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THE NATIONAL ENERGY CONSERVATION POLICY ACT: AN EVALUATION

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In October 1978, Congress passed the National Energy Conservation Policy Act (NECPA),[1] a landmark piece of energy conservation legislation. This act sets out a large and diverse array of measures intended to promote energy conservation in all three sectors of U.S. energy use: buildings, industry, and transport. It is important for energy planning purposes to make quantitative assessments of the potential impact of this legislation on U.S. energy consumption, and to monitor that impact on a continuous basis. This brief review has the more modest objective of setting out qualitatively the basis from which more detailed analyses can be developed. We examine:

1. The principles behind and objectives of the act;
2. The methods by which the act seeks to meet its objectives; and
3. The extent to which these objectives are likely to be met.

I. PRINCIPLES AND OBJECTIVES OF NECPA

Title I[2] sets out the rationale for energy conservation that underlies NECPA. Congress found that:

> (1) The United States faces an energy shortage arising from increasing demand for energy, particularly for oil and natural gas, and insufficient domestic supplies of oil and natural gas to satisfy that demand;
> (2) unless effective measures are promptly taken by the Federal Government and other users of energy to reduce the *rate of growth of demand* for energy, the United States will become increasingly dependent on the world oil market, increasingly vulnerable to interruptions of foreign oil supplies, and unable to provide the energy to meet future needs; and
> (3) all sectors of our Nation's economy must begin immediately to significantly reduce the demand for nonrenewable energy resources such as oil and natural gas by implementing and main-

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1. National Energy Conservation Policy Act, Pub. L. No. 95-619, 92 Stat. 3206 (1978) (codified in scattered sections of 12, 15, 23, 42 U.S.C.A.).

2. 42 U.S.C.A. §8201 (Supp. 1979).

> taining effective conservation measures for the efficient use of these and other energy sources.[3]

Title I further sets out the purposes of the act, which are "to provide for the regulation of interstate commerce, to reduce the growth in demand for energy in the United States, and to conserve nonrenewable energy resources produced in this Nation and elsewhere, without inhibiting beneficial economic growth."[4]

The first finding is a conventional statement of the U.S. energy problem, expressed in terms of an "energy shortage." It completely ignores the economics of energy supply and demand. Of course, there exists some (higher) price of energy at which domestic supply and demand would be equal; the real problem pertains more to what levels of energy price and government intervention would be socially acceptable, how fast the social/economic system can adjust, and what economic, social, and political values are attached to reducing the growing U.S. dependence on foreign oil. The first finding would be more accurate if the phrase "at historical low and decreasing prices" were added.

The second finding, that "effective measures" are necessary to prevent an increasing dependence on foreign oil, is without contest. Here the question is what constitutes effective measures. The major policy issue in this finding regards the degree to which measures on the *demand,* as contrasted with the *supply,* side of the energy equation can be relied on to alleviate the problem. Only recently a prominent political group stated that the United States must produce its way out of the energy problem.[5] The role of energy conservation is neither widely understood nor fully accepted.

The third finding calls for an actual *reduction* in demand for nonrenewable energy resources such as oil and gas, as opposed to a slowing in the growth rate of that demand. Such a goal is certainly possible, but its attainment over the next several decades will require a vigorous and sustained conservation program, as well as substitution of nuclear or coal-generated electricity for many of today's uses of liquid fuels. Among the energy-demand futures examined by the National Academy of Sciences' CONAES study,[6] the only scenarios

3. *Id.* (emphasis added).

4. *Id.*

5. Statement attributed to a member of the Texas Railroad Commission, as quoted in NEWSWEEK, April 18, 1977, at 73.

6. U.S. NATIONAL ACADEMY OF SCIENCES, REPORT OF THE COMMITTEE ON NUCLEAR AND ALTERNATIVE ENERGY SYSTEMS (1979). *See* Demand and Conservation Panel of the Committee on Nuclear and Alternative Energy Systems, *U.S. Energy Demand: Some Low Energy Futures,* 200 SCIENCE 142 (April 14, 1978) (hereinafter cited as C.O.N.A.E.S.), for a summary of the Demand and Conservation Panel. Other panel reports are Supply/Delivery, Risk/Impact and Synthesis/Modeling.

showing a constant or declining use of liquid fuels were those in which fourfold increase in energy prices by 2010, as well as strong government conservation measures, were assumed. *Total* U.S. energy use continues to grow in almost all CONAES scenarios, although per capita use declines significantly in the high-conservation scenarios.

