 MILES PER YEAR[a]

	Medium Car	*Compact Car*	*Savings*
Weight (lbs)	3500	2500	—
Miles Per Gallon	13.5	19.5	6.0
Gallons Per Year	900	623	277
Dollars Spent Per Year[b]	$367	$235	$132

a) Excludes other operating costs which also will be less for compact car than medium sized car, thereby increasing savings.

b) Assumes medium sized car requires premium gasoline which costs 3¢ more per gallon than regular.

If you buy a smaller car complete with accessories, such as air conditioning and automatic transmission, don't delude yourself that you are going to cut down greatly on your fuel consumption. These "extras" require much energy to operate and you will not get the same advantage of increased miles per gallon in your gas tank through buying a smaller car if you have them. A study by the Environmental Protection Agency showed that an automobile's fuel economy loss from air conditioning averages about 9 percent; it can go as high as 20 percent in city traffic on a very warm day. The automatic transmission can bring about a fuel loss of about 6 percent.

Anti-Pollution Controls on Automobiles

Air pollution is a major problem in this country, and the emissions from automobiles are one of its greatest causes. Part of our national effort to curb air pollution is to require certain emission control devices on cars. As in any solution to major problems, there is a trade-off involved here—these devices will cause a reduction in gasoline mileage per car, thereby costing us more energy. Buying smaller cars is one solution to insuring better fuel economy; decreasing the weights of new model cars is another. A June 13, 1973 speech by Chairman Russell Train of the Council on Environmental Quality put this issue in some perspective.

" . . . a spate of advertising has tried to convince the public that auto emission standards are the cause of major reductions in gasoline mileage. However, according to a study conducted by the Environmental Protection Agency, greater weight, automatic transmissions, and air conditioners are more important causes of increased fuel consumption than pollution controls. . . . EPA's engineers attribute much of the decrease in gas mileage to increases in vehicle weight. Their investigation found that over the years, new vehicles having the same model designation have become heavier. . . . And as the weight of the car has gone up, its gas efficiency has dropped. . . . The plain fact is that we need to both reduce automobile emissions and improve automobile fuel economy."

We Can Make Better Use of the Automobile

Most people do not think about national energy savings when they operate their cars. This is a perfectly understandable phenomenon. Drivers of automobiles are

conscious of speed, safety, and good operation of their cars when they are out on the highway. If the speed limit allows them to drive at 70 mph, usually they will use this maximum allowable in order to get where they are going. Why shouldn't I do this, a person would ask?

The answer is that slowing down on the highways can help save gasoline, alleviate energy shortages, and promote safety. In his Statement of June 29, 1973, the President asked highway drivers voluntarily to slow down—and save fuel. By reducing speed from 70 mph to 50 mph, individual cars use about 25 percent less gasoline per mile. There is a potential fuel savings of up to 2 percent nationwide by reducing speed 10 mph on the highways.

How you drive your car can also affect the amount of gasoline you use. There are no signs posted on city streets telling you not to idle your engine longer than three minutes or to avoid excessive braking and too rapid stops and starts. All of these things cost money in your family budget. If you periodically get your car engine tuned up, you will get better gasoline mileage for your car. Better maintenance is an absolute essential for saving wear and tear on your automobile, reducing the amount of gas you consume, and ultimately saving you money. Each new car comes equipped with an operating manual which contains suggestions from the manufacturer on periodic maintenance.

Cars Are Not Always the Best Way to Travel

As this booklet has pointed out, the automobile is not the most energy-efficient means of traveling, although for many people it is the most convenient. Our fixation on the car has led to neglect of other convenient, energy-efficient and sensible modes of transportation which are environmentally preferable. Of the total amount of energy consumed in the transportation sector, automobiles use 14.3 percent; public transportation—which includes ground passenger traffic, airlines, freight, and farm vehicles—uses 10.8 percent.

Bicycles are 28 times as energy-efficient as cars, walking 17 times, buses almost 4 times, and railroads 2.5 times. Only airplanes are less energy-efficient than automobiles.

COMPARISON OF ENERGY EFFICIENCY OF TRANSPORTATION MODES

Mode	*Energy (Btu/Passenger-mile)*	*Mode*	*Energy (Btu/Passenger-mile)*
Intercity		*Urban*	
Bus	1,600	Bicycle	200
Railroad	2,900	Walking	300
Automobile	3,400	Mass Transit	3,800
Airplane	8,400	Automobile	8,100

It would obviously be very desirable for people to get out of their own private automobiles and onto public transit and bicycles and to use their feet, particularly in cities where congestion is greatest. Bicycling and walking also provide health benefits. Contrary to the dire predictions of some, this will not

mean a drastic change in basic lifestyles. All it takes is for each person to stop and think before jumping into the car: Isn't there another equally efficient way of getting to and from my destination? The car is just not that convenient to use every time we travel.

Bicycles deserve special mention here. They are a prime example of how an environmentally sound, economical, and energy-efficient mode of transportation has become a significant part of the way we travel. In 1972, 13 million bicycles were sold—more than the total number of cars in the same period. About 50 percent of all sales are among adults, as compared to 10 percent a few years ago. The bicycle is fun, healthy, convenient, and useful. But it has yet to be considered an integral part of our transportation network, particularly for the growing number of commuters who get to work by bicycle. This is an area where more positive public policy actions clearly need to be undertaken, if the obvious consumer choice for the use of the bicycle is to be assisted. We need more trails and paths, traffic lanes, safety regulations, and all of the myriad transportation planning aids which other forms of travel enjoy. Bicyclists have rights, responsibilities, and needs, just as users of the car, bus, train, truck, and airplane do.

INDIVIDUAL CITIZEN ACTION CHECKLIST FOR TRANSPORTATION

Now you have the facts about transportation and energy consumption. Here is a checklist of things you can do about the problem.

HOW TO USE TRANSPORTATION

_____ **Don't always rely on the automobile**
Walk, take a bus, ride a bicycle when you can. Vacation trips do not have to revolve around the car. Consider other ways of traveling.

_____ **Plan to use public transportation**
Check the schedules and routings; call your local company if the current routes do not meet your needs. Make the building of better public transportation systems a priority in your community.

_____ **Try to make one less car trip a week**
Plan your shopping and medical appointments together, if possible. Consciously think: Do I have to use the car for this trip?

_____ **Organize car pools**
It might be at least as convenient to travel with others to work, school, or shopping.

HOW TO SAVE AUTOMOBILE ENERGY

_____ **Reduce speed on highways when possible**

_____ **Drive smoothly, avoid excess braking, slow down if possible before stepping on the brakes**

_____ **Don't idle your engine unnecessarily**

It should not run longer than 3 minutes while you're waiting. In cold weather, drive slowly for the first quarter-mile instead of idling. Racing the engine also wastes gasoline.

_____ **Keep your car maintained in good condition**

Have the automobile periodically checked for repairs and upkeep, and keep the engine cleaned and properly tuned. You'll save on gasoline this way.

_____ **Keep your tires properly inflated**

This helps gasoline mileage. Radial tires also help conserve gasoline.

_____ **Encourage proper filling of your gasoline tank**

Don't let service station attendants overfill your tank so that gasoline is wasted. This is an appreciable source of air pollution.

_____ **Use car air conditioners wisely**

Think about how necessary it is to turn it on before you flip that switch. If possible, don't use it. When you do, set the temperature at the warmest level that is still comfortable.

_____ **Use low or no-lead gas, if possible**

Find out from a mechanic or your salesman if your car can use it before buying. Find out what octane rating your car needs and don't buy a higher one. Gas stations now post this rating on pumps.

THINGS TO THINK ABOUT WHEN PURCHASING A NEW CAR

_____ **Horsepower**

How will the car be used? Does it have more horsepower than you need?

_____ **Size**

Will a small or medium sized car meet your needs as well as the larger models?

_____ **Fuel economy**

What fuel economy measures are involved in this purchase? Does the car waste gas? Will you waste gasoline unnecessarily by using it?

_____ **Optional accessories**

How many of the optional electrical features do you really need or will you use enough to justify their purchase?

* If you are interested in obtaining a separate reprint package of all the action checklists in this booklet for reproducing and distributing, write to the Citizens' Advisory Committee on Environmental Quality, 1700 Pennsylvania Avenue, N.W., Washington, D.C. 20006.

CHAPTER 4

ENERGY CONSERVATION IN OUR HOMES AND OFFICES

Residential and commercial use of energy accounts for 25.2 percent of total consumption of our gross energy supply, 12.6 percent in our homes, and 12.6 percent in the commercial sector (primarily stores, office buildings, and hotels). These two aspects of energy end use are grouped together for discussion in this booklet because many of the same energy conservation measures apply to both.

As might be expected, energy consumption in both the residential and commercial sectors has steadily increased as a percentage of the overall national picture. Along with the rise in population, standard of living, and overall economic growth, we have witnessed an increase in the construction of individual homes and service industries. At the same time there has been an increase in the number of energy consuming devices—such as air conditioning and electrical appliances—which are used in each sector, and there is little doubt that this trend will continue. We Americans like our convenient, easy-to-use electrical hardware, and more and more people are buying a growing variety all the time. Many of the things which used to be called "luxuries" are now considered "necessities." Consider the fact that only 10 years ago, only 19 percent of the families living in homes wired for electricity had room air conditioners; the figure is 47 percent today. Almost half of the country's families have electric can openers; 11 percent had them a decade ago. From 1964 until today, the number of homes with color television sets rose from 5 percent to 61 percent.

A national program of energy conservation, it should be pointed out, cannot rest heavily on a huge cutback in the use of items such as the electric can opener. Although their overuse is a symbol of our wasteful society, most studies have shown that while a reduction in the use of these small appliances would have a salutary effect, by and large we must concentrate our efforts on the larger energy drainers in our homes and offices, such as space heating, water heating, refrigeration, and cooking. The issue, then, becomes largely one of containment. We know that consumption is bound to keep on rising in these two sectors; the question is how to keep a realistic check on this anticipated growth.

