THE FUTURE OF ENERGY DEMAND

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This session on energy and countless others at other conferences and workshops are manifestations of the profound increase in attention devoted to energy matters since the energy crisis of 1973-74. Up to that time, the country had been proceeding blythly on a path of steady, 4 per cent per year growth in consumption of low cost, abundant energy. A few brave souls were expressing concern about the national energy situation. M. K. Hubbert already was contending that we were nearing the zenith of the petroleum era, some research on energy policy and energy outlook was underway at a few isolated locations, and the Congress was holding occasional hearings on energy policy. But the public at large and most policy makers were completely oblivious to the possibility that the United States would encounter any difficulty in continuing to supply ever increasing energy demands.

There were a few disquieting precursors to the crisis of 1973-74. But they caught the attention of few people until suddenly there were shortages. Then serious questions were raised about the possibility of getting fuel to heat homes, to power tractors, or to fuel industrial processes.

The reaction was as one might expect in a "crisis" situation. The federal government put things on "war time" footing with mandatory allocation of the available supplies to protect essential functions and to prevent panic and breakdown of the nation's economy. Price controls were instituted wherever they had not already been in force in order to prevent profiteering. A search was launched for the enemy in this war that had been thrust upon us. Several likely culprits were quickly identified. Since the crisis commenced when the embargo was imposed, the Arabs were quickly singled out and blamed for our energy miseries. But the embargo affected such a small fraction of our oil supply that it was thought someone else must be involved. The oil companies also were charged with withholding supplies in order to create a crisis situation that would make it easier for them to raise prices, set aside environmental restrictions, and generally get their way in the country. But a more thorough investigation seemed to indicate that the petroleum industry was guilty only of a little "war time" profiteering.

In a few months, the embargo was lifted and the energy situation returned to some semblance of normalcy. But everything was not the same. The petroleum industry was regulated to a much greater extent than it ever had been before, prices for energy were much higher and still climbing, and there was a lingering sense of profound uneasiness about the prospects for pleasant tranquility in the country's energy future.

Recent developments tend to confirm the unattractiveness of the energy supply options available to the nation. The natural gas system is showing signs of increasing stress and inability to cope with demands. Alaskan oil is going to be much more costly than originally anticipated. Nuclear power is under even more criticism than it was four years ago. The break-even price for recovery of oil from shale seems to be always staying one step out of reach. Vast conversion to coal is hindered by several environmental problems.

The difficulties of energy supply expansion are discouraging enough to cause a gradual shift of attention to the other side of the demand/supply equation. Maybe it would be easier to reduce demand than to push through the steps necessary to expand supply. Maybe it would be better to think of demand growth as the enemy rather than those who control supplies. Increasingly, policy makers, energy analysts, and the general public are interested in considering whether something can and should be done about the growth in demand for energy.

Past, Present, and Future Demands for Energy

Consumption of energy in the United States has been increasing at an average rate of about 3.5 per cent per year during the past 100 years. It is now at a level of about 80 quadrillion BTU's per year. The regularity of the growth rate and the fact that it has closely followed economic growth, as measured by real gross national product, have led to a common assumption that energy demand will continue to grow as long as the national economy continues to grow. In fact, there has been considerable tendency to simply assume that energy consumption would continue to grow at historical rates regardless of what else happens.

The urge to know what the future holds for energy demands has led to a large number of forecasts, using different methodologies, and yielding widely different estimates of what future energy consumption will be. The simplest approach is to extrapolate past trends in growth of energy consumption. Most experts in the business up to 1973 foretold the energy future by drawing curves on

semilog paper and extending them to 1990 or 2000. That method seemed to work pretty well from 1955 to 1974, but there are serious questions about its validity for longer projections or for projection in times when fundamental changes are taking place. Attackers of extrapolations often make use of the debate tactic of reductio ad absurdim in an application that might be called "extendio ad absurdim." For example, electricity growth at 7 per cent per year rate that was common in the 1960's and early 1970's would result in a 1000-fold increase in demand by the end of 100 years.

Extrapolations of energy growth rates are also attacked for being unnecessarily simplistic. After all, energy demand doesn't just happen. It results from growth in basic economic components, such as households, incomes, and industrial production on the one hand, and the use of energy for personal or business purposes. So recent energy forecasts have usually used either composite projection by energy end-use categories or some form of econometric analysis and forecasting technique.

