REFLECTIONS ON THE ENERGY CRISIS

A Statement
by the
Committee on
Social Development
and World Peace

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Photo by Paul Conklin

I. INTRODUCTION

The fading of the petroleum age disquiets the entire world. Cheap oil and natural gas not only powered the dramatic transformation of Western society in the 20th century, they underlie much of the material progress developing countries have made. Now it is only a matter of time until oil and gas production peaks and starts to drop.[1] In the years ahead, the nations of the earth, both rich and poor, must learn to conserve what supplies they can obtain. They must also find some way of switching over to dependence on alternative sources of energy without sinking into economic chaos.

The United States cannot ignore this imperative. Almost half the energy we use comes from oil and 40 percent of this oil is imported.[2] The abrupt price surges of recent years, besides affecting consumers directly, have contributed heavily to inflation and unemployment. Middle-class families find their budgets increasingly tight, while the poor are faced with the terrible prospect of choosing between fuel and decent clothing, fuel and health care, even fuel and food. Clearly, energy costs will prove to be a growing burden to millions of our people.

Moreover, the American economy is frighteningly vulnerable to outright disruption. The embargo of 1973-74 and the more recent war between Iran and Iraq demonstrate that the nation lacks reliable access to foreign petroleum. If the flow of oil from Africa and the Persian Gulf were suddenly cut off, the production of goods would shrink, jobs would disappear and the delivery of necessary services would be hampered.[3] Under such circumstances, those who have less would presumably suffer more. In a competition for scarce energy and for reduced goods and services, only the wealthy could win.

Because of its economic and political power, the United States bears a responsibility to the international community as well as to its own citizens. There are few greater gifts we can offer the people of other lands than openhearted cooperation in the effort to develop a global policy to bring about future energy security. This duty takes a special moral urgency from the fact that America is the leading energy consumer. A half-century of plentiful oil has made us careless; we waste what other countries need.

Our power can be as much a force for evil as for good. Should we fail to help the world toward security, we increase the chance that we will lead it to destruction. In the absence of well-developed alternative systems, what happens when the oil and gas run out? Even before the wells dry up, what happens as global supplies dwindle and prices soar? Even before supply problems become acute, what happens if there is another, longer embargo or if turmoil engulfs the OPEC nations? Early in 1980, the president of the United States asserted America's readiness to defend its vital energy interests with force. The black seed of the final holocaust may lie beneath the sands of the Middle East.

II. THE MORAL DIMENSIONS OF ENERGY POLICY[4]

The threat of war, the danger that scarcity poses for the poor — such considerations are reason enough for the church to take part in the national discussion of energy. Further, energy is one of those touchstone issues like arms control or the limits of federal power whose resolution will profoundly affect society in the 21st century. Unless some new perspectives are brought to bear, decision makers will have little to rely on but the hard and rather narrow analytical tools that have guided energy development in the past. In his first encyclical, *Redemptor Hominis*, Pope John Paul II said: "The development of technology and the development of contemporary civilization, which is marked by the ascendancy of technology, demand a proportional development of morals and ethics. For the present this last development seems unfortunately to be always left behind" (no. 15).

The present statement offers no solutions to the swirling controversies that surround the formation of energy policy. It constitutes an invitation, not a pronouncement — an invitation to further study, to conscientious judgment, to prudent action at all levels. At the same time, it seeks to situate energy issues in a moral context, to arouse sensitivity to human considerations that are often ignored. Catholic social teaching suggests certain clear principles that should be borne in mind as Americans, remembering their brothers and sisters in other nations, strive to adjust to a world where oil and natural gas are no longer readily available.

MORAL PRINCIPLES

1. Upholding the right to life: It is clear that no overall energy strategy is free from risk to human life. Claims that there is a completely safe option are illusory; the choice is not between black and white but among shades of gray. Furthermore, a given policy can threaten life in various ways. For example, developing energy source A may consign miners or local residents to death, while failing to develop it may indirectly kill others if supply falls short of essential demand.

The church recognizes these sad facts. It is deeply committed to the defense of human life, however, and this commitment is uppermost in its approach to energy. Energy planners and those in authority must do all in their power to safeguard human life. They must especially avoid exposing people to danger without giving them the opportunity to accept or reject that danger. As the bishops gathered at the Second Vatican Council said:

"At the same time, however, there is a growing awareness of the exalted dignity proper to the human person, since he stands above all things and his rights and duties are universal and inviolable. Therefore, there must be available to all people everything necessary for leading a life truly human, (including) the right . . . to (required) information, (and) to activity in accord with the upright norm of one's own conscience . . . . Hence, the social order and its development must unceasingly work to the benefit of the human person if the disposition of affairs is to be subordinate to the personal realm and not contrariwise" (*Gaudium et Spes*, 26).

2. Accepting an appropriate share of responsibility for the welfare of creation: Judeo-Christian tradition views human beings not in isolation but as part of a larger whole — as creatures in the midst of creation. This tradition counsels respect for the natural world, emphasizing that we have duties as well as rights in its use. Since we derive all our energy from nature, the relationship of humanity and environment has the broadest implications for energy policy.

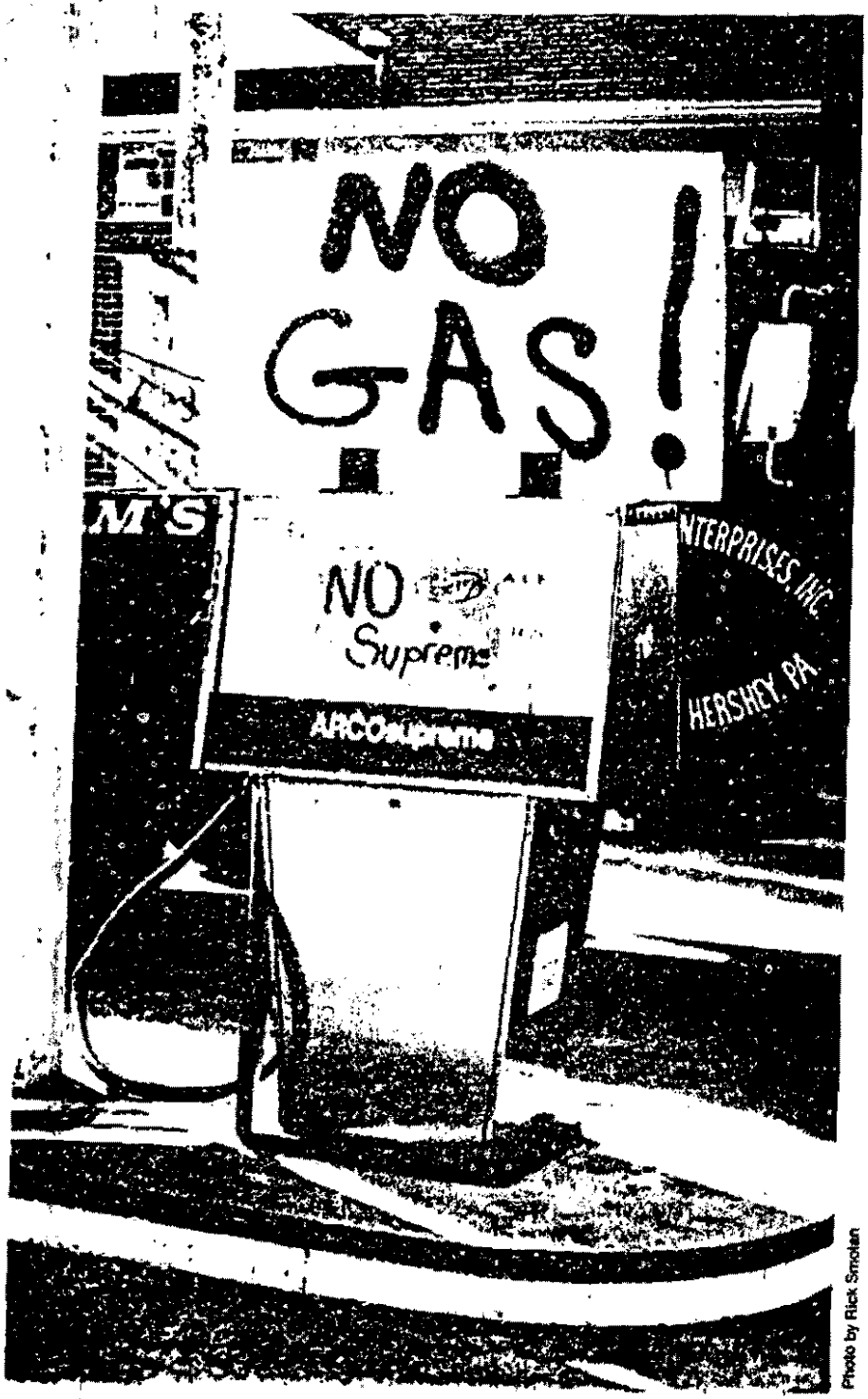

Photo by Rick Smolan

In the religious community, this relationship is often described as "responsible stewardship"; we are stewards to whose care the Master has entrusted his creation. The technological strides we have made since World War II require a sharpening of that concept. The human race has the capacity to alter nature, even to destroy it, and the scope of our responsibility grows with the scope of our power. We are no longer called upon simply to tend the garden God has given us. It is now in our hands to determine whether our descendants will inherit an earth capable of sustaining them.

