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# ENERGY POLICY IN A CHANGING SOCIAL ORDER



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## 1. INTRODUCTION

The nature of public policy formation is largely contingent upon and reflective of the basic social, economic and political context in which public issues are debated [1]. As such, public policies represent the intentions and perceptions of government, conditioned by prevailing pressures, circumstances and ideology. At the same time, public policies often develop a constituency and staying power which transcend the initial context in which the policies were formed. National welfare policies, as an example, were created in a particularly demanding social climate. Fifty years and a post-war economic boom later, federal income support policy continues. The long-range intentions of government represented in this policy have been incrementally adjusted over-time but remain basically intact. Policy legitimacy has been clearly established.

The dynamics of national energy policy may be examined in the above framework with valuable results. If we can begin to appreciate the social context which has led to past policy choices, we may better recognize present social trends and choose more intelligently among conflicting energy policy options now before us. However, should we remain insensitive to the evolving social order, the policy choices presented us will be unwelcome, if not resisted.

This paper briefly sketches the background of conventional energy-management and use relative to public policy. Next, the events which threaten to overtake our lingering social, economic and political impressions relative to energy will be examined. We shall see how current social trends may be taking us in unfamiliar energy policy directions, particularly involving the more advanced and alternative energy options now under consideration. Finally, it is argued that the emerging social consensus which will ultimately define national energy policy increasingly favors a transition from conventional to renewable energy sources.

## 2. ENERGY AS PUBLIC POLICY

It has only been in the past few years that energy use management has emerged as a focal point of public policy. The nation's transition from wood and coal fuels to petroleum and natural gas occurred with little or no specific policy guidance from government. As Edgmon has concluded, prior to the quadrupling of imported oil prices in 1973-74, energy was "not widely utilized as an organizing concept in public sector policy formation and implementation." [2] What public interest did exist regarding energy centered on the contribu-

tion of low cost fuels and energy conversion processes to the expansion of the nation's economic base.

The substitution of increasingly higher quality fuels across all energy use sectors yielded larger economic returns per unit of capital and labor investment. Productivity rose steadily throughout the early and middle years of this century with the nation enjoying an unparalleled period of growth in public and private well-being. Government's role was restricted largely to the use of regulatory mechanisms to maintain low energy prices and reliable supplies. Even these policy actions, notes former Federal Energy Administration head John O'Leary, were "overwhelmingly a residual of policy considerations relative to the economy at large." [3]

It is worth recalling some of the more significant examples of what has essentially been a de facto energy policy in the United States. In the period immediately following the second world war, natural gas and petroleum fuels began to threaten the energy markets long dominated by coal. Public policy did little to discourage this growing inter-fuel competition. Rather, government assisted petroleum and gas competitiveness during this period, although still outside the context of a comprehensive energy policy. Oil and gas producers used the resulting decline in prices to capture growing shares of energy markets [4].

The natural gas regulatory arm of the Federal Power Commission (now the Federal Energy Regulatory Commission) maintained a cap on gas prices well beyond the time when replacement costs for gas demanded higher prices. One of the principal arguments used to support this policy was the concern of government that gas users be protected from the threat of uncontrolled price rises by suppliers having monopoly control over the fuel and its distribution network. As the government saw it, the spectre of duplicating the gas supply system to allow free market competition among distributors was neither economical nor logical. Such system redundancy was clearly not affordable, and so long as supply could be guaranteed at the controlled price, little thought was given to the concept, much less policy, of replacement pricing.

A second major government initiative affecting the nation's use of fuels was a tax policy which extended generous depletion allowances to fossil energy extraction industries. O'Leary has remarked how this seemingly non-discriminatory policy actually favored the capital-intensive oil and gas industries to the detriment of a labor-intensive coal industry [5]. A neutral tax climate would have required expensive petroleum exploration and extraction costs to be included in the final price of oil products. Labor intensive industries fell victim to capital intensive ones, leaving the coal industry, as we have it today, "a by-product of public policy." [6].