The more sophisticated projections tend to agree that energy consumption is not likely to grow as rapidly from now to the end of the century as it did during the period from 1950 to 1975. Trend extrapolations are apparently over-estimating even before they reach obviously absurd levels.

The differences among econometrically derived forecasts of energy demand arise mostly because of differences of opinion about what will be the future levels for certain key consumption rates that enter into the forecasts.

The public and private debate over which demand forecasts is most appropriate often becomes quite heated. The reason is that the forecasts are the basics for long-run plans for constructing energy supply facilities. High demand forecasts mean that we should begin now to plan for much larger systems in 15 to 20 years. This makes energy suppliers feel good about their company's growth prospects. Also, erring on the side of over-capacity has certain advantages for a supplier who is serving customers on demand. The environmentalists want the opposite because it means that fewer plants will be planned and, hopefully, fewer will be built.

Reducing the Growth of Energy Demand

The idea of taking deliberate action to decrease the rate of growth in energy demand was first put forward in specific terms in the Ford Foundation's Energy Policy Project. Their preliminary report was given a timely release in 1974 and immediately received

lots of attention and lots of criticism. The FFEPP presented three scenarios of the future: (1) historical growth led to continued supply difficulties, (2) technical fix scenario would employ those demand reducing measures that could cut energy consumption without affecting our standard of living, (3) a zero energy growth scenario included more conservation to the extent of some sacrifice of level of living (from projected levels, not current) and changes in lifestyle.

Opponents of the Ford Foundation study claimed that its zero energy growth scenario in particular was unrealistic and undesirable. However, the idea of taking deliberate action to reduce the energy consumption growth rate has continued to receive consideration and backing.

The Energy Policy and Conservation Act of 1975 gave a small boost toward consideration of the demand side. A potentially larger push has come from President Carter's Energy Message which referred to energy conservation as the "cornerstone" of his policy. His subsequent proposals to Congress for action included a number of measures aimed explicitly at the goal of reducing the rate of growth in demand for energy.

Energy demand reduction is now generally referred to as energy conservation, in what seems at first to be a misnomer. However, further reflection reveals that there are some close parallels to the soil, forest and nature conservation movements of the 1930's, 1940's and 1950's. As in the earlier movements, it is now argued that there are unused opportunities for reducing energy consumption and hence conserving resources by slowing the depletion of those resources.

The basis for arguing that there are opportunities for saving energy and also saving money is of particular interest to economists. Neo-classical economics generally assumes that consumers and businessmen will constantly adjust their use of inputs, such as energy, so as to maximize satisfaction if a household, or income if a business. Advocates argue that energy conservation opportunities have been overlooked because some measures have only recently been discovered to have widespread applicability and the word has not yet reached all potential beneficiaries.

Price distortions faced by the energy user can have the effect of delaying conservation. Energy pricing regulations have long been designed to protect customers from price gouging or profiteering by energy suppliers. Among regulated utilities it has been contended that this policy has caused utilities to convert from the normal profit-maximizing behavior to pursuit of maximum

investment in order to have the largest possible base for applying their allowable rate of return.

Adoption of profitable conservation measures also can be delayed by prices for inputs and devices that save energy that are more expensive to the energy user than are comparable inputs for use in energy supply. The cost of capital for investment is a case in point. Energy consumers (i.e., potential conservers) often have to pay interest rates for capital to invest in insulation or conservation equipment that are significantly higher than rates paid for capital to be invested in energy supply.

Lastly, individual energy consumers are not likely to take into account broader social costs and benefits of their actions. Environmental costs and the social costs of depleting scarce resources are two important side effects of energy consumption. Past experience with soil conservation and other similar programs indicates that only rarely will an individual voluntaritly accept individual responsibility for these social costs.

The biggest question about potential energy conservation savings is whether acceptable policies can actually bring about the adoption of the identified conservation measures. So far, very little has been done that would overcome the information gaps, price and cost distortions, and other hindrances to adoption of conservation measures. Therefore, we cannot expect that a large share of the potential savings will actually be realized with continuation of present policies. Policy changes aimed at removing or overcoming the impediments could bring actual energy demands more closely into line with what would be an optimal level of usage. However, even with all plausible policies (short of mandatory police power) we believed that adoption would cut savings realized to about one-third of the maximum potential.