This awesome responsibility has led some analysts to advance the notion that humanity is an intruder in nature; they advocate extreme measures, including methods of population control that are destructive of liberty. There is no question that in our present state of knowledge we cannot obtain adequate energy supplies without imposing some costs on the environment. But surely our response should not be to alienate ourselves from nature, to spurn the gifts God has given us. Pope John Paul gave the context in which we should approach the task of designing an ecologically sound energy program when he declared that "exploitation of the earth . . . and the uncontrolled development of technology outside the framework of a long-range authentically humanistic plan often bring with them a threat to our natural environment . . . and remove us from nature. Yet it was the Creator's will that humanity should communicate with nature as an intelligent and noble master and guardian, and not as a heedless exploiter and destroyer" (*Redemptor Hominis,* 15).

3. Accepting limitation in a Christian spirit: When a certain young man questioned Jesus on what he should do to be saved, Jesus advised him to sell what he had, take up his cross and follow. The young man "went away sad, for his possessions were many" (Mt. 19:16-22). If preservation of the common good, both domestic and global, requires that we as individuals make sacrifices related to energy use, we should do so cheerfully. Americans have become used to the idea that rapid economic expansion is an unqualified, even inevitable good. Future resource restrictions may force us to rethink our expectations; they may even lead to substantial changes in our way of life. Insofar as these adjustments affect excess possessions, we should welcome them. They are a blessing.

Adopting this attitude will free us to face the energy situation with hope. God did not put us here to build up his kingdom only to strike the requisite tools from our hands. The problems that close us in can be solved if we will seek the right solutions. This means rising above a preoccupation with material gain.

4. Striving for a more just society: The energy debate is not about

abstractions and statistics. It is about war and famine and suffering; its content is the struggle against cold, against dark, against isolation. The energy policies we choose must reflect a search after justice for all, not only on the level of individual rights but also with regard to the structures of society.

Catholic social teaching has touched on these themes time and again. *Gaudium et Spes* declares, "Meanwhile that conviction grows . . . that it devolves on humanity to establish a political, social and economic order which will increasingly serve people and help individuals as well as groups to affirm and develop the dignity proper to them" (no. 9). Pope John XXIII, in sounding a similar note, emphasized that every human being is spirit and body, multifaceted, born to pursue a varied perfection. His words in *Mater et Magistra* remind us that economic considerations impinge on the development of energy policy in more ways than one. The desire for economic justice must dominate.

" 'National wealth' — as our predecessor of happy memory, Pius XII, rightfully observed — 'inasmuch as it is produced by the common efforts of the citizenry, has no other purpose than to secure without interruption those material conditions in which individuals are enabled to lead a full and perfect life. . . . For the system whereby both the common prosperity is achieved and individuals exercise their right to use material goods, conforms fully to norms laid down by God the Creator.' From this it follows that the economic prosperity of any people is to be assessed not so much from the sum total of goods and wealth possessed as from the distribution of goods according to norms of justice, so that everyone in the community can develop and perfect themselves. For this, after all, is the end toward which all economic activity of a community is by nature ordered" (no. 74).

Finally, Pope John Paul teaches in *Dives in Misericordia* that the spirit of justice must be perfected by the spirit of mercy. "Certainly, the Second Vatican Council also leads us in this direction when it speaks repeatedly of the need to make the world more human and says that the realization of this task is precisely the mission of the church in the modern world. Society can become ever more human only if we introduce into the many-sided setting of interpersonal and social relationships, not merely justice, but also that 'merciful love' which constitutes the messianic message of the Gospel" (no. 14).

Public discussion of energy policy has been sharply polarized. Too often, advocates of a particular point of view refuse to even consider the arguments of those they oppose. It is difficult to see how these attitudes, the antithesis of fraternal charity, can help create a more just social order. The church would be false to its founder if it did not take up the cause of the oppressed. But it must also insist that justice is not to be

meted out to some and denied to others. Just as utility companies should not raise rates above the level needed to ensure a fair return for honest and efficient service, for example, consumers should not demand that rates be held below the same level.

5. Giving special attention to the needs of the poor and members of minority groups: The first Letter of John asks, "If someone who has the riches of this world sees his brother in need and closes his heart to him, how does the love of God abide in him?" (1 Jn. 3:17). As noted above, poor people, especially those with fixed incomes, will feel the sting of rising energy prices more keenly than their affluent neighbors. Moreover, racist attitudes may affect both price and access to supply. In circumstances where energy is essential to the maintenance of life, health or human dignity, there is but one course to follow. Private agencies and federal, state and local authorities must take whatever steps are necessary to ensure an adequate supply to people whom poverty or discrimination place at a disadvantage. No energy policy is acceptable that fails to deal adequately with basic needs.

No one will quarrel with the proposition that Christians cannot stand idly by while people freeze in their homes for lack of fuel. The church goes further in its advocacy for the poor, however. In "A Call to Action," Pope Paul VI outlines the attitude we should adopt toward those who suffer deprivation. He also shows why the poor should be singled out for special attention in dealing with the energy crisis.

"In teaching us charity, the Gospel instructs us in the preferential respect due to the poor and the special situation they have in society: The more fortunate should renounce some of their rights so as to place their goods more generously at the service of others. If beyond legal rules there is really no deeper feeling of respect for and service to others, then even equality before the law can serve as an alibi for flagrant discrimination, continued exploitation and actual contempt" (no. 23).

Our concern for the poor must extend beyond America's borders. Domestic policy, far from imposing burdens on the economies of other nations, should be consistent with the goal of promoting sound development throughout the world.

6. Participating in the decision-making process: Fairness requires that groups and individuals representing a broad spectrum of opinion have an opportunity to take part in formulating energy policy. Even local energy decisions often involve danger to life and health, and national ones can have major economic effects and can help determine the patterns of power in society. The stakes are too high both practically and morally for the ordinary citizen to ignore the processes through which such decisions are reached.

Given the inequalities that pervade American society, fairness may also require active assistance to those whose voice is rarely heard in policy discussions. Pope Paul's words in "Justice in the World" describe the situation well:

"Unless combated and overcome by social and political action, the influence of the new industrial and technological order favors the concentration of wealth, power and decision making in the hands of a small public or private controlling group. Economic justice and lack of social participation keep a person from attaining basic human and civil rights" (no. 9).

The principle of subsidiarity, as outlined in *Quadragesimo Anno* and reaffirmed in *Mater et Magistra,* is relevant to any discussion of citizen participation. In general terms, the principle holds that social functions that can be performed by an individual should not be transferred to a group, and that functions that can be performed by a smaller "collectivity" (the local community, for example) should not be transferred to a larger "collectivity" (state or, at the next stage, federal government). Pope Pius XI gave the reason: "Inasmuch as every social activity should, by its very nature, prove a help to members of the body social, it should never destroy or absorb them" (quoted in *Mater et Magistra,* 53). In order for energy decisions to be broadly based, they must be taken in accessible forums.

COMMITMENT

These principles are offered as a framework for moral reflection and action regarding energy policy. They are lenses through which such policy can be examined, benchmarks by which it can be judged. However, the principles have their limitations. Because they are general, different people will reach different conclusions when applying them, say, to nuclear power or coal use. The element of informed individual judgment remains critical. In the same way, the principles cannot move anyone to take Christian morality seriously in grappling with energy. That is a matter of faith, a matter of religious commitment.