Residential Use of Energy

More than half of the cost of an average family's energy budget is spent on home uses, about 43 percent of the total energy consumed. As this booklet will point out, lowering both the dollar and energy costs can be done quite easily. This is also true for conservation in the office.

The most important thing to remember is that if you consider the "life cycle" cost of the products you buy and the house you build or remodel, you will save energy and money. Don't think only about the initial or "first costs" of your purchases; consider what it will cost you to operate them over a period of time. Buying an energy-efficient air conditioner or installing additional insulation

In a new home might be comparatively more expensive today, but you'll save more on your electricity bills tomorrow.

Home Space Heating

Heating a home is the largest expense after the automobile in a family's dollar and energy budget. It totals over one-quarter of the energy consumed by the family. Obviously, home heating systems are necessary to protect people's health and provide comfort, but many practices associated with space heating are wasteful and could be adjusted without too much difficulty.

You may also not be aware of how much energy is actually wasted in the process of heating your home. This waste of energy becomes a waste of money for you if you are unnecessarily paying for fuel you do not need to buy. Waste in home space heating can generally be attributed to one or more of the following factors: personal habits, lack of proper insulation, and need for better maintenance.

Waste in Personal Habits Costs Money

If you stop and think about it, many of our daily personal habits cause us to spend money unnecessarily. Small changes in our daily life will mean that winter heating fuel bills can be reduced quite easily. Have you ever thought about setting your thermostat a few degrees lower? It probably will not cause you any undue discomfort or lessen your protection against the cold. The most you might have to do is wear heavier clothing around the house. And those few degrees can save you—and the country—a significant amount of fuel. This will happen because the heating load in a home is directly related to how great a temperature difference there is between indoors and outdoors, and the smaller that difference, the higher the savings.

Some examples of savings from re-setting the thermostat, depending on the type of heating system installed are:

- An average family living in a *mild climate* (such as Atlanta, Georgia) will save $12 a year on the gas bill, $18 on the oil bill, or $41 a year on the electric bill merely by setting back the thermostat at night from 75°F to 67½°F.
- If a family in a *moderate climate* (such as the New York City area) sets the thermostat back during the night from 75°F to 67½°F, and during the day from 75°F to 70°F, this will mean a savings of $38 in gas, $55 in oil, or $110 in electricity.
- A family in a *cold climate* (such as Minneapolis-St. Paul, Minnesota) making similar day and night thermostat changes, can save $42 on gas, $62 on oil, or $131 on electricity a year.

The table on page 28 will show more of these savings in detail.

It also should go without saying that if you lower that thermostat when you are away on vacations and weekends, this will also save energy—and your budget. Also, don't constantly change the dial. It costs more energy and money to do so.

Another no-cost item is closing your window draperies and shades at night. The closed drapery helps average the temperature on two sides, thus re-

ducing the heat loss from the house. Conversely, keep the draperies open during the day so as to let the sun—solar heat—help warm the room. Draperies and shades should also be kept closed in unoccupied rooms. If you have an extra room no one uses, close it off and shut off the heat there. You don't need to use your heating system to supply an empty room, do you?

If you're careful about open doors and windows, you'll save energy and money. As cold air rushes into your home because you are idling at the front door talking to your neighbor, the thermostat will be activated unnecessarily. The same thing will happen if you open the bedroom window before you go to sleep and keep the bedroom door open. If you normally don't open certain windows, keep them latched so constant air leakage through the cracks can be prevented.

Air leakage, commonly known as drafts, is caused by warm air leaking from a building and being replaced by cold air, which then must be heated. One estimate given is that for many houses 35 percent of the heating energy has to be used to warm the cold air which enters this way. You can stop this by closing and tightly sealing openings in your house from the indoors to the outdoors. Make an inspection of cracks around windows and doors, attic stairway doors, fireplace dampers not being used, electric light fixtures, the area around plumbing vents, or pipes. It is particularly important to pay attention to excess air leakage through attic stairway doors or openings. This will prevent an excess flow of moisture which might condense; be sure the ventilation openings are not overtaxed when there is no wind so that proper ventilation can be maintained. You can also save money this way.

It has been estimated that a mere ¼-inch crack 3 feet wide under an attic door would cost $5.00 a winter in fuel. You could put a scrap of carpeting over that crack and stop the leak without any cost.

Proper Insulation

If you contemplate making any changes to your current home, or buying a new one, think about the possibility of adding more insulation. Too much energy is unnecessarily wasted because homes are not properly constructed to minimize heat loss. Admittedly, if you are building a new home or adding on to your present one, you will have a better opportunity to control the thermal efficiency of the structure. This is one area where the problem of considering "first costs" only instead of operating costs comes into the picture. Although it might cost more money initially to put more and better insulating devices in, you will most likely save money as you live there.

If you're buying an already finished home, it would be wise to check that its insulation meets or exceeds the Minimum Property Standards (MPS) promulgated by the Federal Housing Administration. Remember that the climate you live in will affect how much insulation you properly need. You can check your current wall and ceiling insulation against the following chart.

HEATING SYSTEM	Ceilings (inches)		Walls (inches)	
	Moderate Climate	*Severe Climate*	*Moderate Climate*	*Severe Climate*
Gas Heat	3½"	6"	3½"	3½"
Electrical Heat	6"	9"	3½"	3½"

Protective insulation to prevent heat loss can also be obtained through the installation of weatherstripping around doors and caulking or sealing the frames of windows or doors. This will effectively seal out cold air from your home and halt the loss of warm air. This type of unchecked air leakage increases your family's heating bill about 15-30 percent and unnecessarily causes energy waste. If storm windows or insulating glass are installed, half of the heat loss through windows will be cut and more personal comfort provided. Heating bills will also be reduced.

Better Maintenance and Equipment

How well the heating plant operates is a very important consideration in the amount of fuel used in any home. If you keep the equipment well maintained and cleaned, there is a potential energy savings of 10 percent or more to be realized from your heating device. If your heating system has air filters, they should be cleaned or replaced when dust or lint collect. Remember that few products can last a lifetime. As technology improves the operating efficiency of home heating systems and yours begins to wear out, consider buying a new one. The difference in fuel energy may be significant for your pocketbook when you compare the older inefficient system to the new one.

You may have heard about the "heat pump" as a new form of electric space heating and cooling. The heat pump has been called an "air conditioner in reverse" and is a fuel savings device in that it delivers about two units of heat energy for each unit of electrical energy which it consumes. The heat pump can most practically and not too expensively be installed in a new home at the same time as central air conditioning is being put in. It is most appropriate in a milder climate. You should check on the potential maintenance costs of such a system before you purchase it; new developments in component reliability are being produced constantly.

If you have a leaking hot water faucet, repair it quickly. It's hard to believe, but a leak which can fill an ordinary 4-ounce cup in 10 minutes can waste 1,642 gallons of heated water a year.

The table on the next page will show you the dollar savings you will realize by practicing some of these energy conservation measures in home space heating.

Home Space Cooling

As is the case with home space heating, there is a definite need to improve our conservation practices in order to stop the waste of energy in home space cooling. With home heating, we face the possibility of not enough fuel being supplied during cold weather, which sometimes can be anticipated and planned for. But the problem of energy loss for cooling in the summer carries with it the added characteristic of a time bomb. Excessive use of cooling devices during very hot weather can overload the electrical power system to such an extent that within a very short time, things just cannot work, and there is no way to get more power into the system. This over-use of the system comes just at the time when people need it most. Thus, if everyone can begin to practice individual conservation, the risk of a system overload will be reduced and the possibility of brownouts and blackouts lessened considerably.

HOME HEATING

Some estimated savings from energy conservation measures[a)]

CONSERVATION MEASURE	MILD CLIMATE Example: Atlanta, Georgia (2600 DEGREE DAYS)				MODERATE CLIMATE Example: New York City Area (4900 DEGREE DAYS)				COLD CLIMATE Example: Minneapolis-St. Paul, Minnesota (8000 DEGREE DAYS)			
	ENERGY SAVED (Million Btu)	ANNUAL DOLLARS SAVED ON FUEL -GAS	OIL	ELEC-TRICITY	ENERGY SAVED (Million Btu)	ANNUAL DOLLARS SAVED ON FUEL GAS	OIL	ELEC-TRICITY	ENERGY SAVED (Million Btu)	ANNUAL DOLLARS SAVED ON FUEL GAS	OIL	ELEC-TRICITY
CHANGE OF HABITS												
Set back thermostat at night 75°F. to 67½ °F.	12	$12	$18	$41	14	$15	$21	$42	15	$16	$24	$51
Set back thermostat during day 75° to 70°F. and at night 75°F. to 67½ °F.	31	33	48	110	36	38	55	110	40	42	62	131
SMALL INVESTMENT												
Weatherstrip doors and windows.	7	7	10	(see note b)	10	11	16	(see note b)	12	12	18	(see note b)
Add storm doors and windows.	13	21	21	45	24	34	37	81	37	48	58	126
LARGER INVESTMENT OR NEW CONSTRUCTION												
Insulate ceiling—6 inch glass fiber.	7	12	12	25	13	19	20	45	20	26	32	69
Insulate walls—3½ inch glass fiber.	11	17	17	37	19	28	30	65	30	39	47	102
Insulate floor—foil with air gap.	17	11	27	24	15	21	23	49	23	29	35	77

NOTES: a. These are examples which would apply to a "nominal" house of 1500-1800 sq. ft. Annual savings are listed and are not necessarily additive. Dollar savings were estimated on the basis of typical blocked rate structures for gas and electricity. Savings listed are fuel bill savings only and do not take account of investment costs. Some of the measures listed do not pay for themselves in mild climate with gas heat.

b. The electrically heated home is assumed to be weatherstripped and better insulated when constructed.

