THE ENERGY PROBLEM

J. ERNEST WILKINS, JR.
EG&G Idaho, Inc.
Idaho Falls, Idaho 83415

In order to place matters in some historical perspective, let me remind you that President Nixon had announced as a national goal the concept of energy self-sufficiency for this country by 1980. Even prior to his resignation, however, government officials had backed away from that date and were talking about 1985. President Ford later introduced the more modest concept of invulnerability to foreign disruption, and the date for accomplishing that goal was slipped to 1990. President Carter has to a great extent abandoned, or at least retreated from, both of these goals and appears to be seeking an energy policy that reduces the likelihood of catastrophic global conflict.

I shall make a few remarks about these concepts and the role which various forms of energy production (in particular, nuclear energy) can play or should play.

In the first place, the words "self-sufficiency" are intended to convey the idea that the population of the United States will satisfy its desires for those quantities and forms of energy necessary to provide a quality of life similar to that currently existing, and that this be done without significant dependence on foreign sources of raw or refined materials. Variations of this theme involve qualifying the desires for energy as "reasonable", or requiring that the energy be available at a "reasonable" cost, measured both in terms of dollars and of insult to the environment.

Discussion of these variations gets quickly to some of the basic issues involved, and I will return to this in a moment. First, however, I would like to describe the "invulnerability" concept. This differs from "self-sufficiency" in a major way. We would accept some, or even considerable, dependence on foreign supplies under normal circumstances, but would be

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able to maintain an adequate though gradually decreasing quality of life if those supplies were to be interrupted or denied to us. The lowest adequate quality achieved would be noticeably poorer than at present, but no one has suggested that it would be so poor that survival as a nation, or even as individuals, would be seriously threatened. Rather, one thinks in terms of belt tightening and sacrifice of many of those luxuries that have come to be commonplace in our time.

President Carter's concepts are harder to describe, perhaps because he has not really announced a national goal with the broad scope of those of his predecessors, but has instead concentrated his efforts on mechanisms that in his view will lead to a reduced exposure to the risks of nuclear war. So he has been emphasizing conservation techniques to reduce the demand for energy, a nuclear energy policy that he believes will reduce the likelihood of further proliferation of the capacity to wage nuclear war, and political initiatives intended to stabilize the mid-eastern area of the world where much of our imported oil supplies originate.

Let me now return to the topic of "reasonable" that I mentioned earlier, for it applies with varying force to all of the presidential concepts. Most observers would agree that if the American public were not so "unreasonable" in its demand for air-conditioning or individually chauffeured automobiles, for example, much of the concern about the energy problem would evaporate. In my judgment, however, it is inappropriate in this country to impose arbitrary restrictions on public and private behavior that are neither necessary to protect one citizen or group of citizens from the rapacity of another citizen or group of citizens, nor necessary to meet some emergency situation (such as war or Arab oil boycott) arising from external sources. In addition, it is even more inappropriate to impose such restrictions on the behavior of a subset of American citizens, but not on the entire populace. Banning air-conditioning in new residential construction would be an example of such an inappropriate restriction.

In keeping with this philosophy I claim that all widespread desires of the American public are "reasonable", and the country will not have achieved energy self-sufficiency, or even invulnerability, if any major fraction of these desires is unmet. This statement does not mean that

significant steps cannot or should not be taken to influence the desires of the American public. After all, the entire advertising industry exists for precisely this purpose. We have seen in the recent past a substantial effort to persuade the average American to reduce the number of items for which he demands energy, and to use less energy to satisfy each of those demands. The policy of the Ford administration was largely channeled in this direction, and this is an even more significant aspect of President Carter's program.

I am, in fact, reasonably optimistic about the contribution to the energy problem to be obtained from such conservation techniques. Reduction in size and weight of automobiles and acceptance in our residences, offices, and factories of somewhat cooler temperatures in winter and somewhat warmer temperatures in summer, are examples of significant changes in the social habits of the American public which can continue to make a real dent in our energy requirements.

The willingness of the American public to make such significant changes in its social habits will depend, of course, to a considerable extent on the leadership and guidance furnished by our political leaders, but will perhaps be determined to an even greater extent by economic pressures, real or imagined.

This observation brings me to the second variation on the theme of "reasonableness", i.e., cost of energy. It is certainly true that the desire for any energy-consuming article can be dampened if the cost of original purchase, combined with the cost of maintenance after purchase, is sufficently high. It is theoretically possible to let the price of coal, oil, gas, electricity, etc., increase until the demand dwindles to the level of the available domestic supplies. To achieve invulnerability a little economic fine-tuning is required so that the prices of the so-called luxuries not considered absolutely necessary to a minimally adequate quality of life are affected to a significantly greater extent by the increased prices of the basic energy sources than are the prices of the so-called necessities. (Please don't ask me how to do this sort of fine-tuning.