Despite these difficulties with the congressional findings, NECPA's statement of purpose well expresses a principal goal of energy conservation: "to conserve nonrenewable energy resources produced in this Nation and elsewhere, without inhibiting beneficial economic growth."[7] Realization of this goal depends on the degree to which growth in energy use can be separated from growth in GNP, over different time periods. The link between energy and economic growth has been a major issue for energy conservation policy, and there is considerable disagreement about the nature and magnitude of this link. We adopt here a generalized economic definition of energy conservation, which allows a reference against which to measure the goals and possible impacts of NECPA. *Conservation means using energy in a manner consistent with maximizing welfare.*[8] Principally in response to rising costs and prices of energy, energy users will find less costly substitutes for energy, over time. This may involve some changes in behavior, for example choosing to set thermostats back at night and using more blankets, in the short term, and choosing to live closer to the place of work, in the longer term. Consumers will seek lowest-cost solutions to the ownership of energy-using equipment such as automobiles and appliances, by taking into account lifetime capital and operating costs.

Even at today's prices, there is much room for energy conservation as defined here. There will be even more at tomorrow's higher prices. Indeed, there is evidence that energy use was not economically efficient in the past, for a variety of reasons.[9] Several studies, using engineering, economic, and behavioral analyses, have concluded that conservation could provide substitutes for energy at increasing rates such that energy demand will grow much more slowly than the economy as a whole.[10] This conclusion is particularly evident when each

7. National Energy Conservation Policy Act, 42 U.S.C.A. §8201 (Supp. 1979).

8. This is developed in Schipper & Darmstadter, *The Logic of Energy Conservation*, 80 TECH. REV. 41 (January 1978) and Schipper, *Another Look at Energy Conservation*, AM. ECON. REV. (PAPERS AND PROCEEDINGS) (May 1979).

9. Reasons include lack of information, diffusion of the market incentive because the investor or builder does not pay bills, management or worker practices. *See* C. Blumstein, B. Kreig, L. Schipper & C. York, Institutional and Social Barriers to Residential Energy Conservation (1979) (report prepared for the Council on Environmental Quality, LBL-8299, Lawrence Berkeley Laboratory, Berkeley).

10. C.O.N.A.E.S., *supra* note 6. *See also* 1 THE TRANSITIONAL STORM (Edison Electric Institute ed. 1977). Presented is a collection of essays, generally inveighing against energy conservation.

energy end use is examined separately from an engineering, economic, or behavioral viewpoint, although it is often unclear when only aggregate demand elasticities are studied.

NECPA should be judged in terms of the most important issues of conservation. In our view, these issues are:

- How much energy can be saved?
- How quickly can energy be saved?
- At what cost can energy be saved?

From a strictly economic viewpoint, the goal of a set of conservation measures such as NECPA contains would be to establish incentives to encourage energy conservation based on the concept of the present value of energy savings, or maximizing utility over a variety of behavioral options and costs.[11] In contrast, from a political viewpoint, the goal might be to specify particular conservation targets that are higher (or perhaps lower) than economic optima, or are implemented more rapidly than economics alone would dictate. Indeed, some present-day political policies (e.g., low energy prices) work against energy conservation. NECPA avoids specifying energy consumption targets for the nation as a whole. (In Sweden by contrast, a goal of two percent yearly growth in end-use energy was set by law.[12]) By not specifying an energy growth rate, NECPA avoids evaluating energy savings to an end in itself.

Much of the text of NECPA is vague in that its provisions are specified only in general terms. Perhaps this is necessarily so. How can the "right" amount of conservation be specified? Even though related administration documents[13] state or imply methods for carrying out present-value calculations, what discount rates, energy price inflation rates, or energy prices are to be used? NECPA implicitly suggests that these often are best determined locally for the legislation to be truly effective. Some would argue, however, that the discount rate should be a matter of national as well as local concern.

