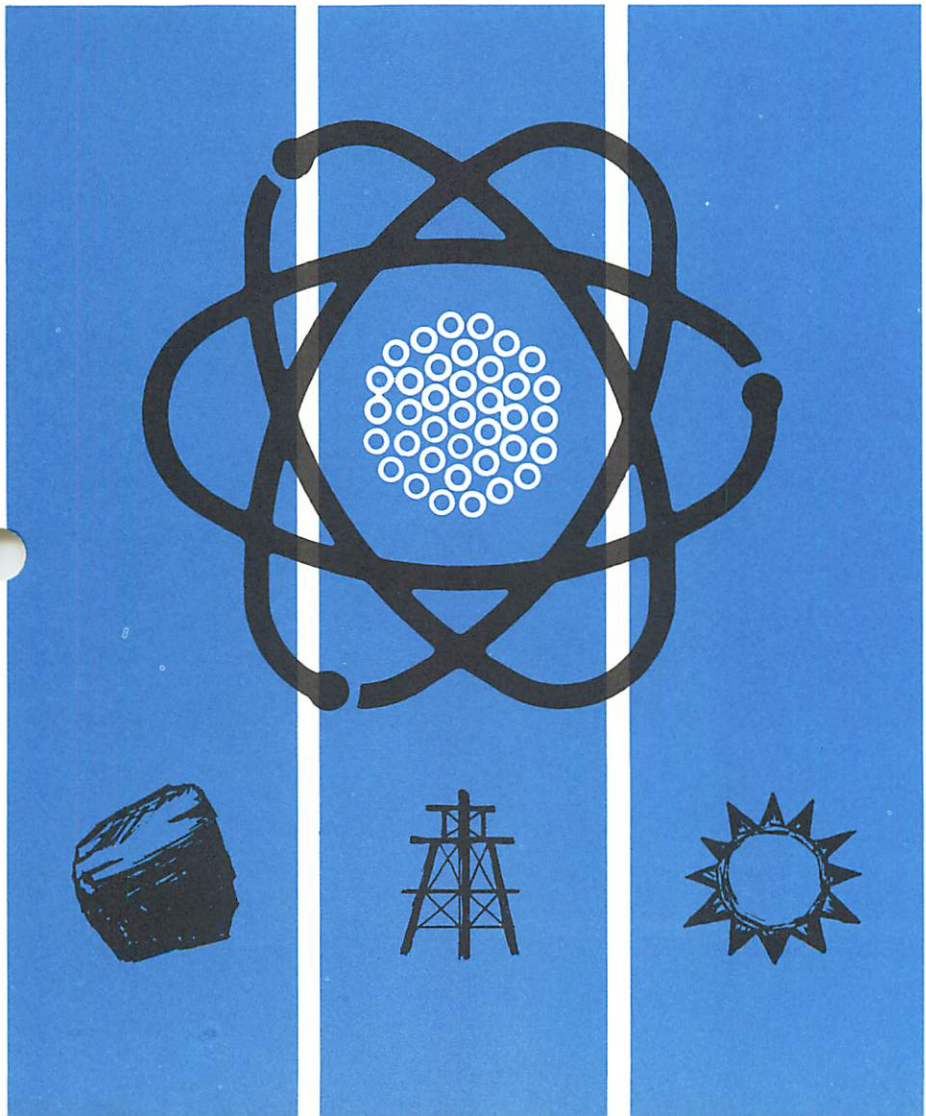
Nuclear Power and America's Energy Challenge



"Coal and nuclear power are the only economical alternatives for large-scale application in the remainder of this century"

—National Academy of Sciences Report
January 1980

INTRODUCTION

Historically, Americans have enjoyed more abundant energy supplies than almost any people on earth. Having ample fuel enabled us to meet, with relative ease, the energy needs for our homes, farms, factories, transportation, and electricity. So, too, has it allowed us to increase our personal conveniences and leisure time.