Underlying government pursuit and public acceptance of what passed as energy policy was a shared perception of long-term energy supply availability. The nation and its leaders failed to openly acknowledge the prospects for eventual decline in fossil energy supply. Public policy addressing supply was not necessary as long as the perceived security of that supply was beyond question. As a result, the nation went relaxed into the late 1960's, unprepared for the shocks to come.

Government actions in several non-energy areas have contributed equally with tax policy to establish the vexing social environment in which comprehensive energy policy must now be made. Transportation policy, reflected in a burgeoning highway system, combined with federal housing policy influencing mortgage insurance availability, helped make energy-intensive suburban development both possible and attractive. Regulatory policies affecting trucking and rail industries created artificial rate structures and in unintended ways guided the use and overuse of energy in the transportation sector. Finally, the policy of oil import rationing protected domestic producers and contributed to the depletion of domestic petroleum reserves.

All of these policies went unrecognized in their latent effect on energy use trends within the United States. They stimulated the economy in untold short-term ways. More importantly, they allowed end-users to enjoy, in a very convenient fashion, the services and products made possible by the increased use of high quality energy, first from coal, and later from oil and natural gas. The underlying premise of energy plenty tied public policy to a series of incremental and surrogate energy initiatives, leaving the U.S. energy structure more a product of the overall economy than of conscious energy technology or resource use policy [7].

## 3. A CHANGING SOCIAL ORDER

Quite abruptly, political, economic and ecological realities have combined to alter the social environment in which U.S. energy policy options, surrogate or otherwise, must develop. Most prominent, of course, has been the 1973-74 price rise of imported oil. Almost overnight, the world price of crude rose from close to $3.00/barrel to over $12.00/barrel. Recent increases by the African OPEC nations have brought crude prices to a record $26.27 a barrel [8]. Spot prices for crude now hover near the $4.00 per barrel mark. The cost of enhanced recovery of domestic crude is projected by industry to reach the $67.00 per barrel level by the end of the coming decade [9]. The base case price for oil in the year 2000 ($25), as forecast by the President's Domestic Policy Review of Solar Energy, has been surpassed in a little over twelve month's time [10]. The era of low cost, high quality energy sought by government and enjoyed by the public for so long has apparently ended.

Across all sectors of the economy, energy prices climb higher by month. A recent Department of Energy survey of nine major oil refiners disclosed that heating oil prices increased 15.7 cents a gallon in the first six months of 1979. Translated across the industry, this would mean an annual rise in consumer cost of nearly $4 billion [11]. Gasoline prices have climbed nearly 40% in 1979 alone [12]. Coal prices, too, have not been immune to price increase, surging in some cases 400 per cent since 1970 [13].

The full force of early 1979 oil price rises have now begun to be felt in the economy at large. The Washington Post reports that a third of the rise in the consumer price index is due directly to the OPEC price hike of early 1979 [14]. Promising to exaggerate the economic impact of the recent price rises are the subtle effects of energy demand reduction. As demand slows in response to higher prices, energy capacity additions will become staggered, leaving each unit more expensive than the last. Fewer opportunities for conventional economies of scale will exist, forcing end-use prices higher still. And the continued use of petroleum imports will push the marginal cost of all energy higher.

While energy price has no doubt accelerated the debate over construction of a comprehensive national energy policy, other social changes had begun

occuring by the late 1960's. These changes were to have considerable force of their own in altering the overall societal fabric in which the nation's de facto energy policy had developed. In the order in which they will be discussed, they include a) the environmental movement, b) consumerism, c) the "limits to growth" movement, d) resistance to nuclear power, e) the tax rebellion, and f) growing national insecurity over dependence on foreign energy sources.

## 3.1 The Environmental Movement

As a social and political phenomenon, the environmental movement was seriously established well before the embargo-induced energy shortages of the early 1970's. Public interest led to public policies which established a legitimate mandate for the environmental cause at all levels of government. We now have in place a public resolve to include environmental concerns in all of our significant policy deliberations. The implications for energy policy were immediate and pervasive.