The Air Conditioner: A Growing Fixture on the American Scene

The air conditioner has become a permanent fixture in almost a majority of American homes, and more and more people are buying them every year. More than 6 million units were sold in 1970. The amount of primary energy devoted to residential air conditioning increased at an average growth rate of 15.5 percent per year between 1960 and 1968, and much of the increase in total electrical residential consumption between 1960 and 1970 is due to this. An estimated 30 percent of the national use of electricity in the summer months consists of air conditioning for homes and apartments. The size and variety of home air conditioning equipment vary greatly, ranging from a manually controlled window unit to a complex system which will give independent temperature and humidity control to every room in the house.

One of the most important differences among the many models of air conditioners on the market today is that some are more energy-efficient than others. It would be wise—not only from an energy conservation standpoint but from a monetary one—for consumers to start making choices based on the efficiency criterion. While providing the same amount of cooling, the less efficient machine can consume 2.6 times as much electricity used as the most efficient one. When you are purchasing a machine, you can figure out the efficiency ratio fairly easily from the basic numbers that are usually on the back of the machine. They will tell you the number of Btu's per hour (i.e., cooling accomplished) and the number of watts needed to operate it. The efficiency ratio is obtained by dividing the Btu's by the watts. If the label does not contain this information, ask the salesman for it.

The results will be efficiency ratios ranging from 5 to 10 for smaller units, and up to 12 for larger units. The higher the number, the more efficient the machine. A machine that is more efficient will consume less energy and thus cost you less to operate. This could well offset any additional cost of the initial purchase if the more energy-efficient one is more expensive.

In addition to efficiency, you should very carefully consider how large a unit you really need, i.e. how much cooling capacity is required. If the one you purchase is too large or too small, it will need more energy and often will not work as well as one matched to your needs. Too large a unit not only draws excess power but doesn't cool properly. It should go without saying that a room which is not used every much or is closed off does not need an air conditioner running in it.

As with most equipment, good maintenance is a must. The system should be kept clean and working well, and particular attention should be given to using clean filters if you want it to work at maximum efficiency. The manufacturers manual will give information on lubrication.

If your home has central air conditioning, check the ducts for leakage or blockage. A minimum of 1½ inches of insulation is recommended.

Personal Actions to Conserve Cooling Energy

Purchasing the right air conditioner is only one way to conserve cooling energy. As with winter heating, there are many things which can be done at little or no cost to reduce energy waste. Consider the energy that could be saved if unnecessary cooling was curtailed in places which people occupy only a short time,

such as entrances, halls, and storerooms. Too often, thermostats are set lower than needed for comfort. Increased insulation along the lines discussed above for heating will also keep out the hot air in summertime, thus reducing the need for more cooling power.

For some reason, the advent of air conditioning has made people forget about opening windows. Very often, it is not too oppressive outside, and the fresh air can cool off the house adequately. Of course, many buildings—particularly office buildings and some new homes—are built with windows that cannot open. Given the cycle of high temperatures only a few months of the year in many areas of the country, this is a wasteful practice that should be discouraged.

Attention should also be given to shading windows, especially from direct sunlight. The daytime heat gain through windows, which can represent about 15-30 percent of the exterior wall area of a house, thus puts a large burden on the air conditioning unit. This heating can be reduced by as much as 50 percent through using blinds and draperies, particularly if they are light in color and opaque. Special heat-absorbing or reflecting window glass, and outside shading devices, such as awnings, will reduce solar heat appreciatively. Consider planting a tree near a window if you can. The proper use of an attic fan for ventilation and a tightly closed fireplace damper (to keep air out, both in summer and winter) should not be forgotten. Why not think about wearing informal and lightweight clothing around the house and to work? It's part of the "new energy" style of living.

The next section of this booklet deals with conserving energy used by our household appliances, but a short word is in order at this point about the relationship of those appliances to summer cooling. In the summertime, if more people stopped to think about when they used their major appliances—such as clothes dryers and washing machines—the threat of a power shortage would be diminished. The greatest demand for electricity is during the daytime hours, when commercial and industrial establishments are operating at full swing and people have their air conditioners turned on to ward off the daytime heat. If you can arrange it, wash and dry clothes and vacuum at night—it will reduce the pressure on the power system. Also, if fewer electric lights and appliances are used, less excess heat will be generated, thus reducing the cooling load in your home.

Home Appliances

Americans are very proud of the many electrical appliances in their homes. These devices make life easier. They save us from a lot of hard work and provide comfort and enjoyment. Most often we are willing to spend a considerable sum of money to purchase them, no doubt because we feel that it's worth the cost to let the machines do our work for us. Increased earnings and a rise in an individual's standard of living inevitably mean more dishwashers, televisions, electric toothbrushes, and electric frying pans.

Take a look around your house. How many appliances are there? Do some of them duplicate each other unnecessarily? Do you leave a radio on in a room for a long time when you're out of it? How often do you use that dishwasher just for a few plates and saucers? Stop and think what that means if everyone in your neighborhood did the same thing. What about your city or the entire State? Then

try and imagine how much of an unnecessary drain that can be on the national use of energy.

The message of this booklet is not that you should forego those purchases if you want and need them. But if you use them wisely, you will save energy. You will also lower your electric and gas bill. Major appliances alone are the third most expensive item in an average family's energy budget.

Check the master list on the next page of 29 appliances commonly found in the American home. The list will show you that the total dollar cost for running all of them a year is $281.72. Together, their use consumes 11,938 kilowatt-hours of electricity.

As you can see, the largest consumer of energy and dollars is the air conditioner, closely followed by light bulbs. Other large energy eaters are the range, clothes dryer, and food freezer. Note the difference in cost between the black and white and color television. You'll be interested to know that solid state sets for both black and white and color consume less energy than filament (tube) sets. If you have an instant-on model and if you leave it plugged in, it's consuming anywhere from 5 to 40 watts all day long, even when it's turned off. (It will pay to unplug the television when you're not using it.)

Here are some more facts about some of the appliances we use a great deal. If you make wise purchases—once again, according to your real needs, potential use, and cost of operating—you'll save money.

Refrigerators

Take a look at the following table which compares the energy and dollar costs of various types of refrigerators and freezers.

COMPARISON OF STANDARD AND FROST-FREE REFRIGERATORS

Type of Refrigerator	*Annual Energy Consumption (Kwh)*	*Annual Cost of Energy Consumed*
Refrigerator (12 cu. ft.)	580	$13.69
Refrigerator, Frost-free (12 cu. ft.)	750	$17.70
Refrigerator-Freezer (14 cu. ft.)	950	$24.42
Refrigerator-Freezer, Frost-free (14 cu. ft.)	1500	$35.40
Refrigerator-Freezer, Frost-free (17 cu. ft.)	2100	$49.56

As you can see, frost-free refrigerators consume 50 percent more energy and dollars to operate than the standard model. The side-by-side refrigerator/freezer models use up to 45 percent more energy than the conventional models.

This table also points up the fact that the freezer frost-free accessory costs more to operate too. It's best to consider thoroughly whether your potential

ENERGY CONSUMPTION BY HOME APPLIANCES AND LIGHTING

	Annual Energy Consumption (kilowatt-hours)	*Annual Cost of Energy Consumed**
Air Conditioner	2000	$ 47.20
Electric Blanket	150	3.54
Can Opener	0.3	.01
Clock	17	.40
Clothes Dryer	1200	28.32
Coffee Maker	100	2.36
Dishwasher (with heater)	350	8.26
Fan (Attic)	270	6.37
Fan (Furnace)	480	11.33
Fluorescent Light (3 fix)	260	6.14
Food Freezer (16 cu. ft.)	1200	28.32
Food Mixer	10	.24
Food Waste Disposer	30	.71
Frying Pan	240	5.66
Hair Dryer	15	.35
Hot Plate (2 burner)	100	2.36
Iron (hand)	150	3.54
Light Bulbs	1870	44.13
Radio (solid state)	20	.47
Radio Phonograph (solid state)	40	.94
Range	1550	36.58
Refrigerator (frost-free) (12 cu. ft.)	750	17.70
Sewing Machine	10	.24
Shaver	0.6	.01
Television (black/white)	400	9.44
Television (color)	540	12.74
Toaster	40	.94
Vacuum Cleaner	45	1.06
Washer (automatic)	100	2.36
Totals	11,938 Kwh	$281.72

* Cost of electricity = 2.36 cents per kilowatt-hour

use will justify its purchase. If you're buying a model complete with crushed ice dispenser and cold water tap, you'll be adding large extra operating costs.

Finally, a word of caution on refrigerator insulation. Some models presently on the market are rated as having more cubic feet inside than old models yet have the same outside dimensions. It appears that the only way to accomplish this is to make the walls of the refrigerator thinner—and this means a lot more energy for operation. In one model now on the market, the walls are so poorly insulated that heavy water condensation would occur on the outside walls. The remedy for this was the installation of electric heating coils in the walls, which causes an enormous increase in energy usage. Therefore, you obviously should make certain there is ample insulation in the walls when you are shopping for a refrigerator.

Water Heating

After space heating, water heating is the largest energy user in the home, and it is more expensive to operate than the air conditioner. The water heater is what feeds the washing machine and dishwasher. Washing dishes by hand under hot running water wastes energy and raises your fuel bill. Be sure the thermostat on your water heater is not set too high. If the hot water faucet is dripping, fix it quickly.

Cooking

You should be aware of the fact that "self-cleaning" ovens use approximately 21 percent more energy. If you have one, use that feature sparingly.

Clothes Dryers

How many times have you run the clothes dryer only half or one third full? The small table below will graphically show you how much an average family can save by eliminating a few of those half-empty dryers.

COSTS OF OPERATING ELECTRICAL CLOTHES DRYERS

Usage: Number of Loads per week	*Energy Consumed Per Year (Kwh)*	*Annual Cost of Energy**
1	260	$ 6.14
2	520	12.27
3	780	18.41
5	1300	30.68
10	2600	61.36

* Cost per load: 11.8 cents; based on a 5,000-watt dryer

Lighting

As the list of appliances on page 32 points out, a great deal of the average family's electrical bill is due to use of lights in the home. Much of this could be cut

down with some conscious effort. If you are not using a room, why leave the light on there? If utilities are included in the rent you pay for your home or apartment, that's no excuse for leaving lights burning unnecessarily; you are still wasting valuable resources. When you are using a specific work area, use direct lighting —don't light the entire room. Natural daylight coming in through open draperies and blinds may be sufficient. When you replace a bulb, try using a lower wattage instead of the higher one you may have had before.