I am extremely dubious that it can be done at all, or done without major disruptions to our political and social structure resulting in a planned economy more rigidly structured than that of our major adversaries. But I am not an economist.) In any event, the price the American public even now pays for energy, considered on a per-capita basis or a fraction of GNP, is very low compared to that elsewhere in the world. A really tremendous increase in price would be required to make a significant impact on the average citizen, and the consequences to the poverty level or low-income citizen of such increases would be socially and politically unacceptable. I find this aspect of the matter to be of particular significance, although it is frequently ignored. Not only are the direct consequences more serious for such citizens, but the indirect economic consequences of a general stagnation in the economy or an actual recession are likely to be devastating. The NAACP is one of the few groups that has publicly recognized this consideration.

My remarks so far have been concerned with the demand side of the energy picture. Let me switch now to the supply side.

It has been asserted that there is no shortage of energy in the U.S., merely a shortage of oil and related petroleum products. It is certainly true that the U.S. has vast reserves of coal which could be mined and used to meet the requirements for heating and fuel for electrical utilities. Unfortunately, for a number of reasons the historical trend in this country has been away from coal to oil and natural gas for these applications. This trend started long before the environmentalists began their strictures on sulfur dioxide and sulfur trioxide fumes, but was certainly accelerated by their demands for cleaner air. At the same time the social costs of coal mining were being recognized, for example, lung disease, deaths and injury to miners, damage to environment due to unrestricted strip mining, pollution of water supplies due to discarding wastes, etc. The so-called clean fuels, oil and gas, appeared to minimize most of these problems and were, at least initially, not much more expensive. Many utilities are now reconverting to coal, but not all can easily do this, and in any case requirements for low sulfur coal, or at least for controlling the sulfur dioxide emitted from the plant, are not easily or inexpensively met. The

technology of scrubbers to be installed in coal-fired plants continues to improve, but there is still considerable uncertainty in the reliability of this relatively expensive equipment. Moreover, the use of scrubbers to reduce air pollution inevitably results in significantly increased amounts of solid waste, the disposal of which can have a major impact on water purity and the ecology of the immediately surrounding area.

I must also recognize some very real social and political problems associated with an increased dependence on coal. To get more coal we must have more miners. In fact, the historical trend has been a reduction in the number of miners, due at least in part to an increased perception of the hazards to the individual miner due to lung disease and other long term ills, to say nothing of the very real risk of death and injury. This trend has been alleviated somewhat by an increased use of machines to improve the productivity of the manpower, particularly for strip mining. Notwithstanding the undoubted value of such machinery, it is quite clear that additional incentives will be required in order to increase the supply of miners.

To get significantly more coal it will also be necessary sharply to increase the mining in the western states. Such increases will in some instances result in major policy conflicts on land utilization between mining and agriculture and in almost all instances will result in fierce battles on water utilization. The relatively scarce supply of water in the western states is a highly prized resource and an appropriate allocation of this resource among the various competing groups (agriculture, mining, industrial, residential, etc.) that optimizes the benefits to the national or regional economy, and that is politically acceptable to the region, will be extremely difficult to find.

Even if we assume that miners can be located, and that the conflicting needs for water can be reconciled, there still remains a major difficulty in transporting vastly increased amounts of coal from the mine to the ultimate consumer. The existing railroad network is quite inadequate and extremely large amounts of capital would be required to increase the roadbeds and the number of railroad cars to the extent needed.

None of these problems is insoluble, and all of them are getting some attention in Washington and various state capitols, but I regret that I do not see the political leadership that is determined to bring about a substantially increased use of coal in the United States. Nevertheless, in the immediate future, the coal reserves of the U.S. must be used.

Let me shift now to a consideration of nuclear power. Can nuclear power make a significant contribution to our national goals. Unfortunately, my answer is certainly not for 1985 and very probably not for 1990. No nuclear reactors not already conceived, designed, sold, and for which the site is not already under construction will be in operation by 1985. The same statement actually also applies to 1990, particularly if the start of construction phase is omitted. It is possible to calculate now how much electrical power can be generated from nuclear plants in 1990 with the firm assurance that your answer will be at worst an over-estimate.

How does this state of affairs arise? Why does it take so long to get a nuclear power plant in operation? In my judgment the answer is directly attributable to an unwillingness, or even inability, on the part of reactor manufacturers, utilities, government agencies and the various committees of the Congress, to recognize the essentially political nature of the opposition to the use of nuclear energy.