Society began to grapple with the concept of pollution externalities and a federal push toward clean fuels occurred. Oil and gas replaced coal in industrial and utility boilers. (Coal had already been largely displaced in residential and commercial heating applications.) Until the question of oil availability became a salient economic and political concern, the federal clean fuels policy thrived. When pressure came to begin the transition away from oil and gas, the environmental mandates were firmly institutionalized. An environmental ethic existed to block any wholesale return to "dirty" coal without the preservation of environmental standards. To date, the public has shown no significant desire to relax the environmental policy gains of the past decade.

## 3.2 Consumerism

Coincidental with the maturation of environmental policies came a widespread social movement reflecting public concern over consumer product safety, price and quality. Energy as a consumer product fell under the influence of this movement. Government concern for consumer access to low cost, high quality energy is not a new development. It has, in fact, been the driving force behind energy policy as it exists today. Nevertheless, formal organization of consumer interests has been a more recent phenomenon, generating political force of its own.

Debate over the deregulation of natural gas prices led to a classic confrontation between energy consumers and producers. Consumers have become accustomed to the low prices and convenience attached to use of natural gas. They argued from economic and social equity grounds that decontrol would adversely affect the pocketbooks and possibly the health of low and middle income gas users. Economic hardships were not supposed to be part of the natural gas consumer package; thus, rising prices from decontrol were feared and fought. The strength of this position was largely responsible for the congressional compromise which phases in natural gas decontrol over the next several years.

Consumer activism with respect to other fuels has been equally intense, if not similarly successful. Consumers have charged oil companies, utilities and even the government with manipulation and mismanagement of energy supplies and prices. Opinion surveys continue to show a significant number of Americans questioning the existence of an energy shortage [15]. Corporate profit taking is perceived as a more likely cause of higher energy prices. Consumer support

for energy price stabilization occurs routinely with each new oil company profit statement. To date, however, price controls remain in effect on only a shrinking amount of domestic crude oil and on certain petroleum products. Over 30% of U.S. produced crude oil is now effectively free from price control, while the price of heating oil was free from controls after 1976 [16]. Consumer opposition to higher oil and petroleum product prices has been only modestly successful, delaying as long as possible the removal of all price controls for oil.

Consumer interest in energy represents a clear reaction against policy initiatives which would establish a marketplace for conventional energy fuels. The decades-old politics of subsidization has left the consumer of cheap energy almost totally unprepared for such economic reality. Accommodation to replacement cost pricing will not occur overnight given consumer resistance to the perceived lifestyle implications of higher energy costs. A social environment now exists that will test the persuasive (or coercive) abilities of energy policy makers in the years ahead.

As a sidelight, it is interesting to note that national energy legislation has recently endorsed consumer intervention before Federal energy regulatory bodies [17]. A part of such intervention includes access to price and supply information filed by utilities with the Federal government. Ironically, such sanctioned intervention could result in higher consumer prices for energy as utilities are forced to disclose the once-confidential terms of fuel supply contracts. It is not too difficult to imagine fuel suppliers raising prices to levels equivalent with higher prices identified via the consumer disclosure provisions. The government has not admitted the potential for price upswing upon disclosure, yet the possibility alone may prove worrisome to consumers [18].

### 3.3 Limits to Growth

A third strong social current which has evolved is represented in the "limits to growth" philosophy. As noted above, the prevailing assumption underlying previous government policy affecting energy was a belief in long-term energy supply abundance. Public exposure to arguments which countered the abundance theory began as an outgrowth of the environmental movement. Soon, concepts of renewable and non-renewable resources began to frame options within the energy debate. The depletable nature of our fossil energy resources began to be more seriously understood in the context of limits to growth.

