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DEREGULATION AND ENERGY CONSERVATION: A REAPPRAISAL

John Byrne and Daniel Rich
University of Delaware

INTRODUCTION

Conservation represents one of the cheapest and most environmentally benign energy options available now and for the foreseeable future. In spite of this, federal and state policies do not apply the same logic and expectations to conservation that have been applied to other energy resources, such as coal, oil, natural gas, and nuclear power. Moreover, the market and policy arrangments that influence conservation are neglected by most energy research. As a result, we have failed to exploit this resource fully.

Underestimation of the potential for conservation is the consequence of a restricted understanding of the factors that influence this energy option. Conventionally, it is believed that conservation results mainly from escalating fuel prices. Consistently, deregulation of fuel prices has been portrayed as the one action indispensable for the creation of an environment favorable to energy efficiency. Thus Amory Lovins, the Harvard Business School Energy Project, the Ford Foundation, the National Academy of Sciences, and the past four national administrations have all depicted conservation as the one tangible benefit of deregulated fuel prices. With deregulation, prices are expected to reflect the true costs of additional production and thereby provide the incentives to discover and implement the most efficient arrangement of energy services. Indeed, it is widely accepted that market prices, even though hindered by regulation, have been responsible for the only good news about energy — the substantial conservation witnessed since the oil embargo. According to Roger Sant (1979), had we regulated earlier the good news would be even better; we would now be wealthier and more energy secure.

In our view, the conventional understanding of conservation is inadequate and the posited relationship between deregulation and conservation is erroneous. We suggest that: (1) fuel prices are a poor predictor of energy conservation; (2) energy conservation to date does not represent a structural adaptation towards greater efficiency; and (3) assumptions about the consequences of deregulation are based upon an inaccurate understanding of the circumstances that have historically shaped the political economy of energy. We propose that a transition to an energy efficient society requires a change in the criteria used for evaluating energy options and a recognition of conservation as a real addition to future energy supplies.

ENERGY PRICES AND ENERGY CONSERVATION

Market proponents interpret conservation to be foregone energy consumption resulting from higher fuel prices. This interpretation appears plausible within a market economy. Upon examination, however, it turns out to be anything but self-evident. Indeed, the assumption that conservation since the embargo has resulted from increasing fuel prices is not easy to demonstrate.

Efforts to estimate conservation have proved to be extremely difficult. While a variety of statistical techniques have been employed, they all

are predicated upon the specification of an economic demand function in which changes in consumption are linked to changes in fuel prices (and many other variables). A number of anomalies have surfaced. Thus, despite ever more elaborate modeling techniques, projections of energy demand consistently underestimate the size and extent of conservation (Lovins, 1983). Values of fuel price elasticities (estimates of the demand response to changes in energy prices) have varied significantly since the 1973-74 oil embargo although demand theory suggests that they should not without extensive changes in "consumer tastes." Ignoring the problem of defining consumer tastes, one explanation for this variation is that the model used greatly affects the elasticity estimate obtained, raising the possibility that the conclusions reached are an artifact of the method (Kouris, 1981). Since all methods claim to be extensions of the same demand theory, we are left without convincing reasons for adopting any particular model.

A second explanation for variation in estimates is that energy demand is undergoing fundamental change as older household technologies are replaced with more efficient ones. Until this process is completed, we might expect short- and long-run price elasticity estimates to be unstable. Thus, some have suggested revising residential demand formulations to include only or primarily appliance capacity terms (Parti and Parti, 1981). But there are problems with this reasoning. First, evidence on household conservation suggests that cutbacks in use and low-cost/no-cost fixes rather than technological replacement account for most of the reduced consumption in this sector (Frieden and Baker, 1983). Beyond this, such an explanation in itself points to the inability of elasticity analysis to measure price responsiveness precisely in those periods of significant change when accurate measurement is most needed. This timelessness, many have argued, is the principal flaw of this mode of analysis (Kouris, 1981).

The persistent irregularities in conservation estimates indicate the inadequacy of conceptualizing conservation as curtailment caused by higher fuel prices. While fuel prices are undeniably an important factor in decisions to conserve, others may be equally or more important: the availability and cost of alternative forms of conservation, the extent of consumer information about energy-saving methods, the size of subsidies to other fuels, and the policy incentives and disincentives for conservation. These variables are seldom incorporated into demand models, and even if they were, a major flaw would remain. This is because energy conservation is seen exclusively as an attribute of demand, when its greatest contribution could be as a supply option.