Fluorescent lights are worth looking into for installation in some rooms in a new or old home. They are about 4 times as efficient as incandescent lights and last 7 to 10 times as long. They also give off less heat, which can affect space cooling requirements.

Vacations and Recreation

It seems appropriate in a citizens' guide of this kind to discuss briefly the practice of energy conservation when people are traveling or enjoying recreational activities. Waste of energy and pollution is as prevalent then as it is at home.

Just because electricity is included in a motel bill, that's no excuse for leaving the lights on when you're out. Appropriate thermostat settings are important here too.

Recreational activities often revolve around potential energy waste and polluting equipment, If you own a motorboat or power lawn mower, you should be concerned about proper usage, maintenance, noise, and potential pollution problems.

Bicycles, of course, are the ultimate in healthy, pollution-free recreation. Compare the bicycle to the classic opposite example: the electric or gas-operated golf cart. While some people have to use these carts as aids to getting proper exercise for medical purposes, in general the golf cart represents the ultimate irony of "better recreation through technology." There are some 295,000 golf carts now in use across the country (85,000 of them run by gasoline), and their effects upon the land, their use of gas and electricity—not to mention potential safety hazards—puts them into a singular category. Next time you see one, remember that an electric cart usually needs 6 batteries, 12 volts each, and must be recharged almost every day, and that the gas-operated models must be refilled.

Commercial Use of Energy

The commercial use of energy accounts for 12.6 percent of our total consumption. Included in this category are those aspects of the economy which deliver services, such as hotels, schools, office buildings, and stores. The commercial sector uses energy in about the same way as the residential sector, and many of the energy conservation measures discussed above are applicable here. Lighting accounts for more energy use than it does in homes, but space heating is also the largest category of commercial energy use, followed by water heating, air conditioning, cooking, and refrigeration. As in the construction or repair of new homes, greater attention must be given to the "lifecycle cost" of commercial buildings so that the end use and operating efficiency maximize the concept of energy conservation.

Building Design

The key to improving energy conservation in commercial buildings is better building design. Obviously, a great deal of energy is used for large buildings, and if the design, construction, and operation of these structures included measures for energy savings, there would be a greater payoff in cutting down energy waste. Encouraging builders and architects to take these factors into account is the important element here.

Energy conservation in the commercial sector can be brought about in a variety of ways. Some suggested examples are increased use of heat recovery systems, better insulation of windows, and more careful architectural and mechanical systems design. Some large building complexes are being constructed with "total energy systems," which involves the on-site generation of electricity and use of waste heat for cooling and heating. Better maintenance of a building's heating and cooling plant also has a great effect, as does installation of proper ventilation systems. Large glass office buildings with windows that do not open too often stand in isolated splendor. They thus reject the benefits of fresh air and shade from trees which would assist in regulating the temperature inside.

An important area of commercial energy conservation is lighting, which now consumes about 10 percent of total electricity consumption. As is true with homes, excessive lighting gives off heat in the summer and wastes power all year round. Public lobbies and corridors are often brightly lit well beyond the need for providing adequate security. An entire office building does not have to be heated, cooled, or illuminated when an evening meeting is being held in one room or section of the building.

Citizen Action in the Commercial Sector

There are many ways in which citizens can make their ideas about commercial energy conservation known and acted upon.

As members of a community, citizens can encourage better building design in public buildings being constructed or remodeled in their community—such as new schools or libraries. You can find out what lighting, heating, and cooling practices are undertaken now, and suggest ways of improving them.

As employees, citizens can seek to have more informality become the style of office dress during the summer months, so that the air conditioner doesn't have to be set so high. Look around your office at the lighting. Is it excessive? What happens when you stay late for a meeting? Is the whole building lighted or just the area you're in? If you're thoughtful about energy conservation at home, there will be many similar things to think about and change at work.

INDIVIDUAL CITIZEN ACTION CHECKLIST FOR HOMES AND OFFICES

From the preceding pages, you can see that conserving energy at home and at work is something you can do without too great a change in your lifestyle, and it will also save you money. Make an energy inventory of your home and office—you'll find many ways to conserve.

THINK ABOUT YOUR USE OF ENERGY AT HOME

_____ **Heating**

You'll save money and energy if you lower the thermostat a few degrees and wear heavier clothing, close the draperies at night, keep the fireplace damper closed, don't heat empty rooms, keep your furnace in good condition, fix leaky faucets, prevent drafts from open windows and attic doors.

_____ **Cooling**

Remember to raise the thermostat a few degrees and wear lighter clothing, open windows when you can instead of running the air conditioner, turn off unnecessary lights, close draperies during the day.

_____ **Appliances**

Don't run items such as dishwashers or clothes dryers during the day if you can avoid it, and fill them up before you use them. Unplug instant-on TV sets, wash dishes and clothes in warm water, don't leave the radio or TV on when you're not listening.

THINK ABOUT ENERGY WHEN YOU'RE SHOPPING

_____ **Don't buy more than you need**

Avoid buying too large an item, such as a refrigerator or air conditioner, if you will not use it to capacity.

_____ **Look for energy-efficient products**

Think about energy efficiency in the things you purchase, such as refrigerators (the frost-free models consume twice as much energy), air conditioners, and lighting (you'll save with fluorescent lights). If you install weather stripping and storm windows, or add insulating materials when you remodel your home, you'll improve insulation and save on the fuel bill.

_____ **Buy to conserve**

Self-cleaning ovens and crushed-ice dispensers in refrigerators, for example, waste more energy. If you don't need accessories, don't buy them.

ENCOURAGE OTHERS TO THINK ABOUT ENERGY CONSERVATION

_____ **In the marketplace**

Ask stores to carry energy-efficient products. Find out from the builder what insulation your new home has in it.

_____ **In the office**

Start a conservation program in the office—you can save energy at the office the way you do at home. Discourage excess lighting, cooling, and heating, particularly when the entire building is not in use.

_____ **In your community**

Talk about energy conservation. Your friends may not have the money-saving information you do. Remind them to practice conservation on vacations the way they can at home. Encourage local community leaders to use better design in schools and new office and public buildings. Be alert to overcooling in stores, restaurants, and theaters, and urge the managers to avoid this energy-wasting practice.

* If you are interested in obtaining a separate reprint package of all the action checklists in this booklet for reproducing and distributing, write to the Citizens' Advisory Committee on Environmental Quality, 1700 Pennsylvania Avenue, N.W., Washington, D.C. 20006.

CHAPTER 5

CONSERVING INDUSTRIAL & ELECTRICAL ENERGY

Individual citizen actions to conserve energy will have a greater impact in the transportation and residential sectors than in industrial energy consumption or at the electrical generating plant. Nonetheless, while these areas are more removed from the individual, there are certain aspects of their energy consumption patterns which citizens ought to know more about and which can to some extent be affected by citizen action programs.

Facts About Industrial Energy Consumption

Of the five main categories of United States energy end use—transportation, industrial, generation of electricity, commercial, and residential—industry uses the greatest amount, 32.1 percent of the total consumed. This sector represents that part of our economy which produces goods—i.e., manufacturing, mining, and agriculture. In view of the tremendous output of material goods in this country, as reflected in our high standard of living, the industrial sector's role as the leading energy consumer is not surprising. The major consumers of this energy within the industrial sector are the primary metal industries, chemicals and allied products, and petroleum refining and related industries, which account for over 50 percent of industry's energy consumption. Sources of industrial energy, in order of the amount used, are natural gas (the largest and most rapidly growing), coal, petroleum, and electricity. Approximately two-thirds of industry's energy budget goes for heat.

It is extremely hard to generalize about ways in which more energy efficiency can be accomplished within the industrial sector. In fact, given the tremendous number of uses to which energy is put in this area, it is very difficult even to assess how efficient current efforts are. The accelerated retirement of old equipment and upgrading or increased maintenance of existing equipment, such as furnaces, are places where energy efficiency can be improved. Another area is the use of new processes specifically designed for more energy-efficient production techniques—though this is expensive and requires great capital outlays. It also requires cooperation and planning among potential users of such equipment and the combined efforts of trade associations and professional societies, to name only a few. Finally, industries, like people, waste energy through practices which can be corrected if information is given to them by those aware of the situation. Broad-based advertising and information campaigns could be an effective tool in eliminating these wasteful practices, particularly in smaller firms.

One such effort was launched in February 1973 by the Secretary of Commerce. In a letter to the presidents of 45,000 companies, most of them manufacturers and other large consumers of fuel, he proposed 19 steps for industrial and commercial users of energy to consider in lowering overall energy use. These measures, listed below, depend upon cooperation among industry leaders, fuel or electrical suppliers, and equipment and maintenance personnel. They are

examples which you, as citizens, ought to know about in considering the issue of how industrial energy conservation might be accomplished in the long term as well as during acute shortages.

The suggestions for industrial energy conservation proposed by the Secretary of Commerce are:

- Lower thermostat setting
- Check leakage
- Maintain equipment
- Reduce ventilating air
- Install insulation
- Recycle waste as fuel
- Utilize waste heat
- Automate combustion system controls
- Consider multiple fuel capability

For conservation of electrical energy:

- Cut back lighting load
- Use photocell switches
- Add timeclock controls
- Check power factor
- Conduct plant load survey
- Reduce maximum demand load
- Reschedule for off-peak periods
- Convert to higher voltages
- Balance total plant energy load

For more detailed information on these proposals, write to the Secretary of Commerce, Department of Commerce, Washington, D.C. 20230.

To be effective, an industrial energy conservation program must involve the employees of industry through in-plant education programs. This involves publicizing the problems of energy waste and possibilities for conservation through announcements at staff meetings, notices and posters on bulletin boards, in-house newsletters, and other publications. A short publication on plant conservation steps could be distributed at payroll time in much the same fashion that certain utilities have included energy conservation guides in billing their customers.