Our redemption makes us capable of seeking just, generous and loving solutions to the problems we face. But we are too sinful, too given to selfishness, to pursue this difficult search without a conviction that all humanity is one in Christ. Pope John urged his readers in *Pacem in Terris,* "in the light of their Christian faith and led by love, to ensure that the various institutions — whether economic, social, cultural or political in purpose — will be such as . . . to facilitate or render less arduous humanity's self-perfection in both the natural order and the supernatural" (no. 146). Jesus, in St. John's account, spoke more simply:

Photo by Kenneth Murray

"As the Father has loved me, so I have loved you. Live on in my love. You will live in my love if you keep my commandments, even as I have kept my Father's commandments and live in his love. All this I tell you that my joy may be yours and your joy may be complete. This is my commandment: Love one another as I have loved you" (Jn. 15:9-12).

III. MAKING THE TRANSITION: SOURCES OF ENERGY

As annoying as they may be, gas lines and temporary crimps in the supply pipeline are not the "energy crisis." Even our reliance on oil imports is only one element in the crisis. The fundamental problem, simply put, is the need to effect a transition from primary dependence on oil and natural gas to primary dependence on something else in the fairly near future.

From the moral perspective just presented, it makes a great deal of difference how this transition is handled and where it leads. Will the development of alternative sources of energy contribute to a just society in which access to the necessities of life is universal? Will it reduce the risk of self-destruction through war that competition for energy supplies now poses? Will it help balance the need for economic development with the need for environmental integrity? Can it be a creative force in shaping a more hopeful future than the world seems to face today? In the remaining years of this century, the human community will answer these questions for better or worse.

CONVENTIONAL OIL AND NATURAL GAS

This nation will not wean itself overnight from oil and natural gas. Great disruptions would result if it tried. America moves on petroleum; with minor exceptions, our entire transportation system is bound to it. Moreover, large-scale technologies cannot now use any substitute energy source except coal or nuclear fission, and conversion takes time and money.

Not only will the United States continue to burn conventional oil and gas, it will continue to trade on the world oil market. Ideally, this trade is good. If governed by fair cooperative arrangements between oil producers and importers, it serves as a reminder of the interdependence of nations and benefits all. As noted above, though, many considerations make a sharp decrease in our use of foreign oil desirable. Such a step can even be seen as an act of justice toward importing countries struggling to develop their economies.[5]

American imports have dropped significantly since 1977,[6] and there

seems to be room for further improvement. Even though domestic oil production has apparently peaked, industry can contribute by searching for new strikes and employing new techniques for forcing more crude from old wells. Such efforts have clear value.

Given the certainty that our resources are finite, however, oil production should not be overemphasized. Why pursue a policy that guarantees the early exhaustion of domestic supplies, especially when oil has certain uses (in the production of pharmaceuticals, for instance) that would be very difficult to replace? Without ignoring the need to produce for today's demand, it is prudent to begin identifying an alternative or mix of alternatives immediately. As long as oil remains our primary fuel, we are on a collision course with nature.

CONSERVATION

What to do in this dilemma? One response comes quickly to mind. Pope John Paul, in an address to the Pontifical Commission on Justice and Peace in 1978, said that "Christians will want to be in the vanguard in favoring ways of life that decisively break with a frenzy of consumerism, exhausting and joyless." Sadly, few Americans take such exhortations to heart and fewer still think of energy when they think of consumerism. Yet all people of good will do have a positive duty to conserve energy and to use energy efficiently under the conditions prevailing in the nation and the world. Those who have adopted simple styles of life deserve praise for their courage and commitment.

The duty to conserve will vary from individual to individual, depending on each one's health, economic status and other circumstances. For example, older people who set their thermostats too low run the risk of illness or death from a gradual decline in body temperature (accidental hypothermia). Those who live outside metropolitan areas do not have the option of switching to mass transit systems to get to work. Poor people are not in a position to weatherize their homes out of their own pockets. Conservation is a matter of judgment, informed by a lively conscience.

The recent downturn in gasoline sales and slowed growth in demand for electricity show that conservation has gained a certain momentum.[7] It is up to ordinary men and women to make sure that this movement remains strong. Most of us can take some of the small but important steps to save energy that citizens' groups, government agencies and others are constantly proposing. A striking statistic highlights the urgency of the need: More than 10 percent of the oil the entire world produces each day vanishes into the tanks of American cars.[8]

Relatively minor adjustments in the way we live can have only a limited impact of course. There are opportunities for conservation

throughout the economy. For example, much can be done in the industrial sector by "co-generating" electricity with process heat, recycling discarded materials, phasing in more energy-efficient equipment and procedures, and so on. State and federal governments can offer incentives for such innovations where sound economics does not dictate them. Government can also stimulate other wide-ranging improvements in America's use of energy. It can establish stringent performance standards for automobiles, buildings and other products; institute weatherization programs (thereby creating job opportunities as well); and, in general, guide the country in an orderly and sensible conservation effort.

Some shy away from conserving energy because it connotes sacrifice or because they suspect industry of exploiting the market for private gain. Such a response makes little practical sense. A barrel of oil that is not burned today is available for tomorrow; every act of conservation brightens our chances of making a smooth transition to reliance on alternative sources of energy. Conversely, a rejection of small sacrifices today could enforce large sacrifices tomorrow. It is not yet clear whether Americans will have to accept fundamental changes like abandoning inefficient suburban housing and shopping centers accessible only by car for efficient central-city apartments and stores served by mass transit. But such changes are certainly more likely to be necessary if we bury our heads in the sand.

COAL

Conservation only saves oil; it cannot replace it. Leaving aside the transportation sector, the leading alternative to oil is coal. About 75 percent of the coal we now consume goes to make electricity, with most of the rest consigned to industry.[9] It is tempting to increase coal production. America has abundant reserves of the mineral,[10] and the technology surrounding its use is well developed. Coal could become the key transitional fuel, bridging the gap between petroleum and renewable energy sources.

However, the advantages of accelerated coal production must be evaluated in the light of some very serious disadvantages. As the Appalachian bishops' pastoral statement "This Land Is Home to Me" points out, the history of coal is a tale of sweat, of suffering, of bloody conflict, of disease, of early death. Even today, miners lose their lives in accidents and black lung remains a crippling curse. New mining also threatens local residents. In Appalachia, it can lead to increased blasting, flooding and road damage. In the West, it can disrupt communities, turning them into overnight "boom towns." The economic and social health of some small towns and cities has already been shattered; these places are blazing a sad trail that many others may follow.

Environmental considerations loom large. First, strip mining has heavily damaged land and poisoned water supplies in the past; and recently enacted federal law has not yet effectively halted this devastation. Second, burning coal releases huge amounts of sulphur and nitrogen oxides and other pollutants into the atmosphere. The oxides can combine with water to create "acid rain," which is suspected of wiping out fish populations in lakes and damaging some crops.[11] More important, air pollution poses a danger to human health, killing thousands of people every year.[12]

The use of coal (and other fossil fuels as well) has been associated in recent scientific investigation with a darker, more shadowy threat than mining accidents or pollution. Combustion releases carbon dioxide and a buildup of this gas over time could affect temperatures worldwide in ways that are difficult to predict. Such a phenomenon could cause significant climatic changes, jeopardize food supplies by altering growing conditions in agricultural areas, perhaps even trigger catastrophic flooding by melting parts of the polar ice caps. No one is sure how great an increase in carbon dioxide levels would be necessary to produce such consequences or if they would happen at all. But it would be the height of folly to tamper in ignorance with the ecology of the entire planet.[13]

Unlike the question of conservation, the question of increased coal use does not present the Christian with a clear moral choice. As with many other issues related to energy, there are many gaps and uncertainties in the facts about coal. How great a risk does atmospheric carbon dioxide imply? What elements in air pollution are most toxic? How dangerous will contaminated rain be at higher levels of acidity? Moreover, the facts change over time. Until now, neither voluntary compliance nor federal requirements for pollution abatement have been notably successful.[14] Coal's supporters note, however, that future power plants will be designed to conform to rigorous emission standards and that promising new techniques to remove sulphur during combustion are being developed. The basis for moral judgment will shift as our knowledge improves.

The present state of affairs certainly calls for caution in accepting a more prominent role for coal in America's future. The church cannot ignore the benefits coal offers; it is an energy "cushion" that the average person might one day be very glad to have. But neither can the church ignore the attendant dangers to human health and the environment. If a commitment to coal is made, it should be balanced by a simultaneous commitment to improved mine safety and strict ecological and community-protection standards. To act otherwise is to seek a just end through unjust means.