This point is illustrated by research on residential electricity consumption in Delaware during 1967-1980 (Byrne and Wang, 1981). A strong upward trend in consumption per household between 1967 and 1973 was found to have been unmistakably interrupted by 1974 and a leveling off in demand to have begun between 1974 and 1976. By 1977, consumption actually began to decline. While the drop in consumption between 1973 and 1974 was clearly in response to a 22.5 percent increase in real electric prices (i.e., prices adjusted for inflation), the continuing decline after 1974 is not easily explained as an adjustment to higher prices. In four of the six post-embargo years, real prices actually decreased, and the largest single-drop in prices during the eleven years examined was in the post-embargo period (1975-76). Nevertheless, annual household consumption declined to

the equivalent of eleven months of pre-embargo consumption. Most interesting, while seasonally adjusted real prices continuously declined over all eight quarters of the 1977-79 period, residential consumption also steadily decreased.

If conservation is largely a response to higher energy prices, how is the continued reduction in household electricity consumption to be explained during a period of declining prices? Under the elasticity concept, we must conclude that the pattern evident in recent years is a temporary aberration, and that little optimism should exist for sustained conservation in the future. Thus, Delaware elasticity estimates support national research which has concluded that household demand is inelastic; an average 10 percent increase in the price of a Btu of delivered electrical energy is predicted to induce an average reduction of no more than 2 to 4 percent in Btus consumed (Taylor, 1975).

There are important reasons to question the adequacy of the elasticity concept of conservation. Price elasticities do not really measure conservation tendencies. Rather, they project the strength of tendencies to lower consumption when prices are rising and to increase consumption when prices are falling. A problem arises, however, since elasticities do not distinguish between **consumption** tendencies and **conservation** tendencies. Consider this example: one household group continuously reduces its consumption of electricity both while prices increase and fall; in contrast, a second group responds to higher prices with reduced consumption of comparable size to the first group, but increases its use during periods of declining prices. In a period of fluctuating prices, the price elasticity of the first group will be small in absolute terms while that of the second group will be relatively large. Only the behavior of the second group conforms with the expectation that fuel price levels determine conservation. But this leads to the peculiar conclusion that the group which increases its relative consumption is to be judged the more conservation-oriented!

This example corresponds to what was found through a regression analysis of electricity demand patterns among Delaware residential consumers (Byrne and Wang, 1981). Employing a two-stage procedure to correct for simultaneity bias (Bohi, 1981), separate estimates of price elasticity were obtained for both regular service and all-electric households. Real average electric prices, family income, family size and an appliance saturation variable were used as regressors on kWh consumption. Anticipating a structural shift in demand resulting from the oil embargo, separate elasticities were estimated for 1967-73 and 1974-80. All regressions were based on quarterly observations.

The results (Table 1) indicate that the elasticity of regular service users was found to be nearly constant over the pre- and post-embargo periods. In contrast, the elasticity of the all-electric group grew by nearly 60 percent in the post-embargo interval. These elasticity patterns suggest that, since the embargo, all-electric residences are more likely to conserve. Such a conclusion would be wrong, however. Examination of consumption patterns since the embargo shows that the increase in the elasticity of all-electric users is due almost entirely to reversals of conservation gains achieved under higher prices. Whenever real prices fell, this group offset earlier consumption reductions with increases in use. As a result, 1979 average annual consumption for the all-electric group was

nearly equal to the 1972 pre-embargo average! Regular service consumers, however, had reduced their consumption in 1979 to the equivalent of 11 months consumption during 1972. In the last quarter of 1979, even the all-electric group began to reduce its consumption, despite the fact that real prices continued to decline. By the end of the first quarter of 1980, all-electric households were consuming at an annual rate equal to 11 months of 1972 consumption; the regular service group had reduced its use to 10.5 months of the 1972 level. Obviously differences in price elasticity were no guide to conservation tendencies of the two groups.