What "limits" advocates once could only sense regarding the inevitability of declining energy supplies and the implications on future use patterns is now being substantiated in several quarters. Commoner and others have noted that the declining fossil energy reserve base has resulted in a lower productivity of capital investment for oil, gas and coal extraction [19]. The General Accounting Office warns that a decline in the rate of petroleum reserve additions has already occurred [20]. According to GAO, this fact, and not price, will be the major determining factor in future petroleum production rates. Petroleum production by 2000 could easily be only half of today's level. In fact, GAO notes, reserve additions from frontier areas will be needed in substantial quantity just to stabilize the domestic oil production rate through the 1990's.

Adding to the "limits" argument are data showing that, because of reserve depletion, twice the 13,000 successful gas wells drilled in 1978 will be needed by 1985 just to maintain the 1978 production level of 9 tcf [21].

It is widely believed that the current gas "bubble" is more a result of temporary over-delivery than over-supply, for gas reserves are being added at only half the rate of depletion [22]. At present consumption levels, proven U.S. gas reserves will last another 10.3 years. Frontier gas from Alaska is only expected to contribute a small 5% of annual U.S. demand once the proposed Alaskan delivery system can provide for sales to lower 48 markets [23].

Domestic oil and gas reserves are clearly being exhausted and future production rates will necessarily decline. The concept of a limit to growth in fossil energy use has been substantiated in a rather short time period. As a result, there is a better awareness of some of the implications of continued fossil energy consumption. Due to increasingly expensive developmental costs, there may be capital availability problems long before exhaustion of oil or gas supplies actually occurs. The nation's very ability to pay for present levels of energy consumption has been challenged by the "limits" philosophy. While the "limits" argument is not shared by all (there is social resistance to the idea that the last thirty years have been in error), its emergence at least insures that future energy policy options bear greater recognition of the realities of supply depletion as now understood.

### 3.4 Resistance to Nuclear Power

Growing public uncertainty over the impacts of nuclear energy characterizes a fourth social trend now influencing energy policy development. Initially heralded as the environmental alternative to "dirty" coal, and at a price then cheaper than coal, nuclear power is today in jeopardy as a major future energy source. The unresolved issue of where and how to dispose of nuclear waste, coupled with concern over public safety near operating reactors, has created an investment climate for the technology that is stagnant, if not moribund. Public resistance to nuclear plant siting has strengthened since the Pennsylvania accident of this past Spring. Government commitment to the energy source is now less than enthusiastic. Even some utilities have become skeptical of the technology's future role in meeting electric power demand.

Uncertainty and fear over the future use of nuclear power, while not resulting in the dismantling of operating reactors, could effectively narrow policy options regarding future electric energy supply. Neither the social nor political climate currently exists to support expansion of the nuclear option. Until some dramatic technical or political change occurs, the anti-nuclear environment in the United States best illustrates the role of a changing social order on energy policy formation.

### 3.5 The Tax Rebellion

A more recent social phenomenon which is beginning to affect the energy policy environment is that of organized opposition to taxation at all levels of government. Though not immediately apparent, the tax revolt could affect energy policy by constraining the ability of government to "buy" itself an energy policy via heavy subsidization of conventional fuels development or through crash research programs into alternative supply technologies. Any significant reduction in government spending necessitated by limitations on taxing power would suddenly alter the financial and political terms under which new energy directions are chosen. Congressional resistance to a major underwriting of synthetic fuels development reflects worry over the budgetary and tax implications of such massive Federal spending as much as a concern over technology readiness. The success of any "Proposition 13" measure at the Federal level would signal, among other things, an entire new set of political rules regarding energy policy making.

### 3.6 National Security

Finally, the international social order has undergone rapid change in the last few years, adding another influence to domestic energy policy considerations. At issue is the vulnerability of the United States, both real and perceived, arising from a significant dependence on foreign and potentially unreliable supplies of petroleum. Within this political climate, the question often posed is not whether the U.S is running out of oil, but that the U.S. depends increasingly on foreign oil. The strategic stockpiling of petroleum illustrates the urgency of policy makers to buffer the nation from short-term supply disruptions.