I believe it is important for the American citizen to understand that there are risks and costs associated with any benefit, and equally that there are risks and costs associated with the denial of that benefit. Because the nuclear industry was born only recently its risks and costs have undergone a much more intensive scrutiny than any other major technological advance. Moreover, this scrutiny has been both internal from its own self-interest, and external from a number of groups with a variety of axes to grind. The phrase "how safe is safe enough" was only coined in the nuclear debate. Electric power generation has very low risks, both as an absolute basis and also in comparison with the benefits derived. Moreover, nuclear electric power generation is even less risky than

conventional power generation. This last conclusion is a conservative one that allows for a very improbable but very damaging accident to a nuclear plant. (After all such accidents can also occur, and have occurred, to conventional plants.) Indeed, this conclusion is reinforced if one considers also the hazards associated with mining and transporting the fuel.

My point in these last remarks can be succinctly, if crudely, put as "There is no Free Lunch". We must pay the cost of any benefits we desire or need. The use of nuclear energy for the generation of electrical power will reduce the social costs as well as the economic costs, but those costs will never be reduced to zero.

We have discussed the costs and benefits of nuclear power. A related issue is that failure to adopt the use of nuclear power is a policy with its own risks and costs. Perhaps I can be forgiven for imagining a far out scenario in which nuclear energy is prohibited, the U.S. imports an additional 300-350 million barrels of oil (equivalent merely to the 1976 use of nuclear power) at an ever increasing price, both in dollars and in strains on our international politics, and then there is a boycott of the U.S. by oil producing countries. We go to war (and most wars have been fought for just such needs for raw materials). The social costs, the number of deaths, the disruption of the quality of life, of such a contingency, are so great that, in spite of the low probability that I would assign to this event, the policy of prohibiting nuclear power is a dangerous one.

Whether you would agree with me on the details of the last scenario is unimportant. What is important is that the American citizen be reminded that there are costs and risks associated with the failure to use nuclear energy as well as with its use. It is encouraging that the California citizen, when so reminded, voted down an anti-nuclear initiative by a 2-1 majority. Similar majorities occurred in several other states on other initiatives or referenda.

Opponents of nuclear energy have called attention to the general areas of waste management and of nuclear materials safeguards. Neither of these areas in my judgment qualifies as an insuperable obstacle for the nuclear power industry at the present time. The volume of waste to be disposed

of today and in the near future is sufficiently small that any one of several existing technologies is more than adequate. The real problem is the disposal of high level long lived isotopes in ways that give reasonable assurance (again there is no way to give absolute guarantees) of public safety. It is probable that some proposed solutions are already satisfactory, but the Department of Energy has not yet frozen its position.

Similarly, there certainly exist technically feasible methods for safeguarding nuclear materials that probably do not impose excessive costs on the nuclear fuel cycle and that might even be politically acceptable domestically. The problem of internationally acceptable safeguards is, however, a very thorny one, related as it must be to the questions of national pride, of proliferation, and of terrorism. There are times when I feel this international problem is insoluble, in a political sense, and that the world as a whole, including the U.S., will just have to learn to live with the threat of widespread possession of nuclear weapons. In any case any internal decision of the U.S. to discourage domestic use of nuclear energy, or to slow down the development and introduction of breeder reactor technology, will have very little bearing on the existence and magnitude of that international threat.

There are other energy concepts which might be useful in a longer time frame. I do not wish to denigrate any of these concepts, such as fusion, solar power, geothermal power, magnetohydrodynamics, etc., and, in fact, I have urged elsewhere a national policy which pursues an active research and development program in all these areas. As a practical matter, however, the time required to reduce any of these concepts to an economic process for producing large amounts of power cannot be very much less than a human generation, and I won't start counting time until some sort of technical feasibility has been established. Accordingly, I do not look for any significant national contributions from any of these areas until well after the turn of the century. This does not mean, of course, that in local areas there cannot be useful contributions.

In conclusion, let me note that I am aware that I have not in this article challenged any of the Presidential goals. As thoughtful citizens, however, we should certainly examine the consequences for the U.S., both domestically and internationally, of achieving or failing to achieve any of these goals. Do we really wish to be, or realistically can we be, an island fortress, immune to the vagaries of the outside world? Do we have any obligation to assist, or at least, not to obstruct, other developing nations in their efforts to achieve increased living standards? If we succeeded in achieving some sort of independence, would we be setting the stage for a major military attack on us by other countries that perceive us either as rich hoarders or as squanderers of the globe's resources. To what extent is it possible, and if possible to what extent is it practical, to use our position as a granary for the world to wage economic war against those countries that attempt economic boycotts of us? These and related questions must also be faced in the political arena in the very near future.