TABLE 1

SELECTED STATISTICS
FOR DELAWARE RESIDENTIAL ELECTRICITY DEMAND REGRESSIONS*

	Fuel Price Elasticity	R^2	Standard Error of the Regression
Pre-Embargo (1967-73)			
1. Regular Service Residences	-0.322	0.956	0.033
	(-3.010)		
2. All-Electric Residences	-0.231	0.985	0.047
	(-1.421)		
Post-Embargo (1974-80)			
1. Regular Service Residences	-0.224	0.948	0.033
	(-2.503)		
2. All-Electric Residences	-0.445	0.974	0.054
	(-3.226)		

*Reported statistics are for two-stage regressions using logarithms of observed values. This transformation allows for direct estimation of the fuel price elasticity as the constant term for the fuel price variable (see Kane, 1968: 329-331). Student's t statistics provided in parentheses.

These anomalous results not only fail to confirm the deregulation thesis, but, ironically, they suggest that price-induced conservation is fickle. Thus, while all-electric consumers acted in accordance with price-induced conservation, they appear to be the least reliable conservers. The deregulation argument completely ignores the **price of conservation**, and directs attention solely to the **price of consumption**. This relegates conservation to a temporary status unless consumption prices climb so high as to cause a general shift in energy demand. The conservation expected is restricted to activities like reducing thermostat settings or using appliances less often, because only these activities can be easily reversed when prices fall. But there is another, more significant type of conservation that concerns structural changes in the way energy is consumed. This can involve options ranging from insulating one's attic or replacing old appliances with more efficient models to eliminating declining block electric rates or reorganizing the utility industry. These activities result in substantial conservation, but they are influenced by factors other than fuel prices: the price of conservation options, the financing available, consumer information, the number and kind of substitutes, and, most important, the nature of public and private policies. Survey data on Delaware household electricity conservation suggest that these factors rather than electricity prices are of greatest importance to consumer decisionmaking; in fact, few households were able to indicate even approximately how much they paid for electricity (Byrne et al, 1981).

Contrary to the logic of fuel price elasticity analysis, there is no reason to presume that the post-embargo pattern of conservation is a temporary aberration. Rather, the anomaly results from the failure of fuel price elasticities to accurately portray the facts of conservation experience. When Delaware households reduced consumption in the face of falling real prices, they violated the assumptions and the logic of fuel price elasticity analysis. It is not surprising, therefore, that measures of association between fuel prices and conservation do not reflect this behavior.

Conservation will remain systematically undervalued so long as markets and policies focus attention on swings in conventional fuel prices and deny recognition of conservation as a supply option with its own prices and economics. As matters now stand, consumers can choose oil, natural gas, and electricity as systematic alternatives, but they cannot make the same kind of choice for conservation. As a market option, conservation is reduced to a speculation about differentials among the future prices of oil, gas, and so on, with profits awaiting those who correctly anticipate market supply and demand. Even with a general increase in the cost of conventional energy, conservation would remain undervalued. While very high prices contribute to a significant decrease in energy consumed, they do not alter the system of energy production and distribution; higher prices mean higher value for the output of that system and, for a period of time, higher profits. On occasion, it is in the interest of dominant energy suppliers to make conservation more accessible. Thus, fuel efficiency became appealing when smaller automobiles could be sold at a profit comparable to that for larger automobiles; similarly, utilities joined the conservation bandwagon when the return on load management and load shedding bettered that for new capacity. But, these cases merely illustrate the substitution of one source of profit for another. Conservation is maintained as a form of

speculative investment the value of which is the profit to be derived by institutions which currently dominate energy markets. Walter Mead (1982) argues that the only difference between conservation and profit maximization is that "in some circles the latter is bad and the former is good." This is certainly true so long as we accept the existing political economy of energy as the measure of conservation's value. What is not considered by such a measure is energy conservation's value to society. This neglect will continue no matter how high conventional fuel prices become, because the social value of conservation includes benefits which are not expressed by existing prices and can never be accurately assessed from the vantage point of existing markets. Limited to a speculative investment, conservation at most will serve as an erratic and temporary palliative to the marketing difficulties of the current energy system.

THE MYTH OF THE LEAST-COST ENERGY FUTURE

It might be argued that the criticisms lodged so far are inconclusive. They challenge the logic of deregulation and the performance of markets during a volatile period, but they do not demonstrate that market forces are failing to guide us to a long-term, least-cost energy future. Perhaps we should decide, after all, to "let the forces start turning." What could we expect?