The Impact of Resource Recovery, Recycling, and Reuse on Industrial Energy Conservation

One of the most significant ways in which energy conservation could be achieved in the industrial sector is through the implementation of a national program of resource recovery, recycling, and reuse. The institution of such a program would, of course, be primarily aimed at dealing with our staggering problems of solid waste disposal, which continue to mount every year.

In its "Report to Congress on Resource Recovery," in February 1973, the Environmental Protection Agency estimated that the total quantity of waste generated in 1971 was 4.45 billion tons, up nearly 1 billion tons from 1967, and pointed out that materials use is growing at a rate of 4 to 5 percent yearly. The recovery of waste materials, however, the EPA report stated, "supplies a very small part of the total material and energy requirements of the United States population, and while both population and materials consumption are increasing, the use of materials from waste sources is declining relative to overall consumption."

Not only are we recovering fewer resources as we consume more of them, but we are increasing the amount of raw materials—intensive products (i.e. those which require large amounts of raw materials to produce) in the marketplace through such items as non-returnable bottles and excessive packaging.

A number of major reports have indicated that one of the potential benefits of a nationwide attack on the solid waste problem will be the conservation of energy. The recent report of the National Commission on Materials Policy stated: "About 2 percent of the total U.S. energy demand could be saved by the recycling of available steel, aluminum, and paper." Thus, it is clear that if we can use our solid waste more effectively, we will at the same time waste less energy.

The question of energy conservation through resource recovery is a very complex one. EPA's report has cited the fact that 74 percent less energy is required when utilizing recycled steel rather than producing it from iron ore and that 70 percent less energy is required when waste paper is used instead of virgin pulp in the production of certain paper products. Another study showed that the production of primary aluminum requires 12 times more energy than is required for the secondary recovery of aluminum. However, in determining the amount of energy conservation realized, one must consider the *entire* recycling process of collection, separation, and reprocessing, versus the entire process involved in mining, processing, and transportation of goods from virgin sources. EPA's summary conclusion in this regard was stated as follows:

"Preliminary research and analysis indicates that, when compared with virgin materials extraction and processing, resource recovery results in lower quantities of atmospheric emissions, waterborne wastes, mining and solid wastes, and energy consumption. There is substantial disagreement among experts about the extent of such differential effects over time, particularly as strengthened environmental constraints on use of both virgin and secondary materials begin to narrow the differentials that now exist."

In any assessment of potentials for energy conservation through resource recovery and recycling, it is very apparent that the lack of a major national effort in resource recovery has hampered this development. Inequitable Federal tax policies which favor the extraction of natural resources, lack of economic incentives for secondary materials use, discriminatory freight rates for transportation, inadequate incentives for demonstration of new large-scale technology—particularly with regard to recovery from municipal wastes in urban areas—and restrictive procurement policies at all levels of government, contribute to giving a back seat to reusing waste materials. Changes in these policies which favor greater resource recovery and recycling will undoubtedly be meaningful for consuming energy.

But we have to change basic attitudes first, and accept the notion that resource recovery and recycling offer tremendous social cost savings to us, as well as economic ones. The National Commission on Materials Policy summarized the problem in its report as follows:

"As long as materials flow through a system whereby they are extracted from the earth, processed, used briefly, and discarded into the ocean or urban landfills, reusable materials will be treated as waste rather than as a national

resource, and will therefore be lost to the economy. In addition, such waste creates environmental, health, and urban management problems.

"A consumption-oriented economy and incentive policies appropriate to a young nation with an abundance of high-grade resources have made virgin materials cheaper than secondary ones. Dumping is cheaper than recycling. Market deficiencies and technological bottlenecks act as barriers to the creation of a functioning recycling system that would enhance environmental quality and health, benefit land use, offset the depletion of nonrenewable resources, and reduce imports."

Even given these circumstances, there is evidence that if today we were to alter our buying habits slightly to encourage existing possibilities for recycling and reuse, energy savings would occur as well as resource savings. In a study conducted by Bruce Hannon at the University of Illinois, it was shown that the returnable glass soft drink bottle uses only one-third as much energy as the throwaway. Bi-metal throwaway cans were found to use nearly three times as much energy as a returnable glass container; all-aluminum non-returnable cans required four times as much.

There are other areas of resource recovery and reuse which, if fully developed, will pay off in energy conservation. An important one is better use of recovery techniques in urban areas. The National Commission on Materials Policy found that "burning municipal wastes would satisfy about 3 percent of the Nation's energy needs." A number of cities are now experimenting in new types of recovery systems for mixed municipal refuse, and their efforts should be further encouraged. Reclaiming greater quantities of waste lubricating oil, a great deal of which now finds its way into our sewer systems, is another possibility being explored.

Conserving Electrical Energy

It is important to distinguish between consumption of energy in the generation of electricity at the power plant and consumption of energy as electricity by consumers. The process of generating electricity in mid-1973 consumed 26.6 percent of our gross energy. In this process only about one-third of the fuel used is converted into electricity (furthermore, some 10 percent of the electricity generated is lost in transmission and distribution); the remaining two-thirds of the energy consumed in the generating process is lost as waste heat. It is this energy loss that is reflected in the figure of 17.6 percent shown in the end-use consumption figure cited in Chapter 2. (The *actual consumption* of electricity by consumers is accounted for in the figures given for the other four sectors, and previous chapters have discussed ways in which citizens can conserve electrical energy in transportation, at home, and at work.) Electricity's share of the energy market in terms of the waste heat generated has been rising at a much faster rate than the other sectors; the amount consumed in this fashion has increased by 285 percent since 1950.

The large amount of waste heat which occurs in the production of electricity is not startling news. From a purely economic point of view, electric utilities have attempted over the years to improve the efficiency of their use of fuel, both because of its high cost and in order to improve the competitive

position of their product. Conventional conversion technology in electricity generation has for the most part been pushed to the limits of efficiency, primarily because of limitations on suitable materials. Accelerated replacement of older, less efficient equipment is one possibility for short-term energy conservation in this area.

The electric utilities that serve you should also be encouraging citizen conservation programs. They have direct access to all their users through the bills they mail out each month. They should be able to inform citizens about what they're doing to help to save energy and to suggest ways that citizens can do the same.

Many of the suggestions made by the Secretary of Commerce, which appear earlier in this booklet, apply to the electric utilities industry. Heavy emphasis could be given to the maintenance question. Some type of readjustment in rate structures such as raising prices during peak loading hours, could be an incentive to heavy users to shift unnecessary demands on the system to another time. Decreasing electricity selectively, by substituting other installations, operating on different fuels, or relying on home oil burning heaters, should be approached with care. While electrical plants are sources of pollution, central station supply does offer a convenient one-step target to put an end to bad practices. Other forms of direct heat emit equally or more noxious pollutants into the environment. Installing better conservation measures in homes, offices, and industrial plants, such as improved insulation, can also have a salutary effect in reducing demand.

Ultimately, the future improvement of power generation lies in new technology. Among the possibilities for the long-term are developments in the use of solar power, geothermal energy (using underground hot water and steam to provide power), developments in nuclear power—such as the fast-breeder reactor and thermonuclear fusion—as well as trying to make more effeotive use of resources such as coal and oil shale. Making effective use of the waste heat generated in the process of producing electricity would also be very beneficial.

New technology must be appropriately energy-efficient, and, most importantly, it must contain environmental safeguards. Support for an enlarged Federal commitment for advanced research and development to achieve this is essential. The President has requested Congress to appropriate $125 million in the 1974 budget for new or accelerated high priority energy research and development programs. He has also recommended that the entire energy research and development budget starting in fiscal year 1975 should be $10 billion over the next five years.

INDIVIDUAL CITIZEN ACTION CHECKLIST FOR INDUSTRIES AND ELECTRIC UTILITIES*

As consumers and participants in community activities, citizens can encourage conservation practices of industries and electric utilities.

PRACTICE ENERGY CONSERVATION IN THE MARKETPLACE

_____ **Buy energy-efficient products**

Pay particular attention to efficiency when you make large purchases, such as air conditioners, refrigerators, and clothes dryers.

_____ **Buy goods made of recycled materials**

Tell your local stores to stock up on recycled products. Avoid the purchase of products wrapped in wasteful, throwaway packaging.

_____ **Purchase products designed to last**

Let a company know about items that wear out prematurely.

BE A CONSERVATION LEADER IN YOUR COMMUNITY

As a citizen, you — as well as organizations you belong to — should know what your local industries and power companies are doing about energy conservation. They should want to know what your ideas are. Other people in your community may want to learn too.

_____ **Organize public meetings**

Schedule meetings and open forums with local industry leaders, members of Chambers of Commerce, public officials. Exchange ideas.

_____ **Learn about industry conservation practices**

Find out what industries are doing to replace older equipment, use more energy-efficient design, upgrade maintenance of plants, and control pollution. Urge them to set an example for industry and citizens in the community. Reward them by purchasing their products and telling the community what a good job they're doing.

_____ **Distribute information to people in your community**

Tell people about your activities. You'll get others to join you.

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CHAPTER 6

TOWARD A NATIONAL POLICY OF ENERGY CONSERVATION

At the beginning of this booklet, it was stated that individual citizen action for energy conservation is but one part of a total national program. Federal, State, and local governments and private industry must assume major responsibilities in carrying out their own energy conservation measures. Citizen action cannot be the only way, but it is essential.

Both individuals and institutions are coming out of the starting gate right now. Just as we as citizens are beginning to take an inventory of our energy wastefulness and are starting to halt its growth, so too are governmental and industrial officials launching their own programs. Here is a review of where those policies have taken us thus far.