NUCLEAR FISSION

Besides coal, the only developed and expandable alternative to oil for large-scale electrical generation is nuclear fission. It is based on a domestic resource, uranium, and could provide power for a very long time if the breeder reactor were perfected on a commercial scale. America already has a functioning nuclear industry, with some 70 plants in operation and another 90 under construction or cleared for construction.[15] Since atomic energy produces about 12 percent of our electricity nationwide,[16] the question is not whether to use it. Rather, we must decide whether to continue using it and, if so, whether to use more of it.

Nuclear power has been aptly described as standing at the center of an incomplete system.[17] The by-products of fission are hazardous radioactive wastes. These high-level wastes must be totally isolated from the environment for a very long time, and scientists disagree on whether that is possible in all cases.[18] There are also unresolved safety questions in the operation of nuclear plants, as the 1979 accident at Three Mile Island forcefully demonstrated.[19] The effects of low-level radiation on uranium miners and others is the subject of intense and confusing debate. Finally, the spread of nuclear technology here and abroad raises the specter of nuclear arms proliferation.[20]

As everyone knows, atomic energy is fiercely controversial. Many uncertainties surround this complex technology and both pro- and anti-nuclear advocates seem prone to exaggerated claims, creating an atmosphere in which rational public discussion is difficult. Under these circumstances, it is hardly surprising that individuals disagree in good faith on the course national policy should follow. Some favor shutting down existing nuclear plants; others press for a moratorium on licensing or construction; still others want to build new reactors while working to solve the problems implicit in the fission fuel cycle.

This controversy, which has been conducted largely in moral terms, will persist. It should be dominated by a concern for human life, both now and in the future, and by a desire to mold a just society where everyone has access to the necessities. According to one viewpoint, these principles support the continued development of nuclear energy. Failure to pursue the technology could eventually put the United States at a disadvantage vis-à-vis other nations in supplying power to its people. Abandoning the nuclear option altogether creates more immediate risks. Those who would close plants or forbid new ones must concretely demonstrate how conservation and alternative energy sources can provide for essential services.[21]

Without discounting such arguments, we should be aware that nuclear power's share in electrical generation remains fairly small. Our commitment to atomic energy could still be reversed through careful planning. This possibility deserves careful consideration. While nuclear energy is not evil in itself, it can do great evil. The consequences of a core meltdown or an accident involving "hot" wastes could be catastrophic, far outweighing any good society derives from the electricity fission could supply. It may be unwise to cooperate in the spread of nuclear technology through the world, despite the fact that many nations seek this technology. Finally, the effect that hundreds of nuclear plants and their stored wastes may have on our descendants must be taken into account. If the defenders of nuclear power are to prevail, they must be able to demonstrate its safety beyond reasonable doubt.

Because of the risks involved, people's right to participate democratically in decisions that affect them deserves special emphasis where atomic energy is concerned. The average person has the opportunity to vote for government officials, to speak up at public hearings and the like. However, some states have turned to a more direct and potentially more inclusive instrument for registering citizen opinion on nuclear power: the referendum. Industry advocates presumably have a financial advantage in putting their position before the public, but this advantage can be nullified through spending limitations. If fair referenda were held on such questions as the operation of nuclear plants or the disposal of wastes, the outline of a national consensus might emerge. At the very least, responsible leaders of various persuasions would have the chance to educate people on the choices they faced, helping dispel the mythology and reduce the tensions that cloud the nuclear issue.[22]

GEOTHERMAL ENERGY

Geothermal generating plants have been suggested as another substitute for facilities that burn fossil fuels, since in theory geothermal energy reserves are very extensive. But the contribution steam and water from the earth can make to our energy supply is limited by the fact that they can be tapped only in certain locations. They also entail heavy economic and environmental costs. Research into the possibility of drawing on geopressurized zones and on hot dry rock and magma formations may expand the potential of geothermal in the next few decades.[23]

SYNTHETIC OIL AND GAS

Electricity, of course, is only one form of energy and it is not suited to all tasks. Our immediate fuel crisis is largely a liquid-fuel crisis centered on transportation. As a result, the federal government is giving considerable attention to synthetic oil and gas derived from coal, oil shale, biomass and other hydrocarbons. The United States has massive stores of raw materials from which synthetics can be made.[24] Furthermore, the

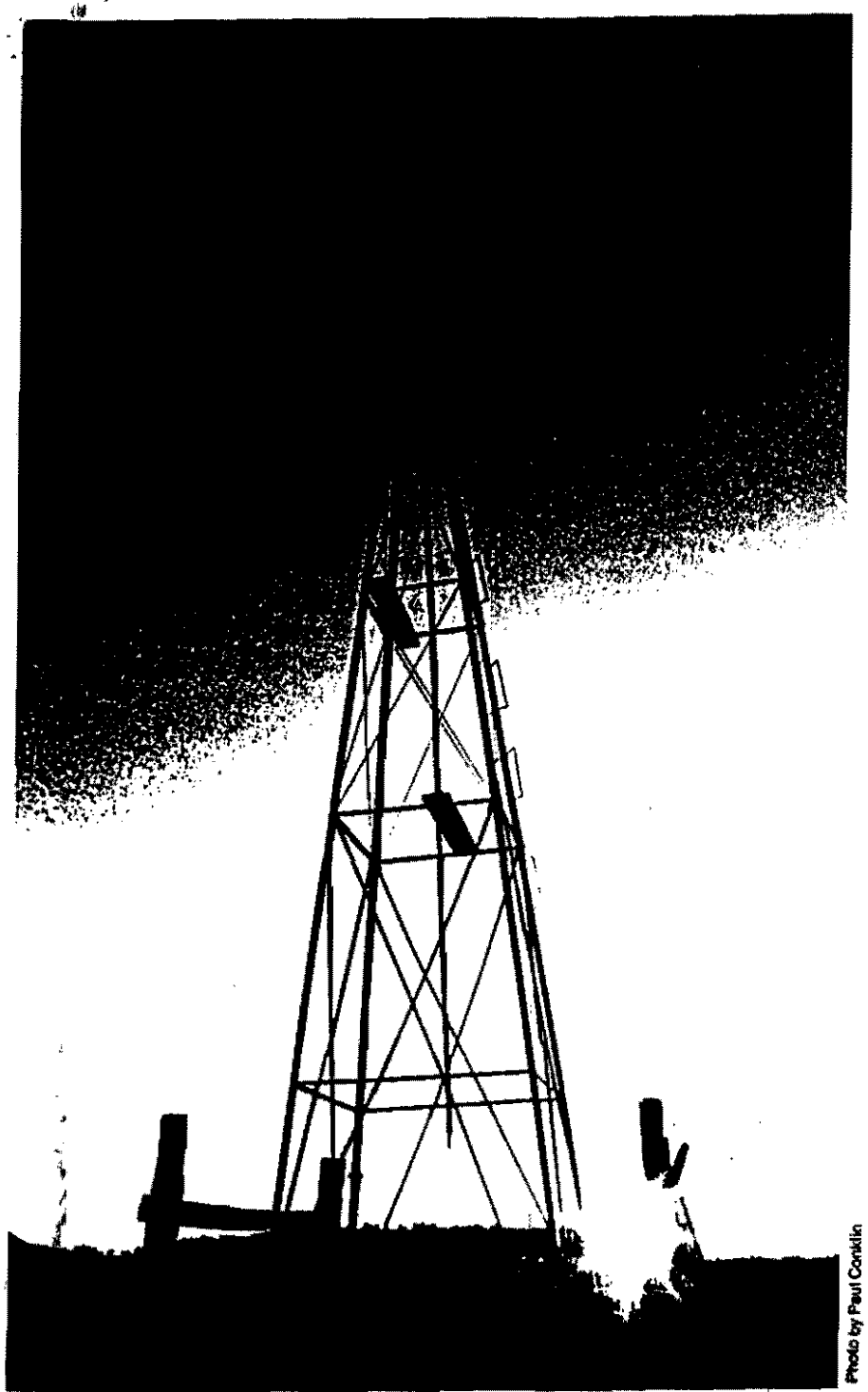

Photo by Paul Conklin

corporations that trade in conventional oil and gas can both produce and market synthetic fuels, using techniques related to those they presently employ.

The major emphasis today is on products synthesized from coal and oil shale. Unfortunately, most of the human and environmental problems associated with accelerated coal combustion apply in varying degrees to the liquefaction and gasification processes under consideration.[25] Manufacturing these substances also requires great quantities of water. In semiarid Western states, public officials would face some very hard choices between water for coal conversion and water for agriculture and home use.