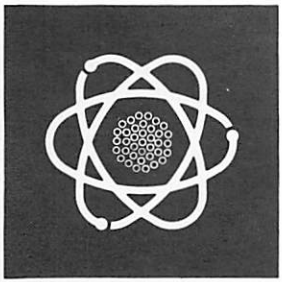
Most importantly, abundant energy is what has enabled Americans to raise their standard of living consistently during recent decades. Economic history has demonstrated that it is the availability and relatively cheap cost of energy that has long provided the very foundation for efforts to improve the quality of life.

The days of cheap, abundant energy, however, are over. Now we are faced with a harsh new reality: the world is running out of primary fuels—oil and gas. Our own nation has become dangerously dependent upon those foreign governments which control most of the world's remaining oil supplies. And, as nations everywhere scramble to obtain the oil which is still available, the costs of this fuel have become exorbitant.

Many Americans have taken our abundant energy supplies for granted. However, the recent gasoline shortages and the increased costs of fuel serve to dramatize for us all just how serious our energy problems have become. These problems demand that our government establish a comprehensive national energy policy that makes sense—and protects our future.

Unfortunately, we have failed to achieve a clear consensus as to just what that policy should be. It seems as if for every group proposing one solution, there is another group opposing it—both sides pointing to conflicting facts and figures in an attempt to protect their own interests. The result has been public confusion on energy, an absence of hard decisions by government officials who too often try to placate those who are loudest in voicing their opinions, and a continual drift toward the day when there simply will be no time left for future planning.

One thing is certain about our energy future. The decisions which we make now will have a profound effect on each and every American for generations to come. Our chances to achieve economic and social progress—as individuals and as a nation—will be directly determined by whether or not America has sufficient energy. A national energy policy must be established which considers the nation's *total* welfare, rather than the interests of any single group or region, and which weighs the overall risks and benefits of each energy option against the greater risk of insufficient energy.



One way for each of us to make certain that a sound national policy is established is to become informed about energy issues and to *participate* in the debate. This booklet is designed to help each of us do just that. It provides an overview of the context of the energy debate, focusing particularly on one of the most controversial energy issues–nuclear power.

Our ultimate future will best be determined by an aware, informed—and committed—public willing to express its viewpoint on energy.

THE NEED FOR ENERGY

"There is no single solution to the energy crisis. To wean America from its costly oil habit will require many steps. They will not be easy or painless, but the nation must start to take them now, or the crisis will get worse."

Newsweek, 7-16-79

For most Americans, our nation's "energy crisis" has consisted of short-term shortages and escalating prices. However, the real dilemma facing us, as well as most nations, is a world-wide depletion of the fuels on which we have become dependent.

OIL: Unacceptable Dependence

First, consider the sources from which Americans get energy: petroleum—49%, natural gas—25%, coal—18%, nuclear—4%, and hydro—4%.

Then consider that by the year 2,000, U.S. resources of oil will be seriously depleted. In addition, by 1990 the U.S. government, *by law,* will prohibit the use of natural gas in domestic power plants.

On top of this, our need for energy will be growing at a rate of between 1.5% and 2% every year.

Not only are supplies of oil declining, but we must consider how the remaining supplies are going to be used. Oil is an essential component of many valuable products like medicines, plastics, fertilizers, and synthetic fabrics.

Finally, our over-reliance on oil has caused severe political and economic problems since America has allowed itself to become dependent upon foreign supplies of this fuel. While importing nearly half the oil we use, America's predicament is evidenced by the fact that during the past ten years alone, we have increased our annual payments for imported oil from $1.3 billion to $60 billion. And, at recent rates of consumption, continued reliance on oil would require the U.S. to import 12 million barrels of oil a day by the year 1983—an amount 50% above the current level of imports.