While the inclusion of the words "economic" or "economically feasible" is a feature of NECPA, language defining these terms is lacking. The reason, of course, is that there is no widely agreed upon definition of conservation. Everyone favors conservation in principle, as reflected in the goals of the act,[14] but there is much less agreement over specific measures. Thus, it is extremely important that the

11. Schipper & Darmstadter, *supra* note 8.

12. Riksdagen, Energiehushaallning MM. (Energy Bill), 1975 Session, Stockholm: Liberfoerlag.

13. BEPS Advance Notice of Proposed Rulemaking, Energy Performance Standards for New Buildings, 43 Fed. Reg. 54,511-54,616 (1978).

14. 42 U.S.C.A. §8201 (Supp. 1979).

economic nature of conservation be made explicit. Failure of the administration to proclaim the economic advantages of conservation, especially during the months surrounding the original introduction of the act in April 1977, has led to the subsequent difficulties in passage faced by legislation governing conservation. Recall that conservation was defined as "sacrifice" by the President in 1977 and 1978.[15] By contrast, the President's recent attempt to decontrol oil prices now puts him in a position to advise energy users that conservation will help them minimize the impact of higher prices.

Given this refreshed perspective on conservation, some economists are nonetheless skeptical about the need for government action. In this view the marketplace alone should be able to handle the coming adjustment, particularly for cases in which the elasticities of demand substitution away from energy use may be substantial. We note, however, that this is not always the case, and in such situations it is appropriate for government conservation policies to provide a surrogate for market signals. For example, the demand for gasoline so far has been notoriously insensitive to prices. During the several year period when real prices for gasoline dropped after their initial rise during the 1973-1975 embargo, the government stepped up its efforts to control consumption by passing legislation aimed at increasing fuel efficiency of new cars.[16] The government had asserted its role in energy conservation, and chose this way to do so.

The question of what should be the governmental role in energy conservation is indeed central. The National Academy of Sciences study[17] concluded that a limited government role is essential, given the nature of the market. Energy markets have been politicized for so long, there are so many nonmarket sociopolitical determinants of energy supply and demand, and energy supply has become so vital to national security, that an ideal competitive market is a fiction that would not be tolerated politically even if in fact it could be attained. The need for government participation is illustrated by the abundant set of market failures that deter conservation of energy in buildings.[18] These failures are aggravated by the widespread paucity of information about the energy and economic consequences of various behavioral and technological options.

Were the nation to be granted a very long time to adjust gradually

15. President Carter's Address to Congress on National Energy Plan, I PUB. PAPERS 663 (April 20, 1977); EXECUTIVE OFFICE OF THE PRESIDENT, ENERGY POLICY AND PLANNING, THE NATIONAL ENERGY PLAN (1977).

16. Energy Policy and Conservation Act of 1975, 42 U.S.C. § §6201-6422 (1976).

17. C.O.N.A.E.S., *supra* note 6.

18. Institutional and Social Barriers to Residential Energy Conservation, *supra* note 9.

to rising energy prices, a changing mix of available fuels, and increasingly serious environmental and social costs of energy production, perhaps it would suffice to allow prices alone to guide consumption decisions. Indeed, virtually every study of energy demand[19] suggests that given sufficient time and rising prices, demand growth will slacken considerably and alter its tightly coupled short-term relationship to economic growth, just as happened in the past. But when *neither* expensive new energy sources *nor* spontaneous changes in demand patterns come about quickly enough to satisfy political goals (such as the reduction of oil imports), it is necessary for government to stimulate investments in conservation and supplies or to remove barriers that prevent a "spontaneous" response of the marketplace. NECPA appears to approach energy conservation from both directions.

II. RESIDENTIAL PROGRAM

This program, contained in Title II of the act,[20] is built on several principles, primarily: 1) homeowners lack adequate information to carry out profitable conservation measures, 2) the economic good, "conservation," cannot be bought easily because energy has declined in price for decades, and 3) many people do not own or control the structures they live in.

The act includes several provisions for low income weatherization assistance.[21] Poor people have need for comfort (weatherization) regardless of the price of energy, and this section plays an important political role by attempting to include consideration of equity in an energy package that otherwise allows prices to rise.