Clearly, the moral concerns mentioned in connection with burning coal are relevant here as well. A serious disruption of our transportation system in the future could have a disastrous effect on millions of people and threaten the stability of the entire economy. However, the legitimate need to find a replacement liquid fuel should not make us less vigilant in protecting human life and environment. We will pay a price for fossil-derived synthetics, perhaps a heavy one. It would be irresponsible not to weigh the risks very seriously and not to examine any promising alternative technology before embarking on a massive "synfuels" program.

Proceeding with care should not cause excessive delay. At present, the United States has no commercial synthetic-fuel plants. Although the practicality of several liquefaction and gasification technologies has been demonstrated on a relatively small scale, further research will be required to develop the most desirable methods and to make sure that large-scale production is feasible.[26] While these economic and technical questions are being settled, we should also study the social and environmental implications of synthetic-fuel production, both for America and other nations. We will probably discover that we can have a synthetics industry. We must then decide whether we should have one.

SOLAR POWER

Given the severe difficulties they present, one cannot help viewing most energy sources with a touch of apprehension. By contrast, the general reaction to solar power is hope. (The term "solar power" includes energy from the sun; from wind, wave and falling water; and from biomass.) The sun is an inexhaustible fount of energy for a variety of purposes, with the probable exception of tasks requiring high heat — firing utility and industrial boilers, for example. Its effects on people and the environment are relatively benign.[27] Since some small solar applications are appropriate for use in poor as well as developed countries, we can render the whole human family a service by perfecting the relevant technology. Most important, solar power can help open the way to per-

manent energy security, pointing beyond the end of fossil fuels.

Hope centers on something yet to be realized. Hydroelectric generation is an established energy source and working solar units of various kinds are scattered throughout the country. But the rewards of solar power lie mainly in the future, partly for technical reasons and partly as a result of social, economic and institutional barriers. Moreover, since most solar technologies are still in an early stage of development, it is extremely difficult to predict their potential — or for that matter the unforeseen problems they may present. This accounts for much of the controversy surrounding energy from the sun. The value of pursuing the solar option is not in serious dispute. But analysts disagree vehemently on when various solar devices will come into general use and how strong a contribution they will make, individually and collectively, to our energy supply.[28]

The matter of timing is critical in a discussion of the transition period from primary dependence on oil and natural gas to alternative sources — roughly the next 20 or 30 years. Again, few would deny that the sun may provide a significant share of our power in the long run. Will it prove practical in the short run? The way different people answer this question helps determine their attitude not only toward solar but also toward the energy sources solar is intended to replace or supplement.

How quickly scientists and engineers can develop solar systems is a technical issue that does not invite moral reflection. However, two related considerations deserve stress. First, energy is a tool for fulfilling essential human needs. No energy policy is just which fails to meet these needs; that is the fundamental requirement. Those who question the near-term effectiveness of some solar devices, therefore, raise a legitimate concern. Second, solar energy, because it is renewable and generally benign, possesses key advantages over the rest of the field. It follows that energy planners, while making sure that essential needs are served, should favor the development of selected solar technologies, offering generous public incentives and attempting to remove the obstacles that impede rapid advance.

Active and passive systems for space and water heating, the leading direct solar applications, are the likeliest vehicle for ushering in a solar age.[29] In the present state of the art, solar heating remains beyond the reach of the poor, and even affluent people will exercise care in purchasing equipment whose performance is relatively untried. However, the benefits of these systems will increase as the price of fossil fuels rises and they can provide a valuable buffer against interruptions in oil supply.

On the basis of continuing research, the prospects seem good for using solar radiation to produce other forms of energy besides heat. Photovoltaics, the direct conversion of sunlight into electricity with

silicon cells, may be extremely important to a society so thoroughly electrified as ours is.[30] Mention has already been made of biomass (nonfossilized organic materials ranging from garbage to crop residues to trees to manure) as a feedstock for synthetic liquids and gases. If one or more of the conversion techniques under study proves successful on a commercial scale, the outlook for solving our transportation fuel problems could brighten considerably.[31]

Support for biomass conversion must be qualified, however. The creation of large "energy farms" featuring fast-growing plants destined for the factory could cause serious erosion and water pollution problems. Planning should include steps to minimize these effects. The well-established trend toward fermenting alcohol from grain for gasohol also bears watching. While it is true that the grain presently used for this purpose is surplus, the alcohol-fuels industry could become a powerful competitor in the world food market. Research into ways of deriving ethanol from materials without food value should be encouraged.

PERSPECTIVES

Although it is necessary for analytical purposes to separate one energy source from another, they are intertwined as closely as threads in a tapestry. Because oil and natural gas are such versatile fuels, replacing them requires broad adjustments across the entire energy spectrum. Moreover, changing the role one source plays in supplying America's energy has an impact on the role alternative sources play. Increasing the use of coal for electrical generation, for example, might well have any or all of the following consequences: decreasing the need for nuclear power; retarding the development of photovoltaics; retarding research on new ways to tap geothermal energy; and impeding (through production and transportation bottlenecks) the rapid establishment of a synthetic-fuels industry. When one adds to this the further complications associated with human health, the environment and world peace, the impossibility of isolating one aspect of the energy situation becomes clear. Wise decisions can only come from maintaining perspective on the whole.

Humility also has a particular value in the debate over energy sources. The hallmarks of the field seem to be uncertainty and change. Experts work with educated guesses as to demand, supply and the timing of both. Furthermore, we cannot see very clearly over the rim of the century. While a technology like nuclear fusion will have no immediate impact, it is the subject of intense research and development and holds considerable promise in the longer run. Breakthroughs in fusion or in such areas as hydrogen research or energy-storage capacity may shift the range of choices. While these considerations must not be allowed to paralyze energy planning, they should serve to keep it undogmatic.

The most valuable perspective of all, of course, comes from giving moral and ethical standards the attention they deserve. How shall we choose the energy sources we rely on, and how shall we handle them once chosen? The church must answer, "as creatures and as fellow creatures." The love of God and the love of humanity must guide us if we are not to injure ourselves in the search for energy security.

IV. MAKING THE TRANSITION: ENERGY DISTRIBUTION AND CONTROL

The national debate is not exclusively a discussion of where our energy will come from. It also takes in the structures that control the flow of energy through American society and the uses to which energy is ultimately put. The church's interest in these topics is quite straightforward. To the extent that energy is necessary for human life and health, and for life with dignity, access to it is a matter of justice. Institutions and energy policies that fail to take human need sufficiently into account violate rights which the church must defend. In doing so, it both espouses the common good and reaffirms its special sense of identity with the poor.

THE DISTRIBUTION OF ENERGY

Late in 1980, the Congress of the United States appropriated about $2 billion to help low-income people pay their fuel bills. Some question the adequacy of this funding. Others see the need for government aid as an indictment of the economic system that produced the need in the first place. Whatever its precise implications, the legislation makes a two-pronged statement about our society. It acknowledges the fact that the days of cheap and plentiful power are over. It also acknowledges society's responsibility to respond by making sure that the poor are not denied necessities. Just as food stamps are an attempt to deal with inequitable food distribution, this assistance is an attempt to deal with inequitable energy distribution.

If anything, the problem is likely to get worse. Our oil-supply system is so vulnerable to disruption that we must expect a series of spot shortages and-or price increases in the future.[32] The price of oil, in turn, will draw the price of other fuels upward, magnifying the effects of rising construction costs, high interest rates and general inflation. These conditions, devastating to the poor, will progressively squeeze other groups of Americans as well.

