# SOME ECONOMIC ASPECTS OF ENERGY POLICY

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In a radio broadcast before World War II, Orson Welles almost literally turned the United States upside down by announcing an invasion from Mars. This has been a crisis society ever since. Some of the crises, such as those involved in World War II, have been all too real. Some, like the Orson Welles broadcast, were thoroughly artificial. Our present energy crisis is an unusually complicated mixture of both. I shall attempt to place the issues in some kind of perspective.

Here are the questions I want to raise:

First, economists believe that the price system tends to operate as a fever thermometer in identifying crises as well as a curative device in its own right. If so, to what extent is the present energy crisis a product of the malfunctioning of the price system? And to what extent can the energy crisis be alleviated, if not eliminated, by a better performance from this same price system?

Second, to what extent is our approach to the present energy crisis muddled by our failure to distinguish between short-run problems and long-run problems?

Third, to what extent is the crisis due to our obtaining most of our energy sources from so-called "wasting assets" rather than from renewable resources such as those produced by our farms and forests?

Fourth, to what extent is the crisis psychological, occurring in our minds rather than in the external world, either because we have just awakened to what has been true all along, or because we *think* we have awakened to what has been false all along—and still is?

Fifth, to what extent is the crisis essentially a feature of our adjustment to international politics rather than to our energy position?

These five questions are only a sampling of those which could be raised in connection with the energy crisis. But they should be sufficient to introduce some of the economic problems involved.

The outstanding example of what the price system *has done* with respect to the energy crisis—in contrast to what it *might have done*—is provided by the history of prices, investment, and production with respect to oil and natural gas since the mid-1930's, and more particularly since the end of World War II. The story reminds one of the hare and the tortoise: The hare took a commanding lead, decided to rest awhile before completing his obvious victory, and then woke up to find himself irretrievably behind. The situation is similar for our hare-brained oil and gas policy.

Let us begin with the recital of certain economic relationships between oil and gas.

**Oil and Gas—The Supply Side**

Historically, crude oil has had a much greater total value at the wellhead than natural gas. This has been the result of two different factors: more calories of crude oil were produced, year by year, in the United States, and each calorie had a considerably higher value than its heat equivalent in natural gas. Try running your automobile on natural gas—which is, by the way, entirely possible—and you will immediately understand a major source of the oil advantage.

Geologically, the relationship between oil and natural gas tends to be both close and complex. About half the natural gas wells discovered in the United States are discovered by wildcatters who are looking for oil; conversely, a small percentage of the oil wells are discovered by wildcatters who are looking for natural gas. A substantial, though not major, share of the natural gas produced in the United States is so-called "associated" natural gas, produced from wells which also produce oil. Moreover, an important share of oil output in the United States derives from "gas drive" oil fields—that is, from fields in which oil is forced to the surface by pressure from underground natural gas deposits.

**Oil and Gas—The Demand Side**

As if these supply-side interrelationships were not enough, oil and natural gas also tend to be Siamese twins on the demand side.

The most obvious use for which natural gas is not a perfect substitute for oil is transportation. This obvious use is very important, because gasoline alone typically provides about one-half of all oil refinery revenues. But, for practically every use of natural gas, oil provides what used to be considered an almost perfect substitute. Electric power plants in Texas burn natural gas, while

electric power plants in New England burn residual oil, but the choice of fuels has in the past been determined almost entirely by relative prices. Something very important has been added to this case of pure substitution in the very recent past. That something is, of course, the antipollution campaign, and the laws and ordinances it has produced. Thus, crude oil and its products, which used to compete with natural gas for almost every use of natural gas, now compete much less effectively for some uses and in some locations.

Oil and natural gas are individually so important, and so interwoven in technical and economic relationships all the way from initial geological exploration to final consumption, that there can be no rational separation of the economics of crude oil, or petroleum products, and the economics of natural gas.

**Irrational Policies?**

This brings us to the irrationality of our national economic policies with respect to oil and natural gas over the last thirty-five or forty years.

The first form of irrationality is the fact that we have had *no policy* which could legitimately be described as "national" for oil. The first national legislation relative to oil, passed in the 1930's, was designed to support *state* regulation by preventing oil produced in violation of state laws from moving into interstate commerce. Direct national action was deferred until 1958, when compulsory quotas on oil imports were introduced. But even these mandatory quotas could scarcely be described as a policy, or as the result of a policy. Instead they were the result of the *failure* of a policy. Federal aid had to be called in because state controls alone were not achieving the results that U.S. oil producers wanted.