In the short-run, some market signals are clear. One of these is a well-documented migration south of population, industry, employment, and income. Data concerning these shifts for selected states from Frostbelt and Sunbelt regions (see Table 2) indicate that the highest population growth rates in the Frostbelt (9 to 10.7 percent) are modest in comparison with those experienced between 1965 and 1980 by the Sunbelt states (20.8 to 65.8 percent). Similar results obtain for growth in real per capita income, service employment, and value added by manufacture. The President's Commission on a National Agenda for the Eighties (1981) cited this pattern as a sign of the market's ability to stimulate post-industrial economic renewal.

Some analysts interpret the migration to a warmer climate to signify a shift to an energy-efficient economy (Davis, 1979). If this is to be the result, there is no sign of it yet. The movement south has been accompanied by a spectacular growth in energy demand. In total, energy consumption grew 5.5 times faster in the Sunbelt states than in the Frostbelt. The Sunbelt residential sectors experienced slightly slower growth, outpacing the Frostbelt by a factor of 4.5. The slowest relative growth occurred in the transportation sector, where Sunbelt use increased only 2.3 times faster; but there was a much higher transport energy demand in the Sunbelt to begin with. Most instructive are the shifts in commercial and industrial energy demand. The market generated post-industrial future will concentrate business demand for energy in the commercial sector and diminish demand in the industrial sector. Thus, the Sunbelt commercial sectors experienced the highest growth rate of any sector in either region, 134 percent on average. In contrast, industrial energy use grew the least in both regions, up 56.4 percent on average in the Sunbelt states and actually falling by 9 percent in the Frostbelt.

TABLE 2

POPULATION, ECONOMIC AND ENERGY CONSUMPTION CHANGES FOR SELECTED FROSTBELT AND SUNBELT STATES, 1965-1980
(Percent)

	Population and Economic Changes				Sector Energy Consumption Changes				
Frostbelt	Population	Real Per Capita Income (1972=100)	Service Employment	Value Added by Manufacture	Total	Residential	Commercial	Industrial	Transportation
Illinois	6.9	33.8	64.1	184.8	25.0	35.9	41.8	8.5	38.8
Massachusetts	4.4	39.1	68.4	211.7	-2.6	-[illegible].3	20.0	-45.3	36.7
Michigan	10.7	37.3	92.5	117.5	20.9	35.7	65.2	-4.2	35.1
New Jersey	9.0	41.5	82.8	167.5	32.5	21.2	72.7	17.2	42.4
New York	-0.9	31.5	42.4	156.2	3.8	[illegible].9	21.8	-19.2	17.8
Ohio	5.9	45.0	85.0	173.3	15.3	25.3	52.4	-4.1	45.0
Pennsylvania	2.2	39.7	65.4	174.9	4.5	26.3	35.9	-17.7	45.5
Weighted Average[1]	4.6	37.5	68.0	166.7	13.4	21.3	42.0	-9.0	35.5
Sunbelt									
California	27.9	41.3	122.7	324.5	53.7	45.1	90.3	37.8	58.5
Florida	65.8	55.5	179.8	458.4	126.2	20[illegible].6	140.7	96.2	110.9
Louisiana	20.8	71.0	110.4	472.8	102.0	111.5	195.3	90.6	109.6
New Mexico	29.0	48.6	89.8	4,828.1	40.1	48.1	123.0	12.2	51.9
Oklahoma	24.5	65.5	112.5	362.7	65.4	82.1	128.6	45.1	47.8
South Carolina	25.4	65.1	121.5	300.8	84.9	106.7	170.6	74.1	61.5
Texas	38.0	70.9	134.8	441.9	73.3	106.1	178.2	52.4	99.3
Weighted Average[1]	35.8	55.5	132.9	495.4	75.8	95.5	134.1	56.4	81.1

[1]Based on 1980 state population shares.

Sources: U.S. Bureau of the Census, Statistical Abstracts of the United States, 1966, 1981 and 1982-83; and 1977 Census of Manufactures, 1977; U.S. Energy Information Administration, State Energy Data Report: 1960-1980, 1982.