The need to reduce our dependency on foreign oil is obvious to most Americans. President Carter has declared that the U.S. will cut its oil imports almost in half by 1990. In order to reach that goal, Americans not only will need to reduce the amount of oil and gas currently being burned as boiler fuels, but also find new ways to meet our ever-growing energy requirements in the decades ahead.

At present, several options exist for meeting our energy requirements.

Conservation

While the bulk of energy usage in America goes to meet the basic needs of a healthy industrial society, in many respects we have been gluttons in our everyday use of energy. Hence, conservation must become a part of our nation's approach to our energy problems. Yet, as our population continues to grow, so too, do our consumption rates.

Our consumption of electrical energy alone is expected to grow at an annual rate of about 4%. And the fact remains that we can save only so much through conservation. The federal government has estimated that even if we maintain a

vigorous national conservation program at all levels and walks of life, we *might* be able to limit our energy growth to 1% per year–which means we would still need 20% more energy by the turn of the century!

While conservation must become a way of life. it is only a small part of the answer to the challenge we face.

Coal

America has a vast abundance of coal—enough to last us several hundred years at current rates of consumption. It provides us a reliable energy source and can help cut our dependence on costly oil imports. It also will serve increasingly as the principal feedstock for synthetic fuels. Obviously we must take greater advantage of this important domestic resource.

President Carter's energy program calls for using 60% more coal in 1985 than today. With the removal of regulatory obstacles that impede greater production, transportation and use of coal, and barring unreasonable governmental or legal delays in the start-up of new mines, the coal industry will have sufficent mining capacity to meet that national goal.

To do so, however, also means giving a higher priority to coal production from federal lands. And it means removing environmental constraints that lack a reasonable cost-benefit justification. Already the Clean Air Act requires that new and expanded coal use be carried out in a most environmentally sound manner. In fact, new coal-fired electric plants will be cleaner that most existing oil-burning plants.

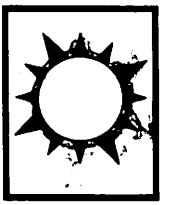
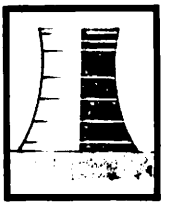
Coal is not without potential problems arising from large-scale coal combustion, but they can be controlled. Therefore, we should keep all energy options open, and recognize that devising a risk-free society is impossible.

Our position should be clear: We need coal and nuclear, working together, to get us through the end of the century—until that time when renewable resources become available, economic and safe.

Solar

Solar energy undoubtedly holds great promise for America's energy future. The President has established a goal of 20% solar contribution, which includes hydroelectric power, to the nation's energy needs by the year 2000. To meet this goal, the President has submitted to Congress a $1 billion solar budget calling for incentives, tax credits, loans and grants, support activities, model building codes, and information programs. He has also called for the establishment of a Solar Bank to help finance solar investments in residential and commercial buildings at reasonable terms.

Every initiative designed to increase the availability and use of solar energy is desirable. However, the realities of present solar technology are such that it will

be only marginally helpful to our total energy situation over the next 20 years. Unfortunately, many who advocate solar power as *the* answer to our energy problems confuse the availability of solar power for heating and cooling buildings with the availability of solar technology to generate electricity. *Technology to generate electricity from the sun economically is still a long way off.*

On the one hand, it is realistic now to apply solar power for home heating and cooling. It is available today and can be made more attractive to consumers through economic incentives and loans. On the other hand, solar power is not yet a viable option for large scale generation of electricity. Two of America's pioneers in solar research, University of Arizona Professors Marjorie and Aden Meinel, have concluded, "It would be folly to cripple any existing energy capability in anticipation of the imminence of solar energy."

Nuclear

For more than 20 years, Americans have depended on nuclear energy. Currently, nuclear plants furnish 12% of this country's electricity. In some areas nuclear power is even more important. Chicago, for example, depends on nuclear energy for over 50% of its electricity. New England is also more dependent upon nuclear for its electrical needs than other parts of the country.