Second, natural gas regulation has been only *partial* at the national or federal level. The Federal Power Commission has had the right to regulate the rates of interstate natural gas pipelines since the 1930's, and was required by the Supreme Court to set wellhead prices on natural gas moving in interstate commerce by the Phillips decision in 1954. But Texas is a big state: in geographic terms, in terms of natural gas production, in terms of natural gas consumption. Texas output consumed within the state is not subject to price control by the Federal Power Commission. The same situation prevails, on a lesser scale, in other producing states.

Therefore, with respect to the governmental status concerning oil and natural gas policy, two things must be said: The federal

government has always lacked jurisdiction to determine and enforce such a policy on a nationwide basis; and this inability has been much more pronounced, and much more important, for oil than for natural gas.

The third irrationality is the economic consequence of this legal and political situation. The thrust of state regulation, with special reference to Texas, has been to assure satisfactory oil prices by the maintenance of *minimum* prices for crude oil through the enforcement of "maximum allowables"—that is, by an elaborate quota system for holding down the output of each producing well. The thrust of federal regulation of natural gas prices has been to check rising prices through the enforcement of *maximum* prices.

Any economist would expect a minimum price policy that maintains satisfactory prices to produce a surplus of both actual oil wells and potential oil output. He would also expect price ceilings for natural gas either to produce a deficit of supply relative to demand, or diversion of natural gas from regulated interstate markets to unregulated intrastate markets, or both. These economic expectations were fully realized with respect to oil until about two years ago, and with respect to natural gas for about the last two years. In short, we have gone from a *surplus* of oil to a *deficit* of natural gas. And, to make matters worse, the former contributed to the latter.

Oil exploration and drilling slumped all through the 1960's as output from existing wells was cut back sharply in an attempt to maintain minimum crude oil prices. The cutback in oil exploration and drilling also automatically entailed future cutbacks in natural gas production. Of course, output controls brought higher prices than would have prevailed without them, but they also encouraged less efficient drilling and production methods. Perhaps more important, they produced an apparent surplus which, like the hare's early lead over the tortoise, was conducive to slumber and not to rational planning.

Finally, our various policies with respect to oil and natural gas have been designed, in a number of ways, to stimulate present consumption of *domestic* supplies. Both oil and natural gas are exhaustible resources. Their main use is in combustion, and they can be burned only once. Yet, as a glance at the map of Minnesota would indicate, we have paid far more attention to conservation of the *renewable* resource of our timber than to the *exhaustible* resource of our hydrocarbons. This is as if a householder went to work to destroy all his heirlooms, and at the same time took

great pains to save objects which could be bought anew from any mail order catalogue.

We may conclude, then, by saying that the price system has never had a chance to operate unimpeded, in either diagnosing or helping to cure our energy problems. As manipulated by different governmental units with different objectives, its operations provide an economic demonstration of Lincoln's dictum that no nation can exist half slave and half free.

### II. THE SHORT RUN AND THE LONG

The hare and tortoise story is still useful here. The hare had the attributes and abilities of a sprinter; his major error was to confuse the tactics of a dash with the tactics of a marathon.

We need to shift from generalizations to the specifics of the energy crisis. No one has yet found a way to push the short-run phenomenon of the coming winter into the remote future. The only way to escape the seasons is to move to the tropics. This obvious point provides a devastating criticism of the kind of energy programs that have been emanating from high places in Washington and elsewhere.

In terms of timing, the easiest part of the energy crisis has to do with present deficiencies in oil-refining capacity. Past *high profit margins* on production of U.S. crude oil tended, inevitably, to create pressure toward *low profit margins* at the refinery. Therefore, investment in new refining capacity did not have the normal profit incentives—quite apart from environmental problems, and uncertainties with respect to import policy. Replacement and expansion of refining capacity, unlike replacement and expansion of oil reserves, is simply a matter of obtaining the requisite skilled labor and specialized equipment—and waiting long enough for the refinery construction to be completed. Yet the immediate part of the oil element in our energy crisis is so immediate that it will not even wait for the completion of new refineries.

On the other hand, the long-run problem of reserves of hydrocarbons is so long-run that it involves entirely different issues from those connected with refinery construction. To treat all of the components of the energy crisis as if they had the same time horizons is not realistic. Indeed, even to say "energy crisis" is misleading. We have, instead, a number of energy problems. If they are to be solved or even ameliorated, there must be a careful *phasing* in time of *properly articulated* programs. Greater incentives to drill for oil and natural gas are not going to raise this winter's temperatures in Brainerd, Minnesota, by a single degree.

## III. WASTING ASSETS AND RENEWABLE RESOURCES

We have already noted what seems to be the paradox of American conservation policy: We seem to be more concerned with the preservation of renewable resources, such as trees, than with the preservation of nonrenewable resources, such as oil and natural gas.