These differences are greater than could be expected as a result of shifts in population and economic activity. Computed on a per capita average (Table 3), the growth rates in total energy consumption increased for both regions. However, Sunbelt per capita demand increased at a rate over 3.5 times the Frostbelt states' average rate. Moreover, average Sunbelt per capita demand was higher at the outset. Most distrubing are the regional trends in commercial energy use. Whereas in 1965 the Frostbelt states averaged roughly 10 percent more energy use per service employee, by 1980 the situation had reversed; Sunbelt states averaged 9.7 percent more per employee than the Frostbelt. Commercial sector energy efficiency improved in every Frostbelt state during 1965-1980 and the region decreased its demand per employee by 15.6 percent; in contrast, five of the seven Sunbelt states posted decreases in commercial sector energy efficiency and the demand per employee rose 1.2 percent on average. Only in the industrial sector was there consistent evidence of conservation in the Sunbelt. Even so, by 1980 the Sunbelt required more than twice the energy per dollar value added (58,000 vs. 26,000 Btu's); and both areas reduced their industrial energy demand per dollar value added by nearly the same proportion (-68.9 percent vs. -65.7 percent).

The short-term gains in energy efficiency since the oil embargo almost certainly will be overwhelmed by the long-term pattern of increased energy consumption depicted in Table 3. Surely, these trends are disconcerting in light of the expectation of a market led least-cost energy future. But even these trends do not convey the full magnitude of the dilemma.

Table 3

Selected Sector Energy Efficiencies,[1] 1965-1980

	Total			Commercial			Industrial		
	1965	1980	% Change	1965	1980	% Change	1965	1980	% Change
Frostbelt									
Illinois	283	331	17.0	594	514	-13.5	74	28	-62.2
Massachusetts	228	213	- 6.6	502	358	-28.7	52	10	-80.8
Michigan	274	299	9.1	615	527	-14.3	61	26	-57.4
New Jersey	231	281	21.6	532	503	- 5.5	49	21	-57.1
New York	209	219	4.8	460	393	-14.6	54	17	-68.5
Ohio	329	358	8.8	566	466	-17.7	98	34	-65.3
Pennsylvania	323	330	2.2	446	366	-17.9	127	38	-70.1
Weighted Average[2]	268	290	8.2	524	443	-15.6	75	26	-65.7
Sunbelt									
California	225	271	20.4	454	388	-14.5	69	22	-68.1
Florida	187	256	36.9	415	357	-14.0	119	42	-64.7
Louisiana	468	783	67.3	580	815	40.5	490	163	-66.7
New Mexico	341	371	8.8	539	631	17.1	1,115	26	-97.7
Oklahoma	304	404	32.9	585	629	7.5	323	71	-78.0
South Carolina	217	320	47.5	531	650	22.4	88	38	-56.8
Texas	469	589	25.6	474	562	18.6	371	104	-72.0
Weighted Average[2]	301	393	29.5	470	486	1.2	217	58	-68.9

[1] Efficiencies were calculated as follows: Total--million Btu per capita; Commercial--million Btu per service employee; Industrial--thousand Btu per dollar value added by manufacture.

[2] Based on 1980 state population shares.

Sources: U.S. Energy Information Administration, State Energy Data Report: 1960-1980, Washington, DC, 1982. U.S. Bureau of the Census, Statistical Abstract of the United States, 1966 and 1981 editions, Washington, DC, 1966 and 1981. U.S. Bureau of the Census, 1977 Census of Manufactures, Washington, DC, 1977.

The American energy system is failing to adapt structurally to new environmental, economic and resource conditions. Evidence of this can be found in the declining system efficiency that has accompanied spiraling rates of energy consumption and prices (Table 4). During the 1965-1980 period, the percentage of energy lost through electricity conversions (including transmission losses) dramatically increased. The losses were experienced nationwide, but were most acute in the Sunbelt where electricity grew fastest as a proportion of total energy supplied. By 1980, over half of the energy flowing into the residential sectors of four of the seven Sunbelt states was lost through electricity conversion. The highest percent of losses through electricity conversions was experienced in the commercial sectors. The Sunbelt commercial sectors, supposedly the catalysts of economic revival, led all sectors with an average of 49.2 percent in electricity losses. Only the industrial sectors of both regions stayed well below the level of 50 percent losses; nonetheless, losses rose by one-half in the Sunbelt and two-thirds in the Frostbelt.