There are basically two ways to allocate energy among all its possible users and uses. The first is reliance on the marketplace tempered perhaps by the social conscience of individual companies. The value of such an

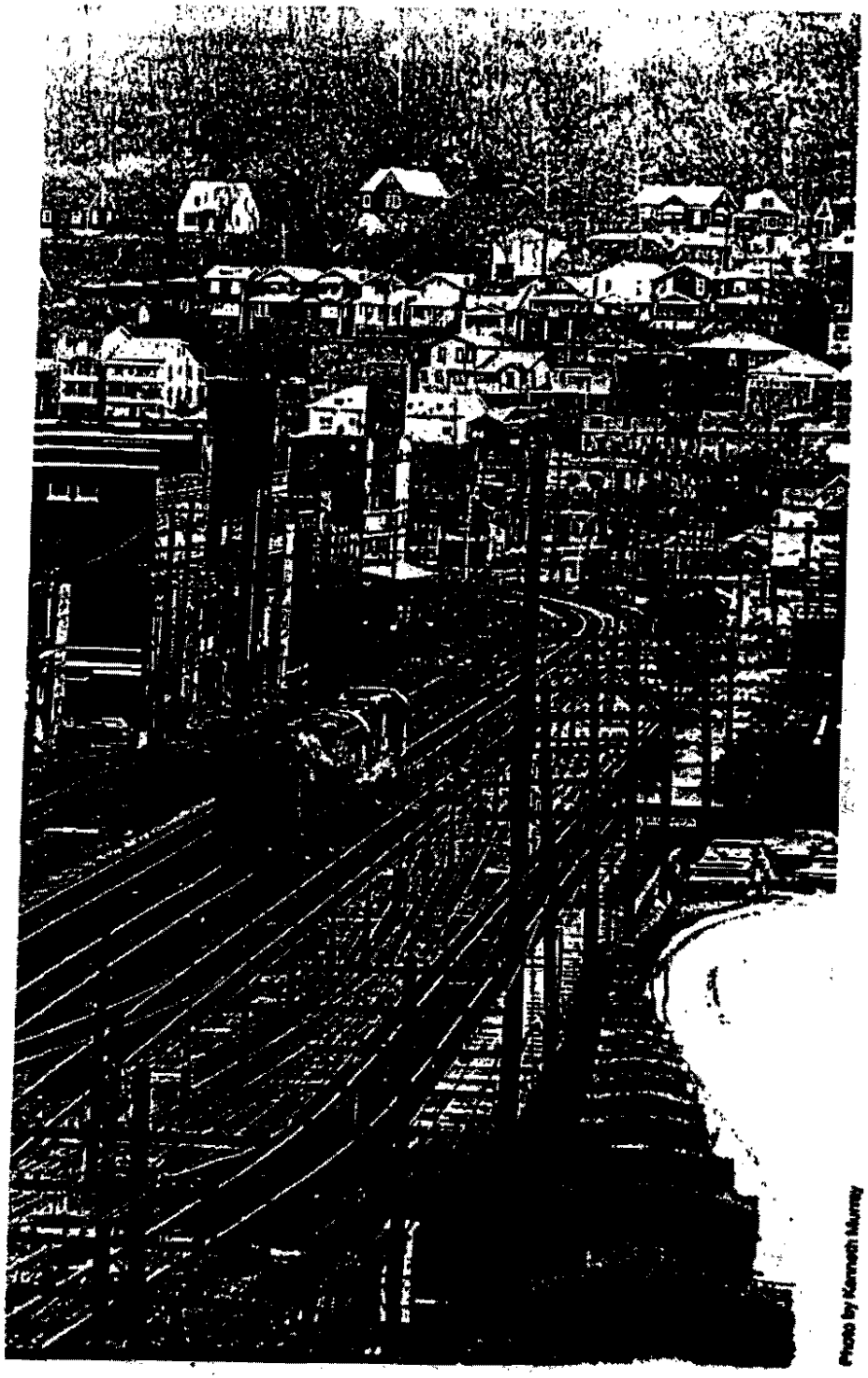

Photo by Kenneth Murray

approach is that it generally reflects the cost of energy to each individual and the economy as a whole and encourages conservation. Its primary disadvantage is that some people and some activities lose out in the competition for energy supplies. When money is the only consideration, affluent citizens can maintain even their most frivolous amusements while their less wealthy neighbors go without fuel for heating and cooking.

The second approach to energy allocation is through government fiat. Public officials, either alone or in cooperation with the private sector, choose the activities and classes of citizens that are to receive help in obtaining energy and decide what form this aid is to take. This method allows for comprehensive planning that protects the interests of all members of society. However, it involves a degree of government intervention in private decision making that many people find offensive.

The United States has chosen to combine elements of both these approaches in dealing with the energy situation. For instance, the federal government has decontrolled oil prices and is in the process of decontrolling natural gas prices. At the same time, it is giving the poor some help and trying to spread part of the benefits of decontrol by means of the "windfall-profits tax."

Christians will differ on how to justly distribute energy supplies, but principle will lead them to agree on certain goals. Even as they offer a neighborly hand to distressed individuals in their own communities, they will back public energy assistance for all low-income people offered in a spirit of respect for the recipients' dignity. They will not be content, indeed, unless such aid completely offsets price increases attributable directly or indirectly to decontrol. It is manifestly unfair that the poor should have to spend an ever greater percentage of their meager income on necessary power as a result of measures aimed at cutting excess consumption.

Government assistance should take other forms besides simple payments. Money used for fuel is immediately helpful, but it does nothing to improve one's long-range situation. Substantial funding should also be invested in weatherizing the homes of low-income people and, where feasible, in installing solar heating equipment. Further, government should work with utility companies to bring about the adoption of rate structures that protect the interests of the poor.[33]

Steps must be taken to ensure that in times of shortage the essential functions of society do not falter for lack of fuel. Authorities on all levels should perfect contingency plans for supplying energy to farms, to health facilities, to basic transportation systems and to other elements in the social fabric that are most important for sustaining life and health. In the absence of such plans, the disruption that a major crisis would cause could explode into chaos.

Concern for the poor and for essential services takes priority in designing strategies for energy distribution because they involve necessities. Beyond that the standard must be equity. To take a concrete example, there is nearly unanimous agreement that the United States should move to free itself from excessive dependence on imported oil. The common good this move would serve is the good of the whole human race, given the threat of nuclear war. Obviously, however, cutbacks in oil could have significant implications for energy distribution, both in terms of access and price. The burden of such a policy must be fairly shared.

THE CONTROL OF ENERGY

The energy industry is dominated by very large companies, ranging from the oil "majors" to the utilities that supply electricity. Moreover, many of the strongest corporations have substantial interests in more than one energy source.[34] This concentration of economic power has become increasingly controversial.

Public discussion of the role of the great oil companies illustrates the point best. Undeniably, our rapid economic development has been based in large part on the availability of cheap energy. The argument can be made that industry concentration was necessary to achieve this end, that it would have been impossible to obtain the requisite supply of oil and natural gas from domestic and foreign wells, transport it, refine it, distribute it and sell it at low prices unless vast resources were invested in a few corporations. If this premise is granted, the companies plausibly claim some credit for America's well-being.

On the other hand, many stress the harm these firms have done. Concentration in the oil industry, critics say, has led to profiteering and monopolistic pricing policies, to the exploitation of people and of nature's gifts, and to the creation of a power structure that undermines democratic ideals. In this view, our material progress has been won at the expense of other nations, which have been denied fair access to humanity's common heritage, the riches of the earth.[35]

This debate, as it applies to the oil companies or to other components of the energy industry, involves enormous complexities that cannot be analyzed here. It is worth noting, however, that since the publication of *Rerum Novarum* in 1891, the Catholic Church has warned against the dangers of unbridled capitalism.[36] Concentrated economic power is as much a threat to individual liberty as concentrated political power where necessities are concerned. In theory, any corporations that controlled the food supply or the clothing supply or the energy supply could, in the absence of regulation, do what they pleased with the consumer. Their decisions could mean life or death for those unable to pay the price.

In fact, no corporation has such power in America today, and many

are run by good people who reject unethical practices. There have been serious abuses, however. In recent years people have suffered great hardships because the firms that supplied their heating fuel cut them off for failing to pay their bills.[37] While it is true that a business cannot continue to operate — cannot supply fuel to anyone — if customers default, cold-weather cutoffs are not a legitimate remedy. Companies should subordinate their economic rights to the higher right to life. Likewise, while the church fully recognizes the right to collective bargaining, workers should avoid strikes that force suspensions of service in winter.

The development of certain solar technologies offers a limited but real opportunity for counteracting the undesirable effects of concentration. Clearly the need for large, centralized, impersonal production and distribution facilities will not fade away. But if solar heating systems proliferate and other small-scale devices prove reliable and affordable, substantial decentralization could occur.[38] Movement in this direction would permit some people — even the poor if installation funds were available — to insulate themselves against complete reliance on outside sources of power. The homeowner with an array of solar cells on the roof of a passive solar house, the farmer with a windmill and equipment for distilling fuel alcohol from crop residues or waste, the tenant with a safe wood stove would have a species of control over their lives that most Americans now lack.

Decentralization through solar power could also have an important side benefit. While analysts disagree on the relationship between energy policy and employment,[39] the installation of small-scale solar devices in homes and businesses is by nature a labor-intensive activity. It should lead to the creation of new jobs, especially when combined with efforts to properly weatherize the buildings where solar power is used.