The President's Statement on Energy

On June 29, 1973, the President suggested that each of us reduce our energy consumption by 5 percent over the next year. In making that suggestion, he stressed the Federal Government's responsibility — as the largest energy consumer in the country — to play a unique role in this effort and to set an example for all consumers. Each Federal executive department and agency was thus directed to participate in a government-wide program aimed at reducing energy consumption by 7 percent over the next 12 months. Key aspects of this Federal effort, as outlined by the President are:

Agency Review

All Federal agencies are to review their activities, determine which of them place a demand on energy consumption, and plan for a reduction in that demand.

Conservation Practices

Federal agencies were asked to consider a number of steps, among them reducing air conditioning and unnecessary lighting in Federal buildings and offices, reductions in business trips, and encouraging employees to use car pools in Government-owned offices and facilities operated for the Government by contractors.

Purchasing Smaller and More Efficient Automobiles

The General Services Administration was directed to establish new regulations requiring the use of more efficient automobiles in Federal activities — i.e., to substantially reduce the size of engines and cars purchased and used by the Government and require Federal agencies to purchase and lease more energy-efficient automobiles when feasible.

Reducing Airline Fuel Requirements

The Secretary of Transportation has asked the Civil Aeronautics Board, Federal Aviation Administration, and the Air Transport Association representing scheduled airlines to consider immediate reductions in flight frequencies and aircraft cruising speeds in order to save jet fuel.

Achieving Long-Term Conservation

Federal departments and agencies were directed to work closely with the newly-established Office of Energy Conservation in the Department of the Interior in developing long-term conservation plans. Areas of further study identified by the Secretary of the Interior are: incentives to encourage use of car pools and mass transit; horsepower, weight, or other taxes on automobiles to encourage more energy-efficient products; incentives to encourage recycling of waste materials; more energy-efficient commercial and residential building construction and operation; methods and exchange of ideas for conservation in industrial and commercial uses of energy; an awards program for industrial energy conservers and for manufacturers whose products are efficient.

Action by the Public, State, and Local Governments, Industry, and Congress

In addition to these efforts by the Executive Branch, the President asked the public voluntarily to reduce speed on highways and gasoline consumption. Conservation of energy at home through readjustment of thermostat settings was also suggested. The public and private sectors were urged to follow the Federal lead in finding ways to conserve energy and to work together with Federal agencies in this effort. The President again urged the Congress to pass highway-mass transit legislation which would provide States and localities flexibility to choose between capital investment in highways or mass transit.

Additional Federal Initiatives

In addition to the new steps announced by the President on June 29, 1973, several Federal agencies have had various energy conservation efforts underway. Here is a quick overview of the programs as of mid-1973:

Department of the Interior

On April 18, 1973, the President announced the establishment of a new Office of Energy Conservation in the Department of the Interior. Its purpose is to coordinate the Federal Government's energy conservation programs; develop a comprehensive research program aimed at long-term energy conservation, and to develop and implement a consumer information program on energy conservation in cooperation with the President's Office of Consumer Affairs and other Federal agencies.

If you want further information or have questions about the Federal Government's energy conservation program, write:

Office of Energy Conservation
Department of the Interior
Washington, D.C. 20240

Environmental Protection Agency (EPA)

EPA has published fuel economy data for automobiles, as part of its automobile emissions testing procedures, in order to assist consumers. The agency will soon publish proposed procedures for voluntary labeling of automobiles and accessories to show fuel consumption. This will permit consumers to compare similar cars to determine their relative efficiency.

Both EPA and the Department of Transportation are evaluating more efficient automotive power systems. EPA is also evaluating various market approaches to reduce the rapid rise in demand for gasoline, such as an increase in the gasoline excise tax and an excise tax on automobiles based on fuel economy. The Agency has testified before a Committee of Congress that some data on the applicability of those measures is expected by the end of 1973.

Department of Transportation (DOT)

The Department of Transportation has been the lead Federal agency in promoting a shift of people and freight to more efficient modes of travel. DOT has focused on Congressional enactment of legislation to permit use of a portion of the Highway Trust Fund for mass transit purposes, and is considering proposals to increase use of rail and water freight carriers. DOT has prepared suggestions for consumers on use and conservation of gasoline. It conducts research and development programs on engine efficiency, fuel economy, and high-performance advanced batteries needed to make electric vehicles a viable possibility.

Department of Commerce

Working with the Council on Environmental Quality (CEQ), and EPA, the Commerce Department has proposed procedures for a voluntary energy labeling program for major household appliances. Such labeling will increase buyer awareness of the operating costs of these products.

The Department's *National Bureau of Standards* (NBS) has ongoing a number of technical evaluations of energy conservation programs dealing with such items as residential and commercial buildings, total energy systems, and solar heating. NBS was asked by the National Conference of States on Building Codes and Standards to identify ways in which State programs could be assisted, and held a major emergency workshop on this topic for State officials in June 1973. NBS and the Office of Consumer Affairs for some time have jointly published and distributed pamphlets containing tips for energy conservation in homes and offices.

General Services Administration (GSA)

This agency has been looking into several possible methods of reducing emissions and energy usage by government vehicles and was directed by the President on June 29, 1973 to establish regulations to that effect. GSA is constructing a new Federal Office Building in Manchester, New Hampshire, which uses advanced energy conservation techniques with a goal of reducing energy use by 20 percent. The information from this effort could serve as a model for other Federal and privately constructed buildings. GSA is also evaluating methods of more efficiently operating existing buildings.

Federal Housing Administration (FHA), Department of Housing and Urban Development (HUD)

FHA recently revised and strengthened its minimum property standards to increase insulation requirements for single and multiple family residences purchased with Federal mortgage insurance assistance. The revisions are geared to reducing heat loss and providing greater energy conservation. These stand-

ards are not mandatory for the building industry; they are required only when the FHA program is utilized. The President stated in his April 18, 1973 Message on energy that when the results of important demonstration programs are available, he would direct FHA to update its standards in light of this new information and to consider the possibility of extending them to mobile homes.

State Initiatives

By and large, energy conservation efforts are just getting underway at the State level. It is important for citizens to be aware of what their State officials are doing —or not doing—to help. Through their regulatory authority, States can affect what is done in existing buildings and new construction by tax, rent, and interest subsidy programs; through price structuring of energy sources; or through increasing taxes on energy. Regulatory actions can also be used to augment or amend building code requirements, or ration the use of energy in the private sector. The access of State officials to the public through educational and media devices is great, as well as their ongoing contacts with a wide range of State professional societies and trade associations. In short, State potential for action in energy conservation is tremendous, particularly when national policy or national standards are considered either inappropriate or infeasible for one reason or another at the time.

State Programs

Although developments in State energy conservation programs are just beginning, actions are coming at a very rapid rate.

In general, a number of States have started to institute conservation practices in State office buildings along the lines directed by the President for the Federal Government. Information on conservation practices has been distributed to State employees, some with requirements for percentages of consumption reduction, others in the form of guidelines. Several have held seminars or meetings on building design for both State and private personnel.

The current fuel shortages have spurred many States to establish new kinds of committees or offices to keep track of the State's fuel supplies. Legislation has been introduced in Massachusetts, for example, to require all large fuel distributors doing business in the State to register with a State office so as to provide current and projected information on supply and demand; if a company cannot meet its customer demand, it must notify the State or risk the loss of its registration. Attention is being devoted to upgrading building code insulation requirements. California's legislature has made the FHA building requirements on energy conservation mandatory for new housing beginning January 1, 1974. Several States are looking into tax incentives for improving insulation standards of existing residential and commercial buildings, as well as new construction.

Finally, there is interest at the State level in upgrading requirements for household products so as to increase energy efficiency. A New York State Task Force on Appliance and Apparatus Efficiency has recommended that official performance criteria be established for refrigerators, freezers, and refrigerator-freezers, and that official standards requiring year-to-year improvements in efficiency be established for residential air conditioners.

State Organization and Personnel

Many of the new State programs are the result of studies and task force reports now underway in a great number of the States. Inter-agency and inter-disciplinary committees and groups have been appointed at the State level, most by the Governors, to monitor the situation and propose new programs. Some, of course, are much further along than others in terms of staff, financial support or available resources.

Knowing *whom* and *what* agency to contact is a very important piece of information for citizens interested in assisting or prodding States to act. In order to help you in that process, here is a list of State agencies and personnel, as of January 1, 1974, who can provide you with information about your State's energy conservation program. (List revised and updated for second printing of this booklet.)

STATE CONTACTS FOR INFORMATION ON ENERGY

(As of January 1, 1974)

ALABAMA
C. L. Melenyzer
Executive Building
Montgomery, Alabama 36104
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Local Initiatives

The conservation practices at the Federal and State levels for lowering consumption in public buildings and encouraging employee conservation practices have great potential on the local level as well.

Municipal officials have been extremely concerned about the need for improving mass transit in their communities, particularly in the large urban areas where excessive traffic is causing congestion and air pollution and represents a tremendous amount of energy waste. New developments in urban transportation and design are underway nationwide. They have suffered from a lack of Federal funding in this area, however, and thus local officials have been at the forefront of efforts to obtain Congressional approval for using the Highway Trust Fund for mass transit purposes.

Cooperation between local public officials and utility companies during peak periods of air conditioning use in summertime is an absolute must. In many cities, public officials have spoken effectively on television to describe the potential and actual power shortages, and to seek public cooperation through conservation measures.

The need for more effective disposal of solid waste has become of paramount importance to an increasing number of local governments. Some have actively sought to encourage the purchase of recycled materials and eliminate wasteful packaging in products sold. There are also a small number of demon-

stration programs in municipal waste reclamation and new incineration techniques. As the urban solid waste problem continues to rise, there will have to be increased efforts to develop and operate new reclamation systems in cities and counties.

Industry Initiatives

American industry, like government, has just begun to practice energy conservation. Its potential contribution to this effort is very great indeed. The President, in his June 29, 1973 Statement, requested the Secretaries of the Interior and Commerce and the Director of the Energy Policy Office "to meet with representatives of American industry to discuss ways of cutting back on unnecessary consumption of energy and to urge their active participation in the conservation effort."