Table 4

Electricity Losses By Sector, 1965-1980
(Percent)

	Residential		Commercial		Industrial	
	1965	1980	1965	1980	1965	1980
Frostbelt						
Illinois	17.3	27.6	27.2	40.4	11.6	20.4
Massachusetts	12.7	25.8	15.0	38.1	13.9	[illegible]
Michigan	17.1	25.1	28.7	32.7	15.4	25.6
New Jersey	15.4	28.4	25.4	36.3	17.2	21.0
New York	15.8	26.8	27.4	38.1	15.4	26.8
Ohio	17.2	31.9	26.5	39.7	19.0	26.5
Pennsylvania	17.6	30.2	23.9	40.9	10.9	21.2
Weighted Average[1]	16.4	28.1	25.7	38.3	14.7	24.6
Sunbelt						
California	24.2	36.9	43.1	48.5	18.0	23.7
Florida	52.9	64.8	47.7	59.2	16.5	24.5
Louisiana	32.1	50.0	41.2	37.2	4.4	9.1
New Mexico	18.9	32.0	37.4	39.2	6.8	14.0
Oklahoma	25.0	41.7	33.8	46.0	8.2	15.7
South Carolina	38.7	54.4	41.3	53.6	24.8	30.9
Texas	33.4	50.0	43.8	47.6	6.0	13.1
Weighted Average[1]	32.4	46.7	43.2	49.2	13.5	20.0

[1] Based on 1980 state population shares.

Source: U.S. Energy Information Administration, State Energy Data Report: 1960-1980, Washington DC, 1982.

These data do **not** indicate the wastefulness of energy choices by individuals who need high prices to conserve (especially when electricity was and continues to be our most expensive fuel). Rather, they evidence the failure of an energy system which cannot accommodate change. This failure is not accidental. It is precisely the result of market forces. The post-industrial economy urged by the market has its optimal location in the south, **as determined by the market.** With the selection of this location came also the selection of energy options. The electrical base of the Sunbelt energy system is not a recent occurrence, nor is the high rate of energy losses. Thus, these conditions must have been anticipated in the market calculus which determined that the Sunbelt was ideal for beginning

the post-industrial transformation. If we are to place faith in market forces, then we must accept a growing reliance on energy systems with 50 percent losses. That such acceptance is to be understood, not as a reflection of our energy problem, but as a necessary part of our best economic solution is, to say the least, baffling.

THE POLITICAL ECONOMY OF ENERGY TRANSITIONS

An energy efficient future hinges upon whether our energy choices include systematic options to conventional energy sources. The obstacles to such a future lie principally in political and economic arrangements which have been reinforced over decades to secure the benefits of an era of cheap energy. These arrangements now constitute the primary source of inertia in choosing an alternative future; they make change inherently costly and serve as barriers to new energy options. The constraints on an energy transition are manifest in the seemingly natural roles and responsibilities fulfilled by energy producers and consumers, in the alignment of political resources in a manner favorable to the economics of conventional fuels, in the operations of a financial infrastructure geared to serve a centralized system, and in the body of law and public policy that legitimates and encourages current patterns of production and use.

As Amory Lovins (1977) has argued, we inevitably face a problem of exclusivity in choosing among energy futures that is the result of "institutional and cultural incompatibility and logistical competitiveness of evolutionary paths . . ."; "the key distinction . . . is in their architecture, the structure of the energy system." So long as the criteria for judging our energy options remains the stability of existing energy institutions, there is little reason to expect materially different answers from those already given to the questions of energy choice; some new options may be exploited but the opportunity for an energy efficient future will be foregone. For the most part, conservation will be limited to a supplementary role within a primary system of centralized production and distribution that is increasingly represented by a dependence on electricity.

Overcoming this intertia will require changes that destabilize energy politics and economics. Fundamental political and economic change typified the historic transitions to coal, oil, and electricity. These transitions involved more than supplementation or substitution of fuel types. Each transition was challenged by the institutional inertia of established energy interests. Each was confronted by legal and policy constraints that secured the economic position of prevailing energy sources and barred new entrants. All of these transitions initially were evaluated on the basis of costs and advantages for the existing energy system and none of them would have been achieved merely through the operations of market forces.