Prudent efforts to achieve some decentralization clearly deserve encouragement. At the same time, there are more direct ways to guard against potential and actual abuses of power. One, of course, is government regulation. Another was briefly mentioned in the discussion of nuclear power: citizen participation in the decision-making process. Whether they are expressing their views on the risks associated with some energy source or helping ensure that corporate actions respect human needs, people have every right to intervene when energy policy is designed and implemented.

What form might such interventions take? With respect to energy companies themselves, they could range from orderly protests to testimony at public hearings to consumer representation on corporate boards. They could also include advocacy in the political arena aimed at influencing the content of legislation or regulation. The possibilities are as varied as the institutions that control energy in this country.

Generally speaking, the smaller the entity responsible for a particular decision — individual rather than group, state rather than federal government, local distributor rather than multinational corporation — the better chance an informed citizenry has of affecting it. Some policies must be made on the highest levels; only Washington, for example, can commit the nation to greatly increased coal production. Nevertheless, those holding authority in the public and private sectors should be constantly looking for ways to center energy decision making as near the grass roots as possible. While adopting this course might lessen efficiency, it should produce results more satisfactory to the people and ultimately to the institutions that serve them.

THE PROBLEM OF SYSTEMIC EVIL

Most socioeconomic systems are established for worthy purposes. However, in a world made imperfect by sin, problems inevitably arise in their application. Obeying some law of institutional inertia, these systems tend to perpetuate themselves and the evil they do is tolerated for the sake of the good. Partly for this reason, the status quo never lacks defenders and reformers never lack zeal.

Certainly the control and distribution of energy in America today occasion as much structural sin as any major feature of our national life. Some corporations neglect or deny their social responsibilities, government sometimes acts without due regard for the common good and pressure groups relentlessly pursue their narrow goals in defiance of others' legitimate concerns.

People who seek justice must do their best to sort out the evil from the good and act on their perceptions. Obviously, this will not end controversy; it may at times have the opposite effect. But by approaching the debate in a certain spirit — again as creatures and as fellow creatures — we elevate it. We also increase the likelihood that it will lead one day to a broad consensus, since sound conclusions flow from sound premises.

V. CONCLUSION

The word "energy" appears only a handful of times in papal or conciliar documents and even these scant references have little application to the current discussion in the United States. That is hardly surprising. Pope Paul VI, commenting on social justice in "A Call to Action," said, "There is of course a wide diversity among the situations in which Christians . . . find themselves according to regions, sociopolitical systems and cultures." Therefore, "it is up to these Christian communities . . . to discern the options and commitments which are called for in order to bring about the social, political and economic changes seen in many cases to be urgently needed" (no. 4).

Photo by Kenneth Murray

The Catholic Christian community in America, as part of the large religious community and in association with all people of good will, faces a most challenging task in dealing with energy. Some matters are fairly clear: the primacy of serving human needs, the necessity of avoiding occasions of war, the duty of conserving energy wisely, the desirability of responsibly developing renewable energy sources, to name a few. However, many of the central questions in the energy field are hard to define, much less to answer. The Catholic Christian community should be a continuous presence in the energy debate as long as issues so closely touching the welfare of humanity go unresolved.

It should be present through Catholic parishes, which can act to save energy in their own buildings, assist the poor, educate adults and children, and provide means for people to organize for advocacy.

It should be present through Catholic primary and high schools, which can emphasize the link between science and morality.

It should be present through Catholic colleges and universities, where theologians and ethicists can join with scientists, engineers and others to design practical ways to bring moral considerations to bear on energy policy and practice.[40]

It should be present through Catholic seminaries and novitiates, which can prepare priests and religious to approach matters of social justice with informed sensitivity.

It should be present through religious and secular Catholic organizations, which can sponsor energy-related projects, aid the work of appropriate American and international bodies, and highlight the moral dimensions of energy policy in many other ways.

It should be present through participation in interfaith groups and compatible secular coalitions, which can broaden support for laudable goals.

Finally, the Catholic community should be present through Catholic people of every calling who are willing to address energy issues with moral insight and commitment.

A sound viewpoint on energy rises above the perspective of the producer who cares nothing for the consumer or the consumer who ignores the producer's rights. It is a viewpoint that recognizes the transition to alternative sources of energy as a movement in history, a link between episodes in the development of civilization. In this movement lies creative potential for promoting human solidarity, for shaping what in Jesus' eyes would be a better world. Only through steadfast loyalty to a dream of justice can we bring that world to birth — as creatures and as fellow creatures.

Notes

[1]Dr. V. Paul Kenney, professor of physics at the University of Notre Dame, served as technical consultant to the USCC subcommittee on energy. He comments, "Estimation of oil and gas reserves is more art than science, but it seems likely that we passed our domestic peak about 1970 and that world production will pass its peak between 1990 and 1995." A well-respected study concludes, "Even if imports of oil were maintained at the 1976 level of about 40 percent, and oil and gas consumption grew at an annual rate of 2 percent, conventional domestic oil and natural gas resources would not last much beyond the year 2000." Sam H. Schurr, project director, *Energy in America's Future: The Choices Before Us*, a study by the staff of resources for the future. Johns Hopkins University Press (Baltimore, 1979), p. 26.

[2]The sources of energy used in the United States in 1979 were as follows: oil, 47.5 percent; natural gas, 25.4 percent; coal, 19.6 percent; hydroelectric, 4 percent; nuclear, 3.5 percent. Power Systems Sector, General Electric Co., United States Energy Data Book, General Electric Co., (Fairfield, Conn., 1980), p. 7. The percentage of our oil that is imported has fallen from a high of 46.6 in 1977 (see footnote 6).

[3]"The denial of (foreign) oil supplies — to us or to others — would threaten our security and provoke an economic crisis greater than that of the Great Depression 50 years ago, with a fundamental change in the way we live." President Jimmy Carter, State of the Union Address, Jan. 23, 1980.

[4]Rev. John T. Pawlikowski, OSM, professor of social ethics at the Catholic Theological Union in Chicago, served as theological consultant to the USCC subcommittee on energy.

[5]"National policies of conservation, fuel substitution and domestic supply enhancement which reduce oil imports have effects beyond the borders of the country which acts. They tend to lower energy prices, lessen stresses on the international financial system, and improve the prospects for political and economic stability. In doing so, they make both the country that reduces imports and all other oil importers better off." Schurr, pp. 418-19.

[6]The United States imported 8.8 million barrels of oil a day in 1977 and 8.2 million barrels a day in 1979. Energy Data Book, p. 46. Preliminary estimates for 1980 put imports at less than 7 million barrels per day.

[7]For electrical demand, see Energy Data Book, p. 15. The drop in gasoline sales, a recent phenomenon, has been widely reported. The current recession may well be responsible for part of this cutback, but the extent of its influence is unknown.

[8]The Washington Post, Sept. 25, 1979, p. A10.

[9]Committee on Nuclear and Alternative Energy Systems, National Academy of Sciences, *Energy in Transition, 1985-2010*, W.H. Freeman, (San Francisco, 1980), p. 158.

[10]"The United States has more mineable coal reserves than any other country, a supply that will last hundreds of years. Current annual excess production capacity in the industry stands at nearly 200 million tons." President's Commission on Coal, "Recommendations and Summary Findings" (Washington, D.C., Government Printing Office, 1980), p. 7. The U.S. Senate Committee on Energy and Natural Resources offers a more precise estimate: "Recoverable coal reserves amount to at least 150 billion tons, which is equal to at least two centuries of consumption at current levels." "Energy: An Uncertain Future" (Washington, D.C., Government Printing Office, 1978), p. 35.

[11]Carroll L. Wilson (project director), *Coal: Bridge to the Future*, report of the world coal study (Cambridge, Mass., Ballinger Publishing Co., 1980), p. 144.

[12]There is considerable uncertainty concerning the number of deaths that air pollution may be said to cause. One study comments, "Although we have given two estimates of deaths attributable to air pollution — 9,000 and 140,000 — we emphasize that reliable quantitative estimates of the overall health impact of air pollution do not exist." Hans H. Landsberg, et al., *Energy: The Next Twenty Years* (Cambridge, Mass., Ballinger Publishing Co., 1979), p. 365. Dr. Kenney adds, "Air-pollution epidemiology studies suggest that sulfate and particulate emissions from coal-fired plants may cause some 50,000 to 100,000 premature deaths yearly across the entire U.S. population."

[13]This discussion of the carbon dioxide problem is drawn from a symposium before the Senate Committee on Governmental Affairs, July 30, 1979. The word "uncertainty" dominated the discussion. While the majority opinion is that increased levels of carbon dioxide will cause a warming of the atmosphere, for example, some scientists think it may produce a cooling. See also Wilson, pp. 147-50.