One significant element in the residential section of the act is planning. States and individual utilities are instructed to prepare conservation plans, to undertake audits of energy use, and (along with various federal agencies) to lend money to people who want to invest in conservation.[22]

Few would argue about the economic value of information. In Sweden, community energy plans, including audits and inventories of public buildings, have had a beneficial effect.[23] With full and timely information, energy users should find ways of obtaining the same

19. These are best reviewed in Pindyck, *Characteristics of the Demand for Energy*, in ENERGY CONSERVATION AND PUBLIC POLICY 22 (J. Sawhill ed. 1979).

20. 42 U.S.C.A. §§8211-8233 (Supp. 1979).

21. *Id.* §§1474, 6862-6873 (Supp. 1979).

22. *Id.* §§6321, 6325, 6327, 8213-8217.

23. Kommunala Energiplaneringen (Community Energy Planning), 1976, Stockholm: Liberfoerlag.

energy services for less energy, sometimes even without investment. Figure 1 illustrates the shifted demand curve:

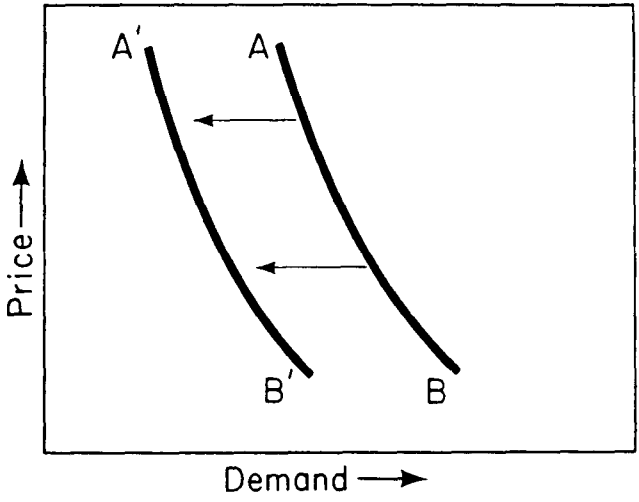

FIGURE 1.

ECONOMIC VALUE OF INFORMATION IN SHIFTING THE ENERGY DEMAND CURVE

Information about the *slope* of the demand curve for energy-related amenities has great value too, for consumers reacting to higher prices need to know where to "belt-tighten" so that their utility is maximized as energy prices rise.

To this end there is, in our view, a clear role for the suppliers of energy and public authorities as well. Energy suppliers know their markets thoroughly and are in a good position to understand the nature of the uses of their products, whereas individual consumers are unlikely to possess the requisite skills for making engineering estimates. Public authorities can and should support efforts in which costs are repaid rapidly with energy savings. There also are economies of scale involved in centrally developing the requisite analytic and educational tools, which may then be made broadly available at low unit cost. Hence there is a role for both public and private institutions in providing energy information.

NECPA is strangely ambiguous about the role of utilities' energy conservation. Section 216[24] prohibits utilities from supplying or financing conservation devices unless the value of the loan is less than

24. 42 U.S.C.A. §8217 (Supp. 1979).

$300 (excluding major insulation or window retrofit) *or* the utility was already selling such devices. (An example is the San Diego Gas and Electric Company, whose office building has a large display of conservation items that are on sale.) The motivation behind this prohibition in NECPA is apparently to prevent utilities from somehow monopolizing the market for conservation devices.

In our view this constraint is short-sighted. Utilities forbidden from selling conservation devices do not have as great an incentive to promote efficient use of their product as do those for whom *both* energy and conservation products offer acceptable rates of return. Today the combination of rising marginal costs of generation capacity and fuel are straining many utilities. Selling insulation or window screens, for example, could reduce peak load more per dollar invested than the addition of new capacity to meet peak demand. In addition, giving utilities a greater role in conservation would probably clear up many of the uncertainties they have expressed in the past about energy conservation.[25] Additional incentives to utilities can be introduced if necessary, as, for example, the California Public Utilities Commission's policy of relating allowable utility rate of return to conservation activity at the utility. In short, utility participation in conservation activities could shortcut many existing institutional barriers to conservation in residential buildings.[26]

If a utility is already selling conservation, how is the program to be financed under NECPA? Section 215[27] mandates *current* expensing of program costs, keeping them out of the rate base. Where such activities lower total system costs (which is likely to be the case because of rising marginal energy costs) the utility can charge the costs to all customers. This makes good sense since the cost of not conserving would ultimately be borne by all rate payers.