Actions to bring about more efficient energy use include policies to correct the problems that cause over-use of energy in the first place and policies that induce or even force energy users to change to a publicly preferred pattern of energy use.

Correction of price distortions is also important. Economists are particularly insistent about the need for pricing energy at full marginal cost so that energy consumers will take into account the full cost impact of any energy using choices that they are tempted to make. To economists, the arguments for marginal cost pricing are totally convincing and there are ample opportunities for corrections in the energy system. For example, federal regulations hold the price of oil and natural gas to less than the marginal cost of

new supplies, utilities typically have rate structures that provide electricity at below marginal cost to at least some if not all customers, and environmental and social costs are seldom added to a customer's bill. Non-economists, however, find it extremely difficult to believe that we could possibly be made better off by further increasing energy prices that seem already to be too high.

The difficult task faced by advocates of marginal cost pricing for energy is to convince the public that they will be better off on balance if they pay higher prices for energy. The key is, of course, that revenues in excess of average cost be returned to the public in some form or other. Economists believe that it matters little how the excess revenues are distributed. The public thinks otherwise.

The third "corrective" approach is to provide incentive payments to adopters of conservation measures. These can be partly justified on the grounds of offsetting various disincentives to conserve. Actually, this is a very popular approach which seems destined for more widespread use, especially in the form of tax credits for part of energy conservation expenses. The reason for its popularity seems to be simply that everyone loves a handout. Closer scrutiny reveals it to be a rather ineffective approach affecting only investment choices, not decisions about behavior such as thermostat settings. In addition, subsidies tend to be costly per unit of change actually obtained since the subsidy must be paid to those who would have adopted anyway.

Policies that make capital available to potential adopters of energy conservation measures at terms comparable to those faced by energy suppliers could help to correct a disparity that now exists. Low interest loans, guaranteed loans, and loans available for longer periods would all help alleviate situations where businesses or households are deterred by capital shortages from making investments that could yield energy savings worth several times as much as the required investment.

Policies that change operating rules, such as building codes, also can serve a corrective function. Requirements for excessive lighting and ventilation are one case in point where a rule change could permit conservation to take place. More often, however, rules and regulations are used to require what is collectively determined to be the "right thing to do." Insulation requirements for new buildings, efficiency standards for automobiles and appliances, and speed limits are all examples of regulation "for our own good." Surprisingly, this approach tends to be more favored than the alternatives that try to bring about change while still leaving the final choice up to the individual. The popular backing for rules that

require energy conservation seems to result from a desire to adopt a policy that will work for sure since it depends on public compliance with the law rather than on uncertain voluntary response.

The ultimate in directed allocation is rationing. Results of a large household survey that we conducted indicate that many more people favor rationing than would approve of taxes to discourage heavy energy consumtpion. Past experience indicates that rationing works best in an emergency situation. It is very doubtful that it would wear well if adopted as a long-run solution to energy problems.

Public policy educators can play an important role in the overall deliberations about energy policy choices. I see three principal areas where your input can be particularly helpful.

Education of the public as to the resource depletion issue would provide a useful base for decisions about how important it is to push energy conservation, even to the point where the cost of the conservation measure exceeds the present value of the energy that is saved. The American public is widely divided on this issue at present.

Communication of a general perspective for evaluating conservation opportunities relative to the alternatives of energy supply could also help to settle a number of debates that have grown up over issues such as power plant construction, coal mining, and so on. At present, there is no agreed-upon basis for comparing such divergent choices. The understanding of public choice processes is increasing, and public policy educators could make a substantial contribution by using that and other concepts to lead to a resolution of energy issues.

Public policy educators could help to develop innovative institutional arrangements for implementing desirable energy policy actions. All too often, policies are agreed to in principle but dropped because no one can see a way to implement them through existing or politically feasible institutional structures. Institutional innovation, in that case, is an extremely valuable input and one that public policy educators may be especially skilled at supplying.

A final note of caution is in order. The stakes in energy policy deliberations are large and there are many opposing points of view about what should be done. The public policy educator who enters this arena should be prepared for attack and criticism, regardless of the role that he plays.