It has been argued that unreliability should not be cause for worry, as OPEC nations retain a strong vested interest in a stable international petroleum market. OPEC investments worldwide have grown, and a threat to continued western access to OPEC oil would be a threat to OPEC itself [24]. This could help explain why, in terms of 1970 dollars, the official OPEC price stands only a little above the levels of March 1974 [25]. Those of an opposing view point to the 1973-74 embargo, as well as recent events in Iran, as sufficient justification for alarm. Barring war, U.S. reliance on OPEC oil will continue. However, mere existence of this dependency and the strategic vulnerability it implies will be a prominent factor in redirecting national energy policy.

## 4. ENERGY POLICY IN A CHANGING SOCIAL ORDER

### 4.1 Conventional Energy Policy Options

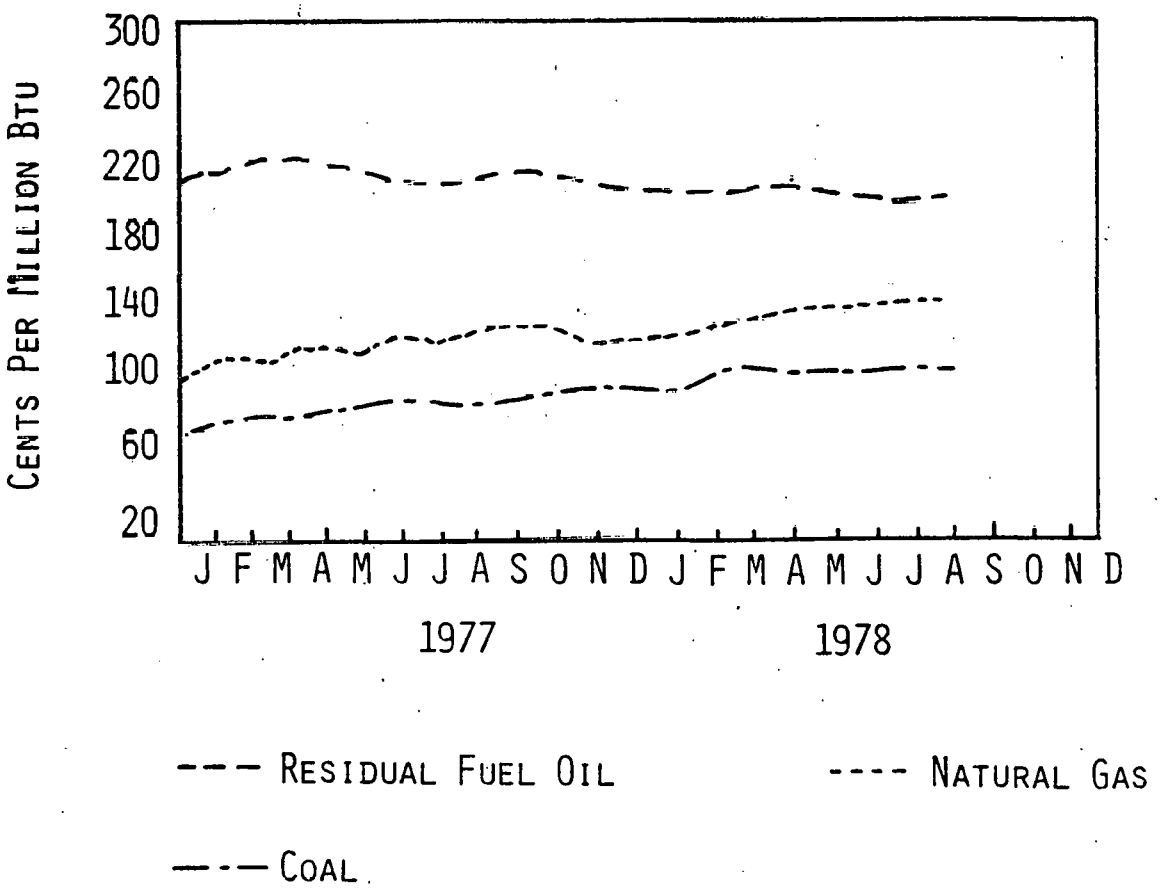
Now that several of the more prominent social crosscurrents have been identified, we can better understand the energy policy options available to the nation. At first glance, development of a new national energy policy is constrained by an economic environment where political choices appear increasingly narrow and unpopular. Irreconcilable trade-offs between conventional energy investment (inflation) and sudden demand reduction (recession) are suggested by most conventional policy options. The Wall Street Journal cites a Bankers Trust Company projection which forecasts that to just maintain domestic oil and gas production at current levels in the year 1990 will require some 21% of U.S. investment capital, rather than the present 9%. Less capital available for other investment is said to signal major shortages of consumer items for the remainder of the century [26]. The Joint Economic Committee of Congress has gone further, predicting a sharp drop in living standards through the 1980's as a result of energy-induced price rises [27].