During 1978 alone, America's nuclear power plants produced energy equivalent to nearly 1.4 million barrels of crude oil a day—or enough gasoline to fuel 17 million cars for a year.

Nuclear power costs less than other sources of electrical energy. During 1978, generating electricity from oil-fired plants cost about 2½ times more than from nuclear plants. The cost from coal was about 50% higher. These higher costs of non-nuclear energy are passed on to the consumer.

Also, supplies of electricity can be assured using nuclear power because the uranium reserves in this country are adequate to fuel all the reactors now in existence—as well as those planned for construction between now and the year 2000—for their entire lifetime.

In addition, the American Medical Association, the World Health Organization and other organizations have clearly endorsed the health and safety record of nuclear power.

Thus, one answer becomes clear. The ability of nuclear power to meet part of this country's needs is proven. Nuclear generated electricity is available now—at a reasonable cost.

THREE MILE ISLAND

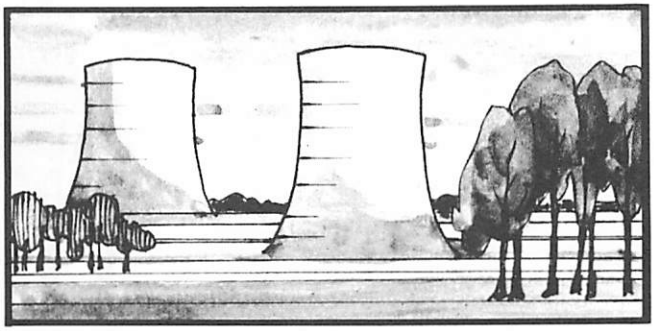
"As the Kemeny Commission implicitly recognized, there is simply nothing in the record of the last 25 years that would justify closing down 13% of the nation's power generating capacity. Indeed, there is nothing to suggest that there should not be further expansion of nuclear power generating capacity with the application of further recommended safeguards."

The Wall Street Journal, 11-1-79

During 20 years of operation, nuclear power plants have had an unsurpassed safety record: no member of the public has ever been harmed by the operation of nuclear plants. Yet the accident at Three Mile Island was the worst in the history of the U.S. commercial nuclear industry. Still, no member of the public was harmed. However, there *were* valuable lessons and experiences gained from that occurrence, and the industry has responded openly, quickly, and enthusiastically to those challenges.

Immediately following the incident at Three Mile Island, President Carter appointed a Commission on the Accident at Three Mile Island, popularly known as the Kemeny Commission, to assess what actually occurred and to make recommendations for the future of nuclear safety. Perhaps the chief conclusion of the report was that the personnel charged with operating the reactor had erred. This led to some general conclusions about the quality of industry training procedures and pointed to the need for improvements. The nuclear industry's response to the findings of the Kemeny Commission is strongly supportive—and the industry has moved effectively to strengthen and improve manpower training procedures.

For example, even before the President's Commission issued its report, the industry had already established a Nuclear Safety Analysis Center to undertake a systematic method of gathering, reviewing, and analyzing nuclear plant operating experiences. In addition, an Institute of Nuclear Power Operations had already been created to oversee, develop, and ensure plant safety. The Institute will establish benchmarks of excellence and require more sophisticated skills for all reactor operators.



After all is said and done about Three Mile Island, however, it must be recognized that the plant's redundant safety systems, which are similar to those designed for all U.S. nuclear power plants, *worked.* The ultimate safety system is a concrete containment structure several feet thick. Within this containment is the steel pressure vessel, which can be nine inches thick. The containment is designed to withstand stresses—such as floods, earthquakes and tornadoes—with particular emphasis on those conditions which might be unique to the local environment. And at the Three Mile Island accident, the containment did exactly what it was intended to do: it prevented the release of significant amounts of radioactive material into the atmosphere.