[14]General Accounting Office, "Improvements Needed in Controlling Major Air Pollution Sources." (Washington, D.C., General Accounting Office, 1978).

[15]General Accounting Office, "Questions on the Future of Nuclear Power: Implications and Trade-Offs" (Washington, D.C., General Accounting Office, 1979), pp. 1, 8.

[16]Energy Data Book, p. 77.

[17]Robert Stobaugh and Daniel Yergin, *Energy Future* (New York, Random House, 1979), p. 117.

[18]Many estimates have been given as to the length of time nuclear wastes must be isolated from the environment. According to a panel discussion sponsored by the Forum of the National Academy of Sciences in Washington, D.C., Nov. 19, 1979, the most critical period is the first 1,000 years. A transcript of the discussion, titled "Nuclear Waste: What to Do With It?" is available from the National Academy of Sciences. See also Schurr, pp. 499-500.

[19]Bishop Joseph Daley of Harrisburg issued a formal statement in the wake of the Three Mile Island accident calling for a moratorium on the licensing of new nuclear plants until the government can "guarantee" their safety.

[20]The question of the connection between the U.S. nuclear power industry and nuclear arms proliferation is problematical. Dr. Kenney comments: "It is certainly technically feasible to apply sufficient overall security measures to ensure the integrity of our domestic reactor fuel cycle . . . . Reactor fuel supplied to nations overseas is the real focus of our proliferation problem. Recent attempts by the United States to dissuade the lesser-developed nations from further reliance on nuclear power have been rebuffed. Moreover, regardless of what nuclear stance this nation assumes, it is already clear that nuclear fuel and technology will be supplied to those who ask for it by other industrialized countries in both Western and Eastern Europe." For a more detailed discussion that draws similar conclusions but emphasizes the need for a non-proliferation policy, see Landsberg, pp. 442-46 and 454-65.

[21]"Questions on the Future of Nuclear Power," p. 26: "The trends we have projected indicate that if actions are taken to limit or halt the growth of nuclear power, they must be accompanied by actions to severely limit electricity requirements or programs to expand coal supply or other non-nuclear fuels. Otherwise, serious shortfalls of electricity supply are likely to occur in the 1980s."

[22]Granted that nuclear power represents a special case because it has been so highly politicized, such referenda might logically be held on all major energy projects where social costs and benefits must be weighed: for example, the construction of large dams, the opening of new coal fields, and the installation of windmill systems and large solar arrays.

[23]This discussion of geothermal energy is based on General Accounting Office, "Geothermal Energy: Obstacles and Uncertainties Impede Its Widespread Use" (Washington, D.C., General Accounting Office, 1980).

[24]For coal reserves, see footnote 10; for oil shale, see Schurr, p. 231; for biomass, see Schurr, pp. 260-61.

There is still considerable uncertainty about the exact environmental impacts of synfuel production, but they would be substantial. For shale oil, see National Academy of Sciences, pp. 138-39. For coal liquids, see National Academy of Sciences, p. 181. For coal gas, see National Academy of Sciences, p. 143.

[26]See Schurr, pp. 55-58.

[27]The most obvious exception to this rule is the hydroelectric facility. When a dam bursts, people die and the local environment certainly suffers. Some solar systems — the solar *power satellite* is the most frequently cited example — may pose very serious risks to humanity and nature.

[28]As is well known, the Carter administration set a goal of obtaining 20 percent of our energy from solar sources by the year 2000. The National Academy of Sciences study mentioned above, which has been widely attacked as being anti-solar, holds that this goal can only be reached if the government provides "vigorous incentives" to promote solar technologies (pp. 346-49); in the absence of such incentives, the authors argue, solar will meet only 5 percent of our energy needs in 2000. Stobaugh and Yergin, who are more optimistic on solar energy's prospects, say, "We believe that given reasonable incentives, solar could provide between a fifth and a quarter of the nation's energy requirements by the turn of the century" (p. 183). Denis Hayes, a leading solar advocate and head of the Solar Energy Research Institute, takes the whole world into account in his projection: "By the year 2000, such renewable energy sources could provide 40 percent of the global energy budget; by 2025, humanity could obtain 75 percent of its energy from solar resources." (*Rays of Hope*, New York, W. W. Norton, 1977), p. 155.

[29]See Schurr, p. 482: "Solar space and water heating may offer a near-term opportunity to shift from depletable to renewable energy sources. This technology may help to fill energy requirements and also supply a prototype for a series of long-term shifts as the energy sector changes over time. On institutional as well as technical grounds, therefore, the solar space and water heating enterprise has far-reaching implications that give it an important role among energy initiatives." This view of solar heating has wide support. Michael D. Yokell, formerly of the Solar Energy Research Institute, concludes in a recent article in Public Interest Economics: "Is the role for solar energy then limited to hot water and space heating in newly constructed buildings plus a few special applications? In the short run, the candid answer must be yes." Vol. 5, No. 1 (Spring 1980), pp. 1, 8.

[30]See National Academy of Sciences, p. 40: "Unlike solar thermal conversion (photovoltaics) is a field in which fundamental research could yield dramatic returns, and recent technical progress has been very rapid."

[31]In a speech at the Bio-Energy '80 World Congress in Atlanta April 24, 1980, Thomas E. Stelson, assistant secretary for conservation and solar energy at the U.S. Department of Energy, estimated that biomass could produce from 8 to 13 quads (using widely shared projections of demand, about 7 percent to 10 percent of total energy use) by the year 2000.

[32]John F. O'Leary, former deputy secretary of energy, called supply interruptions "almost inevitable in the 1980s" in an editorial in The Washington Post (Jan. 22, 1980, p. A19). He also asked, "Will we see a repetition of the downslide of real prices in the years to come? The answer almost certainly is no, because the major factor contributing to falling prices — chronic and sustained surpluses — has disappeared. In fact, it is fair to predict that from this time forward, at least during the 1980s, we shall see constant upward pressure on price."

[33]"Life-line rates" and "time-of-day rates" have been prominently mentioned in this connection. Time-of-day rates would encourage people to reduce their use of energy during certain hours in order to eliminate the need for costly "peak-load" facilities. Life-line rates would establish a basic charge for a certain minimum amount of power for necessary uses, and impose higher charges for energy consumed above that minimum. Life-line rates, [illegible] would have to be carefully structured to avoid discriminating against some of the very people they are intended to protect. For example, a childless middle-class couple where both husband and wife worked might use very little energy at home and thus qualify for the basic charge, while a poor woman with young children might require more power for heating, cooking and so on, and fail to qualify.

[34]Robert M. Wolcott, "Monolith in the Making," *Public Interest Economics*, Vol. 5, No. 1 (Spring 1980), pp. 2, 7.

[35]For a skeptical though not hostile history of the oil industry, see Anthony Sampson, *The Seven Sisters* (New York, Viking Press, 1975).

[36]Pope John XXIII quotes Pope Pius XI on this point and adds his own observations in *Mater et Magistra*, 35-40. See also Pope Paul VI, *Populorum Progressio*, 26.

[37]The Community Services Administration has published a booklet telling people what to do when the heat fails as a result of a cutoff or for some other reason. Among the suggestions: Wrap yourself in newspapers to avoid freezing. See Greg E. Welsh, "No More Heat? A Self-Help Booklet!" (Washington, D.C., *Community Services Administration*, 1979).

[38]"However, where fuel transport costs are very high, or scale economies are weak or non-existent, decentralization may be more desirable. For example, if the direct rays of the sun are the fuel, the possible economic advantage of collecting and using that energy domestically for home heating, as opposed to collecting it for later distribution in a centralized electrical network, becomes a calculation of great interest for energy planning" Schurr, pp. 324-25. "Indeed, because arrays of PV (i.e., photovoltaic) cells may show little or no scale economies, small- and medium-scale installations could well be a more intelligent use of this technology" Schurr, p. 331.

[39]See Paul Keegan, "Employment Is the Name of the Game as Solar Advocates Press Their Case," National Journal (Dec. 15, 1979), pp. 2100-03.

[40]In a speech to scholars and students in Cologne, West Germany, Nov. 15, 1980, Pope John Paul said, "Today it is the church that is the portal for reason and science that trust in capacity for truth, which legitimizes them as human capacities; for the *freedom of science*, through which it has dignity as a human, personal good; for progress in service to mankind, which needs it for the safety of its life and *dignity*."