It is perhaps natural to expect attention to be focused on energy supply options which have traditionally provided for most of our past demand. With liquid and gaseous fuels in declining supply, synthetic oil and gas are often looked to as a means of continuing the flow of conventional fuels through the expensive and expansive energy infrastructure now in place. However, despite optimistic forecasts over the years, synthetic oil is still expected to cost more than world crude. In a price scenario in which OPEC oil averaged $20 a barrel, oil from coal and shale oil were projected by the Department of Energy to range from $22-46 a barrel in present day costs [28]. The median of this range would be significantly higher than the current OPEC level. Private industrial forecasts are similar [29]. Even more alarming, a Rand Corporation study shows that new technologies, which synfuel systems would be, are typically subject to cost overruns of between 250 and 500% of original estimates [30]. Little in the way of encouraging price forecasts have been forthcoming for synthetic alternatives to our declining gas and oil resource base.

Coal supplies are considerably more abundant than either domestic oil or gas, and coal prices offer some hope of remaining lower than the higher quality fuels on a per Btu basis. However, while less expensive on a raw fuels basis, associated user costs (boiler modification, transportation, waste disposal and environmental controls) have brough prices of coal-generated energy to new levels. The mandated conversion of utility and industrial boilers to coal could strain short term supply and further raise prices.

Since the oil price rises of 1973-74, there has been a creeping convergence in all fossil fuels prices. The graph below shows the evolving price relationship among oil, gas and coal fuels on a Btu basis [31]. At the beginning of 1977, gas prices were slightly more than half that of the national average for residual fuel oil. They had climbed to nearly 70% of residual prices by the middle of 1978. Similarly, coal prices rose from 37% to 53% of national residual oil prices during the same 18 month period. It is certain that the lack of substitutability among conventional fuels and varying costs of production will continue to result in some price differentials, both for primary fuels and delivered energy. Nevertheless, there is a significance to price convergence which cannot be ignored.

NATIONAL AVERAGE COST OF FOSSIL FUELS



Certain market factors are now developing which threaten to raise coal prices for all categories of use. An increasing lack of competition in the coal industry is believed partly responsible for the significant price rises which have occurred since 1970 [32]. Current slack demand for coal is forcing small mine owners out of business, to be purchased by major energy companies. Eleven oil companies now own a quarter of all U.S. coal [33]. Oil companies are expected to produce half of all U.S. coal by 1985 [34]. On another front, utility-owned, or "captured", coal is expected to increase to nearly 19% of utility demand by 1985, up from 9% in 1974 [35]. The use of captured coal may be allowing utilities an opportunity to pay themselves more for fuel and to charge rate payers accordingly. Such a maneuver would help guarantee company revenue in an era of declining demand for new capacity and weakened justification for rate increases. It also would avoid the visibility of consumer-opposed rate increase requests.

## 4.2 Alternative Energy Technology As a Policy Option

As price convergence or at least price increases continue to characterize conventional fuels, there exist fewer compelling reasons to insist on a future dominated by traditional energy sources. Short-term price considerations are less likely to drive energy policy decisions as fewer low-cost conventional alternatives exist. Energy planners are now able to pay heed to a broader range of policy options of equal or greater value to the security and long term interests of the nation. Ecological stability, revitalized international trade and monetary positions, strategically less-vulnerable energy distribution systems and more equitable public access to energy supply all become eligible to supplant low private cost energy as the foundation of national energy policy. We are already witnessing several potential policy responses to the energy dilemma which conform more to current social values than to past consumptive behavior.