While there were immediate concerns about the small amount of radioactive materials that were released at Three Mile Island, the event must be viewed in the context of radiation levels routinely encountered from both natural and man-made sources. Indeed, it has now been determined that the average dose of radiation received by the average person living within a 50-mile radius of Three Mile Island was just over half that received by a person during a jet flight across the U.S. Thus, exposure for the average person was equal to that which thousands of travelling Americans receive each week—and about one-third of that received weekly by the typical American from all other sources in the environment. Indeed, the *American College of Obstetricians and Gynecologists, as well as the American College of Radiology, have concluded that there is no evidence of any adverse health effects from the small amount of radioactive material released at Three Mile Island.*

One thing remains certain: what happened at Three Mile Island does *not* justify a halt to nuclear power development, especially at a time when America needs all the power it can get. The system worked. And we've moved to make it work even better.

RADIATION

"Those who seek to reduce cancer caused by radiation would achieve more by curbing the unnecessary use of medical x-rays than by eliminating nuclear power."

The New York Times, 5-6-79

"The radiation associated risk of living at the site boundary of a nuclear power plant for five years is equal to "drinking 30 cans of diet soda (over those five years)... smoking 1.4 cigarettes... or living with a cigarette smoker for two months."

Dr. Richard Wilson, Physicist, Harvard University
2-79, Technology Review

One of the most significant roadblocks to the development of nuclear power is widespread public misunderstanding of radiation. Despite the fact that radiation has been the subject of intense scientific scrutiny for eighty years, the general public remains largely misinformed about the various types of radiation, the benefits or risks of each type, and the effects of the radiation associated with various sources of energy.

Indeed, the misconceptions and misinformation run so deep that the very word "radiation" generates intense fear in the minds of many people. For example, most of us associate radiation with the devastation that can be wrought by military weapons; few of us think of the medical benefits which radiation long has provided us. Unfortunately, this confusion often inhibits us from making a realistic appraisal of the radiation risks associated with nuclear power.

Radiation is a natural part of the world in which we live. It comes from the sun, the earth, many appliances and consumer items, building materials in our homes, and even our own bodies. The average overall exposure each American receives from these sources of radiation is estimated at 200 units (or millirems) each year. In contrast, the National Academy of Sciences has recently concluded that during a single year a nuclear power plant is responsible for the release of only one to two additional units of radiation into the atmosphere. Even during the recent incident at Three Mile Island, the average person living within a 50-mile radius of the plant was exposed to only about 1.5 units of radiation—less than a person receives from living one year in a house of brick construction, due to the radioactive materials found in brick.

What are the health effects of this exposure to radiation? During the last 50 years, particularly in conjunction with the growth of the nuclear power industry, many scientific groups have studied the effects of these levels of radioactive materials released into our environment. Significantly, every independent scientific organization—including the National Academy of Sciences and the American Medical Association—which has studied the issue has concluded that low levels of radiation, especially those associated with nuclear power plants, present *no observable health effects.* They also conclude that the amount of radioactive materials released from nuclear power is comparable to or, in many cases, sig-

nificantly less than those from other sources of electrical generation, such as coal-fired plants which also routinely emit some radiation.

Interestingly, large variations in the amounts of radiation that people receive from many sources have shown no adverse health effects either. For example, in this country natural background radiation exposure (from the sun and earth) varies from 75 to 225 units depending on geographical location—the higher the elevation, the higher the exposure level. If the one to two units of radiation released from nuclear power plants had an adverse effect, people living in higher elevations would have dramatically higher levels of cancer or genetic disease than those living in lower elevations. However, the exact opposite condition exists. People living in Denver, which has a high elevation and thus higher exposure to background radiation, have *lower* rates of cancer and genetic defects than people living in lower elevations. In fact, residents of Colorado receive an annual dose of radiation which is about two times higher than that of people living in Pennsylvania. Yet the rate of new cancer cases per year in Colorado is about seven times lower than that in Pennsylvania.