The most obvious area in which industry has moved thus far has been in advertising programs giving consumers information on energy conservation. Some utility companies, for example, have sent consumer tips along with their monthly bills. A large-scale imaginative effort through the media was undertaken by the Consolidated Edison Company in New York City, with notable results, urging people to "Save-a-Watt." Manufacturers of building materials have prepared information on savings through better insulation. Obviously, many of these advertisements do serve a dual purpose for the company distributing them, as they are also promotional pieces for the use of the products the companies manufacture or sell. As long as this information is helpful to the buyer, does not attempt to unfairly assign blame for pollution or energy waste, and is an accurate description of the product, this type of advertising can have salutary effects.

Trade associations representing a group of manufacturers in an industry have begun to enter the picture. The Association of Home Appliance Manufacturers, for example, publishes an energy-efficiency ratio for all window air conditioners on the market. The area of greatest need, of course, is to put energy-efficiency information on the product itself so that the buyer can easily have it available.

It is very difficult to pinpoint specific in-plant industry-wide activities to date, primarily because much that has happened has been on an individual company basis. Suffice it to say that industry is becoming aware of the monetary savings of practicing conservation and of the fact that the public wants to have products which are efficient and lasting. Most importantly, consumers must continue to show they will reward good environmental practices in the marketplace.

Public Policies For Long-Term Energy Conservation

In the middle of June, the American Automobile Association reported that the chances of finding a gasoline station in the United States operating at its normal schedule was 50-50. The Interior Department estimated a summer gasoline shortage of 1 to 2 percent of demand, with some areas facing a 5 percent shortage. There has been much discussion of a similar crisis in home heating oil next winter, and the possibility of even more gasoline shortages next summer.

What this tells us is that the need for energy conservation is not going to

go away. Whether or not these predictions are too high or too low, or even if there are no shortages at all next winter or summer, the fact remains that we as a nation are simply consuming energy at too great a rate, and this is catching up with us. Our unlimited energy appetite has to be cut back. Crash dieting, however, is not the answer. We must plan and implement a long-range policy for energy conservation. And we, as citizens, must take an active role in getting that plan adopted. Beyond the efforts we make at home or at work, we have an opportunity to work with other citizens to urge collectively that public policies be adopted by public officials.

Recommendations abound for what steps should be taken. Some of them contradict each other, and many are not yet fully documented as to their actual effect. A lot of them require a restructuring of the way our economic system operates. The end result of some proposals may be that it will ultimately cost us money. What is most important in this respect is that the burden of these costs not be thrown onto you, the consumer, without your getting some return for your money—either in reduced energy usage (which in and of itself will reduce your fuel bill), in less pollution of the environment, or in better energy service. And, most important, you must be aware of exactly what it is you are paying for.

To give you some guidance on what long-term conservation measures might be taken, here are some recommendations made by the Office of Emergency Preparedness (OEP) in its October 1972 report, "The Potential for Energy Conservation: A Staff Study." This major study included a series of conservation practices that might be implemented in 3 stages: the short-term (1972-1975), the mid-term (1976-1980), and the long-term (beyond 1980). Each of the measures suggested has a building-block effect, with steps taken in one stage leading to further actions in the next. The proposals listed on the following pages are those which the OEP report assessed as having "High Payoffs" either in terms of energy (Btu) savings or feasibility of public awareness and support. As the report stated, "the economic, environmental, and socio-political impact of these measures will vary, as will the likelihood of their being implemented." In each time span, the report suggests, the following should take place for ensuring environmental protection: "review regulations and programs with the objective of meeting environmental standards while using the least energy and avoiding scarce fuels."

This list is not exhaustive by any means, nor should the suggested time frames be thought of as absolutes. This is an instructive guide to the things you ought to be thinking about and discussing with your public officials.

PROPOSED ENERGY CONSERVATION MEASURES

TRANSPORTATION

SHORT-TERM

Accelerate improvement of motorized mass transit including measures to improve traffic flow.

Improve automobile energy efficiency through use of low-loss tires, improved engine tuning.

Inject energy issue into appropriate national programs (environmental, health, urban reform, etc.). Initiate special conservation programs.

Promulgate energy efficiency standards for transportation.

MID-TERM

Expand intercity surface transportation service.

Expand high speed and motorized mass transit service. Implement feeder service (e.g., "dial-a-bus").

Improve freight handling systems through freight consolidation and containerization.

Emphasize transportation issue in urban development (pedestrian oriented clusters).

Improve automobile energy efficiency through improved engines and drive trains, improved traffic flow, use of low-loss tires and improved engine tuning.

LONG-TERM

New freight handling systems.

New mass transit systems.

Improved urban design.

New engines (hybrid, non-petroleum).

RESIDENTIAL/COMMERCIAL

SHORT-TERM

Tax incentives for adding insulation and storm windows in existing homes.

Educational program to encourage good energy conservation practices in the home.

MID-TERM

Further upgrade FHA minimum property standard for new single and multi-family dwellings to require more insulation.

Increase price of fuel by tax levied at the point of production.

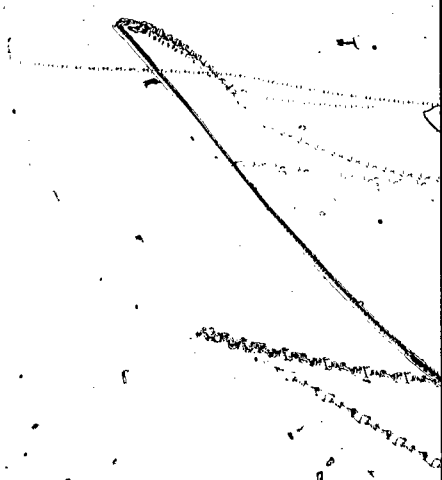
Utilize above revenues for research and development to increase efficiency of energy utilization in the residential/commercial sector.

Establish minimum efficiency standards for furnaces, air conditioners, and appliances.

Require energy consumption of all appliances to be stated on nameplate, price tag, and in any advertisement that quotes a price.

LONG-TERM

Develop non-fuel energy sources (solar and wind energy).



INDUSTRY

SHORT-TERM

Raise energy prices by tax and/or regulation.

Increase recycling and reuse of materials and products.

MID-TERM

Raise energy prices by tax and/or regulation.

Increase recycling and reuse of materials and products.

LONG-TERM

Raise energy prices by tax and/or regulation.

Increase recycling and reuse of materials and products.

ELECTRIC UTILITY

SHORT-TERM

Alleviate construction delays.*

Smooth out daily demand cycle by shifting some loads to off-peak hours.

MID-TERM

Alleviate construction delays.*

Smooth out daily demand cycle by shifting some loads to off-peak hours.

Increase research and development efforts.

LONG-TERM

Increase research and development efforts.

*New plants can be brought on line faster to replace older, less efficient plants.

CHAPTER 7

CITIZENS CAN MOBILIZE FOR ENERGY CONSERVATION

This booklet has discussed why we must start an energy conservation program throughout the country and how you as an individual citizen can participate in it. However, unless citizens work together, through various local, State, or national organizations, your individual action for energy savings will not have as great an impact as you would like or as is needed.

This chapter will give you some suggestions on how citizen groups can work for energy conservation. It is by no means an exhaustive list. If you've organized projects before, such as charity fund drives, protection of environmental quality, or support for State or Federal legislation, many of the things you did then can be repeated for energy conservation now.

HOW TO START

Energy Conservation Starts With You

It should go without saying that if you are not practicing energy conservation, you can't very well ask others to do so. Your enthusiasm and success will be the best reason others will want to join you. Start by telling people how much money you've saved—it's the best way to get more people involved.

Work Through the Groups You Belong To

Think about the places you spend your time in an organizational setting—civic group, church, school, political party, Boy or Girl Scouts, recreation—any place where a number of people get together or there is some type of group structure. Each one of these is an excellent place to start talking about organized efforts for energy conservation projects.

Make Energy Conservation a Project for Local Organizations

Once you've got people in an organization interested, try and make an energy conservation project an "official" activity of your group. Present a plan at a board meeting and publicize it in newsletters or meeting notices. Set some goals for the project—and be realistic.

Reach Out to Others in the Community

Try to persuade other organizations to join you in the project—you'll have a greater impact. Look for experts in your community who can help compile information. If you can enlist those who work in local industry, retail stores, and architectural firms, for example, this will help give you access to the places where conservation must be practiced.

Obtain Information on Energy Conservation

It's very important to do your homework. Marshal all the current facts about energy conservation. Places to begin this are local and national environmental groups, the Office of Energy Conservation in the Department of the Interior, your Congressman and Senators, publications from the Government Printing Office, and, of course, this booklet. Get your name on mailing lists to keep up-to-date.

Do an Inventory of What's Going on in Your Community, State, and Federal Government

Find out what's going on in your community by contacting local elected officials, the Chamber of Commerce, industry leaders, utility companies. Ask them for information on what they're doing.

Write to officials of State government to find out what actions are being taken and whether task forces have been established to plan for the future. Your Congressman or Senators can tell you about the Federal Government's activities and pending national legislation.

WHAT TO DO

There are many activities involved in a citizen program. You can do a lot of them at the same time. Here are some suggestions:

Organize Meetings of Your Organization

When you're ready to get the project going, hold a meeting. Present the facts you have gathered. Ask for suggestions. Get volunteers to help.

Make Your Views Known to Public Officials

Testify at meetings of the City Council or Town Board. Budget hearings are a good place to start. Talk about lighting of public buildings; better design of new schools, libraries, and public office buildings; and solid waste disposal. Suggest ways conservation can be practiced. You might offer to compile a list of conservation tips for municipal employees.

Write to State officials and find out what regulations exist on appliance efficiency, product labeling, building code standards. Tell them your views.

When you find out about pending Federal legislation, take a position and let your elected representatives know what it is. Work with national organizations that lobby for your views. Supply them with information on what you're doing in your locality.

Put Energy Conservation into the School Curriculum

Discuss with local school principals what could be taught about energy conservation. Suggest this be the subject of a classroom or an all-school project. Don't forget the Boy Scouts, 4H Clubs, YWCA, etc. They can be a supplement to school activities in order to reach the younger people.