This apparent paradox can, of course, be turned completely around: Why worry about the conservation of resources which must eventually be exhausted anyway? Is it not more sensible to devote attention to resources which can be renewed with appropriate planning but cannot be renewed without such planning?

Moreover, the renewable versus nonrenewable paradox is not in its most extreme form when we compare oil and gas, on the one hand, with forests, on the other. The days of primary reliance on wood for fuel are long gone in this country. Even sawmill wastes increasingly find alternative uses. The most interesting questions of conservation of resources, whether renewable or nonrenewable, arise from comparisons of products which are directly related in consumer markets.

Even with these qualifications, the period since the beginning of the nineteenth century has been the Age of Fossil Fuels. Resources which took hundreds of millions of years to accumulate are being used up in decades. And the rate of consumption of some of the most important of these resources continues to increase in geometric progression.

Nuclear power, which has seemed at times to offer the key to open the gateway into true energy abundance, is not without problems of its own. Most nuclear power plants being installed around the world today are of a general type, which has been more or less standardized for a decade if not for two. But, even after due allowance for general inflation, the cost of building these nuclear plants has risen in spite of advance assurances from qualified experts that it would drop. Moreover, the nuclear fuel on which the industry depends is not inexhaustible. Breeder reactors which will vastly expand the practical availability of such fuel are still in a very experimental stage. They involve technical and scientific problems which are considerably more serious than those connected with present reactors even in their infancy twenty years ago. And as for opening the sluice gates to oceans of energy via nuclear fusion, a controlled fusion is still being attempted in the laboratories, with no indication of when—or if—fusion will become commercially feasible.

All of these comments point to the conclusion that, in the energy area, we have been living on our capital for a long time now. In the rest of the world, populations are increasing, or living standards are rising, or both. Each of these factors, taken separately, is a source of massive new energy demands. So, although the United States or any one other country may hope to alleviate its future energy needs by imports, a world-wide energy shortage obviously cannot be solved by imports.

Once all of these pessimistic comments are made, it should be added that neither the amount nor the type of energy demand is something determined immutably by the size of a country's population or the level of national income. This has become most evident in the United States, in recent years, not only in the discussion of the feasibility of automobiles which yield more miles to the gallon, but also in a decided shift in public preferences toward such more economical cars.

Looking beyond this obvious case, one notes that most U.S. energy consumption is by industrial and commercial users, not by private automobiles or households. Even natural gas, which is often considered primarily a high-grade source of residential heating, is mainly used for fueling electric power plants and for industrial purposes.

In the industrial sphere, two trends have been evident in the U.S. economy for a long time. One is the trend toward a smaller relative share of goods or commodities and more services in national output. Also, technology is reducing the size of heavy and bulky commodities. Compare, for example, a newest-generation computer with the huge installations used at the dawn of the industry; and compare these, in turn, with the adding and calculating machines which would have been required to perform similar functions pre-computer. Services tend to win out over goods, and commercial services tend to win out over domestic services.

The second trend, which reinforces the first, is for the smaller, lighter, and more flexible to replace the bulkier, heavier, and more cumbersome—and for both to be produced with greater fuel efficiency. A ton of steel now requires much less coke than it did even a few years ago, and the same is true for the electricity required to produce a pound of aluminum. In industry after industry, efficiency gains have meant cuts in energy consumption, even before the appearance of the incentive of higher energy prices which has been so conspicuously present in the last few years.

So far, this whole discussion can be reduced to: "On the one hand, this—but on the other hand, that." In order to continue beyond this level of balanced platitudes, it is necessary to return temporarily to the previous section in order to reintroduce the idea of *timing*. Once the clock is brought into the problem, we have brand new meanings for our "one hand and other hand."

Energy demands tend to increase regularly and quite steadily, so that their growth can be approximated by a simple percentage. Methods of economizing energy also tend to appear more or less continuously; however, they are not adequate to offset the growth in demand.

In our present economy, increasing supplies of energy will depend to an unusual degree on the presence or absence of irregular, discontinuous scientific and technical breakthroughs. By their very nature, these breakthroughs are not likely to come along in predictable magnitude or in predictable order. They may not come along at all. If they do, it is likely to be only as a result of massive and continuing expenditure on all levels of research, and on all types of pilot plants. There may be no need for a crash program of the type developed to produce the atom bomb. But there is clearly a need for a massive, government-financed research effort—preferably in cooperation with such efforts in other countries, on a scale considerably larger than that of the space program.

Even a massive program may not produce massive results when shortages develop. No matter what the remote future may hold, the banquet in the king's palace does no good for the man who has starved along the way. Therefore, there is a unique need in the energy area for *long-range contingency planning* which would do for energy what the armed forces attempt to do for national security. Such planning involves, as a minimum, unified and affirmative supervision (not just the regulatory kind which has dominated until now), with a much greater infusion of governmental funds and a much greater attention to timing than we have seen so far.