The conclusion is clear: if variations between 75 and 225 units of exposure to radiation show no measurable health effects, the additional 1 to 2 units from the routine operations of nuclear power should have no measurable effect either.

All nuclear plants are equipped with redundant safety systems... system on top of system on top of system... designed so that if one fails, another system is there to back it up. The "ultimate" safety system, assuming that everything else fails, is the containment itself—a thick, steel-reinforced concrete structure that serves one main purpose—to prevent the release of any harmful amount of radiation into the environment. This containment structure is one of the sturdiest and most resistant structures built. Many, depending on the plant's location, are designed to withstand the crash of a commercial aircraft. The containment structures have design specifications that make them impenetrable to objects that might become missile-like during tornadoes or other natural disasters. The containment structure at the Trojan nuclear plant in Oregon is designed to maintain its integrity in the case of a complete break in the Grand Coulee Dam. All containment structures must withstand the effects of the most severe earthquake that could be postulated in the area. In short, the existence of a containment structure provides the most effective and, in effect, "the ultimate" safety system.

While all of us remain aware of the effects of radiation, and continue to be alert to studies dealing with any of its consequences, we must likewise consider the issue in its total perspective. No one has yet suggested that jet travel be curtailed or brick houses be banned because of their radiation hazards. The radiation risks of nuclear generated power must be weighed against its enormous benefits. Our country already depends on nuclear power for 12% of its electrical energy needs. Some areas, like Chicago and the New England states, are using nuclear power in even greater proportion.

The effects of radiation will always be a consideration as we look towards this country's future energy needs. However, when put into a realistic, and factual, perspective, the effects of low level radiation associated with nuclear power plants have been proven negligible. And those effects hardly compare to the benefits nuclear power is already providing our society.

WASTE DISPOSAL

"Successful isolation of radioactive wastes from the biosphere appears technically feasible for periods of thousands of years..."

The President's Interagency Review Group on Radioactive Waste Management, Oct., 1978

Another issue associated with nuclear power development which concerns many people is what to do about the disposal of nuclear waste materials? This aspect of nuclear power is also one that is widely misunderstood.

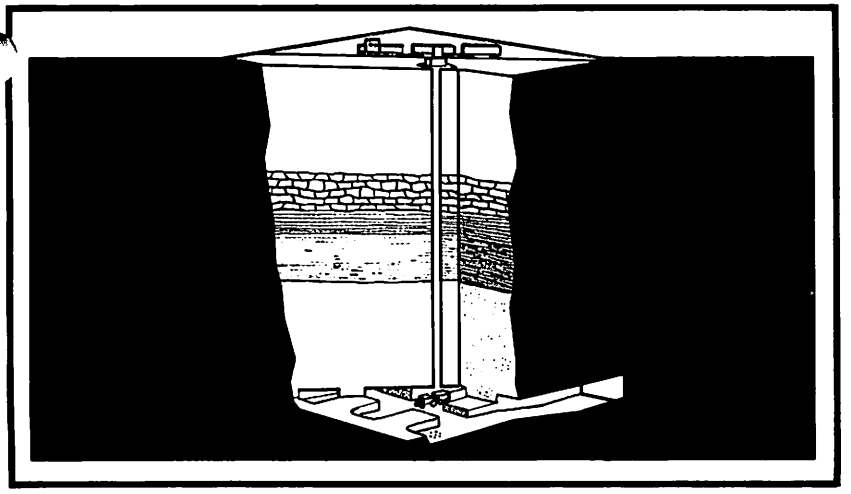
As of this time, our government has not adopted a final, formal policy to guide the safe disposal of nuclear wastes from either the military weapons program or the commercial nuclear power program. Despite the lack of a firm policy, there *are* safe methods for disposing of this waste. We know how to do it—but we are still awaiting a decision by the government as to which of several potential solutions will be adopted for America.