As national concern over strategic vulnerability has intensified, there has been renewed support for the perceived security of a domestic synthetic fuels industry. Continued disparity between the expected costs of liquid snyfuels and the world market price for petroleum is apparently not significant enough to deter synfuels advocates. The New York Times has noted: "Synthetic fuels offer a way out that fits the nation's image of itself and allows the inevitable economic sacrifices to be seen as a consequence of American strength, not weakness." [36]. Clearly, factors other than price have begun to define energy policy objectives.

There are drawbacks, however, to a wholesale commitment to synthetic fuels. Strategic vulnerability due to import dependency is usually perceived in a short-term perspective. If the task is to reduce foreign oil use in the immediate term, the focus on synthetics will provide no early solutions. The time frame for synthetics development promising even slight relief from current import dependency is a decade or more [37]. The urgency with which a strategic alternative may be needed cannot be relieved by the prospects, however optimistic, of synthetic fuel development. Environmental values are also at odds with synthetic fuels technology, while the consumer and tax implications of Federal support for synthetics could easily be severe. Even the limits to growth philosophy argues against synthetics on the basis of the technology's dependence on non-renewable fossil energy fuelstocks.

While synfuels advocacy almost singularly addresses the question of energy security (and even then may prove untimely), other energy technology options exist which are more encompassing in the range of societal values served. There are a variety of conservation, solar and other renewable

energy sources which promise significant energy contributions. At the same time, they should accommodate, if not entirely satisfy, the strong social currents described earlier [38].

Our present social environment places growing emphasis on an energy remedy which offers relief from the threat of strategic supply disruption and all of the international consequences of such an event. While most solar applications do not lend themselves as substitutes for imported oil in the transportation sector, they can often replace industrial uses of oil. In so doing, they contribute to an overall lowering of demand for imported oil, thus allowing domestic liquid fuel supplies to serve a larger fraction of the transportation market. In addition, conservation, solar and renewable energy technologies, including the production of methane and methanol from biomass, can respond in limited ways to the reduced dependency on foreign energy. Shorter lead times and reduced capital requirements for certain biomass technologies insure a timely and valuable response to the import dependency problem.

There remain questions of solar system reliability which still require technical and economic solutions. Without progress in energy storage technologies, the intermittancy of sunlight will limit the ultimate capability of our collector technologies. However, the potentially paralyzing threat to national economic survival posed by our import dependence can certainly be lessened with greater reliance on domestic and renewable energy resources.

Solar and renewable energy options, at appropriate scales, also match nicely with the desire of environmentalists for an energy use policy more compatible with ecological and human health values. A number of analyses have begun to characterize the magnitude of potential environmental benefits possible through the replacement of conventional fuel mixes with solar technologies [39]. One study, recently concluded at the Solar Energy Research Institute, found that "on a life-cycle basis, nearly all solar technologies are more environmentally benign than their conventional counterparts per Btu of energy delivered per year." [40]. From a strictly operational perspective, wind, photovoltaics, solar heating, cooling and process heat technologies compare even more favorably with conventional energy systems. Few, if any, conventional pollutants are produced during the operational lifetime of these solar technologies, compared with the great volumes of air and water pollutants generated from conventional systems.

A key leap in traditional accounting procedures, that of life-cycle costing, not only demonstrates the environmental preferability of solar technologies but offers consumers a more valuable perspective from which to choose a future of long-term energy security. One of the most prominent responses to long-term consumer interest in energy prices has come from a California lending institution. The San Diego Federal Savings and Loan Association has grown concerned that energy costs represent and ever-rising share of home maintenance expense. If the cost continues upward, fewer qualified mortgage applicants may be available to borrow San Diego Federal money. In response, a unique financing plan was instituted to promote adoption of residential solar heating and cooling systems. The capital cost of solar systems on San Diego Federal Savings-financed houses would be absorbed into a homeowner's mortgage, extending the actual lifetime of the debt but maintaining the same monthly payment. This approach represents the first of many needed efforts by the nation's financial establishments to apply the practice of life-cycle accounting to energy use. The disappearance of familiar low cost energy solutions makes it less painful to move in this direction. Under such circumstances, the low maintenance and zero fuel costs

for most solar technologies will be placed in a more appropriate long-term perspective.