### IV. ENERGY AND THE PSYCHOLOGICAL CRISIS

The heading of this section is deliberately chosen to emphasize the fact that part of the present "energy crisis" derives, not from anything that has happened directly to the supply of or demand for energy, but from what might be described as a change in our society's demands on itself.

**The Ecology Movement**

Of all the changes that have impinged on energy markets in the last decade, the most rapid as well as the most unexpected and the most unpredictable have emerged as by-products of "the ecology movement." This movement has already resulted in important legislation as well as in less tangible changes in public attitudes. And, in turn, it has emerged as a submovement within a more general crisis in the American public's view of itself. The traditional staple of Fourth of July oratory was, "My country! May she always be in the right; but my country, right or wrong." The late 1960's might be described as the period of "My country! Therefore it is always in the wrong!"

This attitude has already been a factor in numerous social and political changes—directly, or by reaction. In the energy sphere, the ecological army has already won a number of significant victories, and in the process has directed public attention both to the fall-out—literal and figurative—from energy use, and to the fact that under modern urban conditions this fall-out is likely to be of negative value. Forty years ago the production of electricity was viewed as an eminently praiseworthy activity deserving of stimulation in all its forms. Today the past enthusiasm for new generating plants or new transmission lines has been replaced by attacks on the patriotism of those who use electric can openers or by comparisons tending to denigrate the wants of the human population relative to the wants of the fish population.

So far, the environmental movement has not become mature enough to forsake a tendency toward an all-or-none approach. This shows itself in several ways. One is impatience, which is a typical sign either of lack of historical perspective or of an inferiority complex which is related to the subconscious view that bad recommendations must be enacted immediately precisely because they are bad recommendations. A second is a tendency to prohibit, but not price or tax. Despite the American experience with the prohibition of the manufacture and sale of alcoholic beverages, we still seem to regard the death penalty as the proper treatment for social ills if not for individual crimes. A third is a tendency, again reminiscent of the Anti-Saloon League, to assume that "polluters" are not only antisocial but immoral. As environmentalism matures, those phases of the energy crisis which have been conferred on it by the environmentalists should become more amenable to economic treatment.

Meanwhile, it is imperative to pinpoint just what the problem is and how it may be attacked without making the cure worse

than the disease. Should we spread pollution evenly over the country, or concentrate it all in one place? Should we freeze all pollution at its present level? Does it make sense to require the same antipollution devices on the automobile of a farmer in central North Dakota as on the third car owned by a resident of Los Angeles? The problem of meshing energy needs with environmental requirements is already difficult. It will become more difficult. Without the clearest possible thinking about environmental requirements, it becomes impossible.

### V. THE END OF ECONOMIC ISOLATION

Until very recent times, the United States has had a remarkable degree of economic self-sufficiency. This was largely the result of the interaction of geography and technology rather than national policy. Anyone willing to give up drinking coffee and tea, and eating chocolate and bananas, could spend a long and happy life on a strict basis of Buy American.

Our historical record of a very low ratio of exports and imports to national income is already disappearing into the past. Estimates for the future are that oil, which was on an export basis before World War II, will constitute by far our leading import in just a few years. With the introduction of new technologies and new equipment, ocean shipment of liquefied natural gas has added a further important source of imports. Various Middle Eastern countries have already shown by their actions that they follow the U.S. trade returns as carefully as American officials do. Some of these countries have indicated a keen interest in converting part of their supply of exportable hydrocarbons into political demands.

I would not venture to predict how far these demands will go, or what form they will take. I would like, however, to make two comments about the world energy situation.

The first is that there is no case in world history of such a discrepancy between price and unit cost as that now to be found with respect to Middle Eastern oil. As far as the Middle East is concerned, the "energy crisis" is not only political in its possible consequences; it is also political in its origins. When the incremental production cost of a product lies between ten and twenty cents per barrel, and its sales price ranges from ten to twenty times as much, that product is neither the source nor the measure of a world energy crisis; instead, it is the barometer which registers shifts in world political pressures.

My second comment is that the best policy for the United

States might be the paradoxical one of encouraging the maximum penetration of the maximum number of oil-producing countries into the American market. Once foreign producers gain strong positions in the American market, both economic and political stability may be approached by the time-honored method of the balance of power.

But, whatever the specific recipe for U.S. action in the Brave New Energy World, we must first of all face the fact that it is, indeed, a world and no longer a single country. We are all becoming oil diplomats, whether we like it or not.

# PART II

## *Policy Education Methods*