One thing is certain: several other industrialized nations have already undertaken significant steps in this direction, for they have all recognized the economic benefits of increased nuclear power usage and are moving forward with its development.

One solution is preferred by most experts and favored by most other nations today. Here's how it works:

—Once the fuel has been used at a nuclear power plant, it undergoes a chemical separation process in which most of the leftover fuel is recycled for future use. The remaining waste is then converted to solid form in a glass-like material similar to a pyrex dish.

—This small amount of material is then sealed in stainless steel containers that are then transported to a federal repository in heavily shielded casks



that are strong enough to withstand the most brutal of accidents—from a collision with a diesel locomotive traveling at 80 miles per hour to hours of submersion in jet fuel fire.

—The containers are buried thousands of feet underground in a geologic formation that is proven to have been stable for millions of years. The U.S. Geological Survey already has identified several such sites within the United States that would be acceptable.

—Once buried, these wastes will have been effectively removed from our environment for as long as the materials are hazardous.

Each stage of this process has been proven feasible and safe over the years. Several countries outside the United States, primarily France and Canada, have been reprocessing and solidifying wastes since the 1960's and testing them under a variety of circumstances. America has long had the knowledge and technology to drill holes deep underground and seal them; some industries do it routinely. Finally, the geologic formations that have been identified can be proven to have been stable for millions of years. Yet, after about 1000 years (a very short geologic time period), the wastes will have decayed to a level of toxicity equal to the uranium originally mined from the earth to produce the nuclear fuel.

Thus, this process, which combines both technical and natural barriers, guarantees that the wastes will be effectively removed from our environment for as long as the materials are hazardous.

Finally, with all of the debate over the nuclear waste "problem," one important perspective is often overlooked: the amount of waste produced by nuclear power is exceedingly small. Consider that just one nuclear power plant supplies the total electrical energy needs of *750,000* Americans for one year. Yet the volume of high level radioactive waste that is produced amounts to only a four-foot cube.

Other nations are moving forward with nuclear power because their leaders realize that continued dependency on foreign oil is unthinkable. Their energy policies are based on the premise that *all* practical alternative sources must be developed—coal, solar, geothermal, and nuclear.

Solutions to the safe disposal of nuclear wastes exist. What is *really* needed is a willingness on the part of our nation's leaders to decide which solution is best for America—so we can get on with the task of developing our energy resources.

WHAT CAN BE DONE

With the social and economic well being of every American at stake, Americans everywhere need to become participants in the debate which will shape this country's energy future for years to come. This debate is fraught with controversy, misperceptions, and misinformation. Hence, it is important that we all become sensitive to the issue, keep ourselves well informed, and be willing to express our viewpoints to others. Only in this way will our nation's leaders hear how vitally concerned we, as individuals, are that America resolve these questions quickly and move on to a more secure, self-sufficient energy future.

BE INFORMED. It is difficult to stay abreast of the various positions put forth on the energy issue. However, by making an effort to listen to those of substantive background and real experience with the issue, it is possible to be well informed.

TALK TO FRIENDS AND NEIGHBORS. Be willing to discuss this current subject with friends and associates. Get their opinion. Give yours. Remember that only a well informed and articulate public can influence decision makers in a positive manner.

URGE OTHERS TO BECOME INFORMED. Encourage local civic groups and service clubs to plan meetings and programs devoted to this subject. Invite spokespersons who can address the issue and present evidence which will stimulate others to be aware of America's energy needs.

TALK TO ELECTED OFFICIALS. Be willing to take a stand. Write a letter. Call a local official. Make a point to have your views heard by those who will be the decision makers on this important question.

There is an abundance of information available on the question of America's

energy future. For any further facts on nuclear power, nuclear reactors, or safety operations, please feel free to write to the Edison Electric Institute.

It is through lively, critical self-examination that the best policies will be developed for America's energy future. The nuclear industry is now undertaking such a process. We welcome your participation.

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