NECPA also sets many small restrictions on utility financing of conservation.[28] These are probably reactions to the general mistrust of energy companies that arose during the early 1970s when the energy-environment debate heated up. Justified or not, the bureaucratic heavy-handedness of NECPA's utility program is a political reality. Unfortunately, this reality could lead to higher administrative costs rather than lower conservation costs.

But why "organize" conservation loans through utilities and government? The motivation appears to be a hope that some measure of organization and regulation will speed up the process of adjusting to

25. THE TRANSITIONAL STORM, *supra* note 10.
26. Institutional and Social Barriers to Residential Energy Conservation, *supra* note 9.
27. 42 U.S.C.A. §8216 (Supp. 1979).
28. 42 U.S.C.A. §8217 (Supp. 1979).

higher prices. Wisely, in our view, NECPA does not mandate *how many* units of a given product must be sold per year, but relies on the marketplace, aided by the utility and government programs, to determine the pace of this adjustment.

Should direct subsidies be employed to encourage conservation and solar installations? Many economists would say no. Energy supply has been overburdened with subsidies in the past. However, because the energy problem includes political and environmental components not reflected in energy costs, and because conservation and some alternative energy technologies offer clear environmental benefits compared to conventional energy generation,[29] there may be a real advantage in encouraging these through *indirect* economic means, for example, by influencing interest rates through tax incentives. This approach, however, is not incorporated into NECPA.

Title II (and other titles)[30] requires that studies on residential and related energy conservation opportunities be conducted. Significant in the language (Section 253 b,c)[31] is an economic valuation of conservation which indicates a recognition by Congress that energy saved, per se, is not an end in itself. The language of Section 253 in fact moves a long way towards recognizing that *all* resources are to some degree scarce, so that economic attractiveness, not simply technical feasibility, shall be a prime element in any rulemaking that influences energy use. Unfortunately it is possible that the proposed rulemaking could significantly lessen the economic effectiveness of standards or other regulations promoting conservation. This is a matter to which we point with some concern.

In summary, Title II attempts to organize and bring about the financing of residential energy conservation measures. We find this goal worthwhile in principle; the sums of public expenditures for administration appear small in comparison with the tens of billions spent yearly on utility services by households. The major problem with Title II is that the mechanisms of financing its provisions appear to be over-determined by the law.

III. PUBLIC BUILDINGS

Title III[32] addresses the problems of energy conservation in public buildings, including schools and hospitals. It has long been known

29. L. Schipper, Energy Conservation and the Environment, Conflict or Complement? (1978) (report prepared for OECD Environmental Directorate, LBL-7883, Lawrence Berkeley Laboratory, Berkeley).

30. 42 U.S.C.A. §6373 (Supp. 1979).

31. *Id.* §§8232-8233.

32. *Id.* §§300h-2, n-1(b)(2), n-1(c)(9), 6371-6372.

that energy utilization in public buildings has been very inefficient and could be improved considerably.[33] Lack of attention to energy use in public buildings came about both because occupants of public buildings do not pay the energy bills, and because most public entities have been constrained in the past to minimize first-year costs rather than long-term costs (including energy). Because of this history, behavioral incentives and investment opportunities for energy conservation are still lacking. It is appropriate now for the federal government to make information and assistance available to public institutions in need.

IV. ENERGY-EFFICIENCY STANDARDS

Title IV[34] contains the most controversial parts of NECPA: matters relating to energy efficiency standards. At the heart of the matter is whether people and institutions, through the marketplace alone, will make economically efficient decisions regarding the purchase of new energy-using equipment. The arguments favoring mandated efficiency standards are:

1) Consumers lack adequate information on energy costs, and producers generally do not provide such information;
2) Although investments often are foregone because the consumers' discount rate is high, these investments may be profitable from the point of view of society;
3) Because the phenomenon of rising marginal energy costs is recent, average energy costs to consumers are significantly less than the costs of new supply. This means that even rational decision making by consumers will lead to higher energy use than the economic optimum from society's point of view. (This is a classic problem with regulated industries, where actual prices rarely approximate marginal prices).