The political and economic changes needed to achieve an energy efficient future are comparable in scale to those which accompanied earlier energy transitions. One set of changes represents necessary instrumentalities for expanded energy choice. These include changes in energy pricing policies, the phasing out of massive federal subsidies to the oil, coal, natural gas, and nuclear power industries; and the development of policies to offset entry barriers created by market imperfections. Such changes would address problems that disadvantage virtually all competitors to conventional sources. By themselves, however, they would not alter institutional conditions which militate against the emergence of an energy efficient future.

To take full advantage of conservation's potential, other changes would be needed that bear directly on conservation's distinctive characteristics as an energy resource. These relate to changes in the expectations, behavior, and responsibilities of producers and consumers, and changes in the institutional infrastructure available to stimulate and support conservation options. Thus, for example, households will have to reorient from an initial-price to a life-cycle cost perspective in energy purchase decisions and this may require programs of consumer education as well as legislation to create uniform energy efficiency and operating cost information. Banking regulations will also have to be revised to increase the availability of loans to finance conservation. Since household energy choice is linked to the characteristics of the housing stock, the construction and building industries will have to incorporate energy efficiency into their design and engineering practices and their purchase decisions on appliances for new homes. At the same time, state and local government will have to modify building codes to encourage energy efficiency and revise tax laws to avoid penalizing conservation efforts.

Beyond changes of this type, an energy transition is likely to be accompanied by major shifts in political and economic power. For example, progress towards an energy future based on conservation and renewables is likely to speed the collapse of power utilities that are already experiencing serious fiscal decline. Obviously such a prospect is neither benign or neutral with respect to the current organization of political and economic power in the energy system. Similarly, advocates of conservation and renewables often anticipate that decentralization of energy production and distribution would result in a more participative, community-based mode of decision-making. But this will happen only if there is also a change in the structure of local government to create opportunities for participation as well as a devolution of authority and resources in the federal system to match a shift in responsibilities to the local level. Clearly such institutional realignments are not confined to matters of energy choice and would entail a profound redistribution of political power comparable to that which accompanied the transitions to coal, oil, and electricity.

Finally, and most importantly, changes must take place that alter not only the form and appearance of the political economy of energy but also the system of social valuation that drives it. Fundamentally, political and economic structures represent systems in which the worth of social action and goals is determined. Currently, energy alternatives are unfailingly compared in both economic and political terms with the performance of the existing system of energy. If, however, the current political economy is unstable and no longer viable, then it makes little sense to depend upon it to measure the social value of energy alternatives. This of course is precisely the central issue. Are we to rely on existing political and economic structures to determine our energy future, or must the basis of social valuation change before our energy future can be decided?

Understood as a problem in political economy, it becomes clear that a transition to an energy efficient society will not emerge simply by force of recognition of conservation's social, environmental, or economic benefits. While these benefits are real and ample, realizing them will require

changes that can only be seen as immense costs from the vantage point of the current energy system.

CONCLUSIONS

By treating conservation largely as a response to higher prices, the federal government and most states contnue to systematically undervalue this option. Despite widespread rhetorical support, a hostile climate toward conservation has been created. Thus, the 1983 and 1984 Reagan administration budget proposals called for eliminating virtually all federal support for conservation programs, while doubling funding for nuclear reactor research (Shapley et al, 1983).

If we learned from experience, however, we should conclude that the major opportunities for our energy future lie in an increasing reliance on decentralized energy options like conservation. We believe that decentralized efforts that rely on behavioral and institutional as well as technological adaptations have the greatest potential for stimulating a transition toward a new system of expanded energy choice. The existing system defines these decentralized adaptations as only temporary adjustments along the path of system renewal. That is all they will be unless we remove the current constraints on energy choice.

In our view the value of conservation ultimately lies in the benefits to be derived from displacing a centralized system of energy production and distribution that no longer performs effectively even on its own criteria and has not generated any alternatives. Exploiting this value requires that conservation be recognized as an alternative institutional arrangement of energy production, supply, and distribution. Projections suggest that conservation is our least-cost supply alternative to the end of this century with a highly competitive price of 7-8 dollars per barrel of oil equivalent saved (California Energy Commission, 1981). Despite the refusal of market advocates to recognize conservation as a source of supply, this energy alternative has been responsible for meeting 70 percent of the new energy needs of the U.S. since the embargo (Lovins, 1983). It is time to recognize conservation as a real and substantial source of energy now and for the future.

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