As it is the long-term benefit of society which should ultimately guide public policy, the government will need to consciously respond to the energy dilemma with long-term solutions. The very nature of the renewable energy option suggests its compatibility with the philosophy of limits to growth. The advocacy of solar technologies is a recognition, in itself, of the rather short term future inherent in continued dependence on non-renewable energy. Social forces supporting the philosophy of limits to growth are comfortably served by an energy policy favoring solar and the renewables.

It is axiomatic that the redirection of national energy policy away from conventional fuels would moderate, at least, the concerns now apparent with nuclear energy technology. Existing power plants, uranium mines and fuel fabrication facilities must eventually be decommissioned, whether nuclear is revived as an energy source or not. Power plant wastes already generated must still be responsibly managed. Social concerns over nuclear will thus not disappear in the advent of a solar transition. However, the adoption of renewable electric energy technologies, combined with strong conservation trends, would effectively preclude the need to expand nuclear's percentage of U.S. energy supply beyond its current 3%.

Finally, the transition to a solar and renewable energy future may make certain initial economic demands on the nation's energy consumers. If, as expected, all energy costs continue to rise, current generation solar technologies will come within early competitive range of conventional fuels. Yet in the near term, costs of most supply alternatives, including solar, will likely be higher than historical levels. As scarcity of non-renewable energy is more realistically costed, the consumer price for energy based on inexhaustible fuels can only increase. Meanwhile, with improved efficiencies, solar system costs show a consistently downward trend. Eventually, solar and renewable prices should drop below those of the non-renewable technologies. At this point, consumer interest in low cost energy should again be close to being satisfied. Should a longer term vision of the national and consumer's economic interest be adopted, an earlier congruence between energy prices and consumer expectations will be possible.

Stobaugh and Yergin have argued that long-term conservation and solar investment strategies do not have to threaten the welfare of the energy consumer [41]. It is the time frame in which "welfare" is considered that demands revision. Our perception of the future is changing and new ways of calculating costs are replacing the old. The perceived impacts of a solar transition will be moderated as a longer term perspective is brought to the concept of consumer welfare. Properly and timely executed, the solar transition will put in place a self-sustaining energy infrastructure capable of reducing consumer costs and at the same time reducing the role of tax-supported subsidization of energy policy.

## 5. CONCLUSION

Should a renewable energy course be chosen, it will represent a fundamental restructuring of the national energy decision making framework. Policy will, by necessity, become responsive to the array of potential conflicting social values which have matured, in part, as a result of previous energy practices. Such a response to the changing social order will be less a matter of introducing new factors to the policy equation as it will be the shifting of weight among recognized social, economic and political values. At a more advanced stage of development, energy policy could easily come to control the once-domi-

nant forces represented in housing, transportation, labor and commerce policy. The Department of Transportation's challenge to Detroit to "rebuild" the automobile, in light of inexorable price and supply squeezes in motor fuel, signals the sensitivity of energy as an issue within a non-energy policy context.

Ideal public policy should have as its principal goal the widening of the range of options available to society. In forming new energy policies, we need to acknowledge explicitly the social and political context in which energy is now defined. For from these new dimensions will come greater, rather than less, direction from the political sector. To effectively orient our energy policy toward social aims will require more popular control and direction of the social system than previously experienced. And to the extent that the changing social context forces consideration of more than raw, short-term economic criteria in energy policy making, a favorable environment will be created for the ready acceptance of solar and other renewable energy options. Given the alternatives, it is an opportunity which should not go untested.

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