Projects You Can Organize

Pick one or two examples for a local community-wide effort. They should be simple in concept and money-savers. Examples are: "Save a Dishwasher Load a Week," "Car Pool on Tuesdays," "Use Bicycles Instead of Cars." Enlist as many community leaders and the media as you can to publicize your efforts. Publish short and easily understandable information on what you're doing and why.

WHOM TO TALK TO

Elected Officials

Find out their views and what they're doing about the problem. Be constructive—everyone's interested in good ideas. Try and get them to publicly support you. Show how much citizen support there is for your activities.

Industry Leaders

Contact leaders of industry in your community or State and ask to meet with them to exchange ideas. Invite them to meetings you hold. Suggest ways to make consumers obtain more accurate information about the energy efficiency of the products on the market. Find out about in-plant employee education programs, measures to conserve in industrial processes, and the manufacturing of products that wear out too quickly.

Local Merchants

Organize visits to local merchants to talk about products and equipment. You can set up teams of people knowledgeable about a subject to talk to each group. Suggest that stores pay more attention to efficiency labeling and provide their salesmen with the necessary information. Stress the importance of operating costs to home developers and builders and see if they could at a minimum offer more optional insulating materials to prospective buyers of new homes and information on better materials to those remodeling their homes. Local merchants have to sell what their manufacturers provide. If they get enough requests from consumers, they in turn will pass the message on to their suppliers.

Electric Utilities

Your local power company can help tell citizens how to conserve the electricity it sells. Interest them in providing conservation information to their consumers through such vehicles as an enclosure in the monthly bill; newspaper and television advertisements.

Other Civic Groups and Private Organizations

Don't forget to contact all possible groups in your community who have a real potential to help, and enlist them as active members in planning and implementing your project. Even if a group can't join in completely, you might get help for one or two aspects of what you're doing.

The News Media

You won't get much done if only a few people know what you're doing. Talk to the newspapers and radio and television stations about energy conservation and the activities of your group. Keep their interest sustained. Think about newsworthy events you can hold or sponsor.

The Public

Part of a nationwide public education campaign is a broad dissemination of information. Beyond your efforts with the media, think about planning an open forum on energy conservation. If you have good speakers, visual material, and literature, it will be an exciting event. You could also sponsor a local—or statewide—contest for collecting consumer tips on conservation.

KEEP IT UP...

The need for energy conservation is not going to go away next month or next year. If you start a good project and maintain an interest in keeping it up, you'll have success. Don't get discouraged when things go badly, as they surely will at times. You've got a lot of good reasons to keep on going.

SELECTED REFERENCES

A wide variety of technical papers, basic reference documents, and published materials were drawn upon for the preparation of this booklet. The Citizens' Advisory Committee on Environmental Quality wishes to acknowledge the contribution of previous authors to this effort. For those citizens seeking further information about the topics covered in this booklet, here is a selected list of materials which can be obtained fairly easily.

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61

WHAT IS ENERGY?
A Glossary of Commonly Used Terms

It is almost impossible to pick up a newspaper or magazine today and not read about energy. Many products are also being advertised with a new energy terminology.

Here are some explanations of the most commonly used terms:

ENERGY

What is it?

That commodity which gives us the capability to do mechanical work or to produce a change in temperature (that is, to heat or to cool).

What form does it take?

Energy can take many forms, such as mechanical motion (called "kinetic energy"), temperature difference between two objects ("heat energy"), and the flow of electricity ("electric energy"). "Potential energy" is mechanically stored energy, as in the tension in a spirng, or water stored behind a dam, or chemically stored energy, as in a fuel.

What is the relationship between energy and power?

Power is the rate at which energy is used or the rate at which work is done.

Where does our energy come from?

In our civilization today, most energy is derived by burning fossil fuels (release of stored chemical energy). The fossil fuels are petroleum, natural gas, coal (anthracite, bituminous, lignite, and brown coal), oil shale, and tar sands. They are the products of biological processes modified over millions of years by geological processes. A small amount of energy is also supplied by flow of water, nuclear processes, wood, and the muscle of man and animals.

How do we use energy in our daily lives?

We use energy to warm or cool our homes, to provide light, to propel our vehicles, to operate machinery in our factories, and to process raw materials into finished products.

How is energy measured?

The energy content of a system can be measured in many ways, such as by measuring the speed and weight of an object; by measuring the temperature increase produced in water; or by measuring the current, voltage, and period of flow of electricity.

How do we specify amounts of energy? The quantity of energy can be expressed by a variety of equivalent units which apply to the mechanical, heat, or electrical forms of energy. The most commonly used units of measurement which you will see in product advertisements, on labels, and elsewhere are:

British Thermal Unit (Btu)

One Btu is the energy required to increase the temperature of one pound of water by one degree Fahrenheit. For example, it takes 300 Btu's to heat one quart of tap water to boiling. How is that figured? One quart weighs two pounds. Assume tap water temperature is 62 degrees Fahrenheit. Boiling point is 212 degrees Fahrenheit, so needed temperature rise is 150 degrees Fahrenheit. The Btu's needed are two pounds × 150 degrees Fahrenheit = 300 Btu's.

Kilowatt (1,000 watts)

A unit of electrical power indicating the rate at which electrical energy is being produced or being consumed.

Kilowatt-hour (1,000 watt-hours)

A unit of electrical energy equal to the energy delivered by the flow of one kilowatt of electrical power for one hour. For example, a 100-watt bulb burning for 10 hours will consume one kilowatt-hour of energy.

ENERGY EFFICIENCY

The amount of useful work or product divided by the fuel or energy input. For example, in electrical generation it is the amount of electricity produced per unit of fuel consumed. For an air conditioner it is the amount of cooling provided per unit of electricity used.

ENERGY SHORTAGE

This occurs when there is not a great enough supply of fuel to satisfy the demand for energy, such as when there is not enough gasoline to meet public demand.

POWER SHORTAGE

The supply of electricity is controlled by the utility, the consumption of electricity by the customers. When the customers call for more electricity than the utility can deliver, there is a power shortage. Such shortages are likely to occur on hot summer days between 10 a.m. and 8 p.m. Consumers can help at such times by reducing their use of electricity as much as possible.

BROWNOUTS

During periods of acute power shortage, utilities reduce the voltage on the power lines so that the amount of power delivered to each customer is reduced. Voltage reductions (known as brownouts) can lower the performance of some electrical appliances and equipment. Brownouts are measures of desperation and are an undesirable solution to a power shortage.

BLACKOUTS

The failure of an electric power system, often caused by storm damage or equipment failure. Blackouts frequently occur as the result of power shortages which overload utility equipment.

COMMONLY USED ABBREVIATIONS

bbls — barrels (a barrel contains 42 gallons)
Kw — kilowatt
Kwh — kilowatt-hour
Mcf — 1,000 cubic feet (of gas)
Mw — megawatt, 1 million watts
Btu — British Thermal Unit
therm — a unit of energy used for natural gas equal to 100,000 Btu

Numerical abbreviation

Very often you will see energy expressed in numerical form—e.g., 10^6 Btu. This is a convenient way of expressing the large numbers such as millions, billions, or even quadrillions involved in measuring energy, instead of using many zeros. It is in a formula which indicates the multiples of 10 used to arrive at these large numbers. For example:

$1{,}000 = 10 \times 10 \times 10 = 10^3$
$1{,}000{,}000 = 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 10^6$

ENERGY CONVERSION TABLE

To Convert From	*To*	*Multiply By*
kilowatt-hour	Btu	3,412.8
1 ton bituminous coal	Btu	26,200,000
1 bbl crude oil	Btu	5,600,000
1 bbl residual oil (No. 5)	Btu	6,290,000
1 gallon gasoline	Btu	125,000
1 gallon No. 2 fuel oil	Btu	138,800
1 cubic foot natural gas	Btu	1,031
1 Mcf natural gas	Btu	1,031,000
1 therm natural gas	Btu	100,000
1 Btu	Kwh	0.000293

PREVIOUS PUBLICATIONS

Citizens' Advisory Committee on Recreation and Natural Beauty

Annual Report to The President and to The President's Council on Recreation and Natural Beauty. June 1967. 28 pp. (out-of-print)

Annual Report to The President and to The President's Council on Recreation and Natural Beauty. June 1968. 40 pp. (out-of-print)

The Electric Utility Industry and the Environment. A Report to the Citizens' Advisory Committee on Recreation and Natural Beauty by the Electric Utility Industry Task Force On Environment. 1968. 106 pp. $2.00.

Citizens' Advisory Committee on Environmental Quality

Report to The President and to The President's Council on Environmental Quality. August 1969. 36 pp.

Ottauquechee: A National Prototype. 1969. 20 pp.

Community Action for Environmental Quality. 1970. 42 pp. (out-of-print)

A New Approach to the Disposal of Liquid Waste. 1970. 24 pp.

*Report to the President and to The Council on Environmental Quality. April 1971. 56 pp. Price: 65 cents. A 25% discount is allowed on orders of 100 or more copies delivered to one address. Stock Number 4000-0265.

*Annual Report to The President and to The Council on Environmental Quality For the Year Ending May 1972. 64 pp. Price: $2.00 each. A 25% discount is allowed on orders of 100 or more copies delivered to one address. Stock Number 4000-0278.

*Citizens Make The Difference: Case Studies of Environmental Action. 1973. 72 pp. Price: $1.75 each. A 25% discount is allowed on orders of 100 or more copies delivered to one address. Stock Number: 4000-00290.

The Use of Land: A Citizens' Policy Guide to Urban Growth. 1973. 318 pp. Available from the publisher: Thomas Y. Crowell Company, 666 Fifth Avenue, New York, N.Y. 10019, Department T-4. Paperback $3.95, Cloth $10.00.

*Report to The President and to The Council on Environmental Quality. October 1973. 48 pp. Price: $1.05 each. A 25% discount is allowed on orders of 100 or more copies delivered to one address. Stock Number: 4000-00303.

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