Ideally, of course, efficiency standards would not be necessary if energy were priced at the margin, if marketing techniques for autos, homes and appliances did not obscure the energy implications of purchase decisions, and if consumers and product suppliers had been historically interested in efficiency. Then consumers would make "right" decisions, conserve energy, and earn handsome economic rewards. Unfortunately, as stated earlier, the real world is far from an ideal marketplace, and the goals and means of public policy should recognize this.

33. *See, e.g.*, Schipper, *Raising the Productivity of Energy Use*, 1 ANN. REV. ENERGY 455 (1976).

34. 15 U.S.C.A. §§ 2006-2008, 42 U.S.C.A. §§ 6293-6297, 6303, 6305-6306, 6308-6309, 6311-6317, 6344, 6346 (Supp. 1979).

Another argument for governmental intervention is illustrated by the case of the automobile. This is a situation in which the total cost of the system is relatively independent of energy efficiency. The cost per mile of autumobile transportation, taking account of fuel, capital and maintenance costs, is remarkably independent of fuel efficiency over a range from about 15 to 25 mpg, for fixed vehicle space and performance.[35] From the consumer's point of view, then, he should be relatively indifferent to the fuel efficiency in this range, yet from a social perspective lowered gasoline consumption is favored strongly. This illustrates that price and policy should contribute together to conservation; either alone may be ineffective. Put another way, policy goals relating to the efficiency and structure of energy use should be backed up by market forces.

But will mandated standards bring about economically rational energy use? The answer in most cases is probably yes, but even for the case of automobiles just discussed, such a result is not inevitable because there are a number of values that influence car buying and use, and prospects for continued real price rises for gasoline were not seen until recently. Indeed, if there were a consensus that prices for gasoline will remain constant through the 1980s as a result of controls, doubtless there would be great pressure to dilute the already existing standards. Even more important, the marginal cost of driving a 30 mpg car is usually less than that of a 15 mpg "guzzler," because gasoline would cost less for the more efficient car. This would stimulate more driving, though not so much as to nullify all the savings gained from a switch from a 15 mpg car to a 30 mpg car. Higher prices, however, would slow or halt the increase in miles driven.[36]

Fortunately, the discussion in Title II and Title IV (see e.g., Section 422)[37] refers continually to "economic justification and impact" of each measure. The regulators will be confronted with the value of market forces.

Title IV requires much analysis and determination of test and compliance procedures before any action on standards is taken. Indeed, it is important that the designers of efficiency standards be fully aware of the marginal costs of conservation so that they can anticipate possible side effects of particular standards. Will businesses or consumers suffer during a transition period? Is compliance assured? Will a bureaucracy hold us to the adopted standards even when better ones become possible? (Limiting window area in houses

35. C.O.N.A.E.S., *supra* note 6.

36. Schneider, *A New Tax on Gasoline: Estimating Its Effect on Consumption*, 202 SCIENCE 755, 757 (November 17, 1978).

37. 42 U.S.C.A. §6293 (Supp. 1979).

or banning electric resistance heat, for example, might foreclose energy savings from passive solar designs). In our opinion, the experience of California suggests that building and appliance standards can survive the long public debate and hearing procedure if they make economic sense.

While it is too early to know how the final deliberations of the U.S. Department of Energy (DOE) will come out concerning the *levels* of standards, the analytic process of evaluating standards has provided important lessons. Early in the process, little use was made of economics in analyzing the levels of the standards.[38] The result was general disagreement on what constituted appropriate levels. With the introduction of economics in the form of life-cycle costing, an analytic tool was provided for setting standards: the goal is a life-cycle cost minimum in which increased investment in conservation is offset by reduced fuel bills.[39]

Consideration of the details of the life-cycle cost curves also provides a rationale for a government role in stimulating energy conservation in buildings. For residential buildings these curves are flat: that is, for a relatively wide range of conservation measures there is little net change in the life-cycle cost to the consumer.[40] Thus from the consumer's point of view there may be little economic incentive to build a very energy efficient house, even though the net costs of doing so are small. However, from a national perspective, the benefits of having houses built at the energy efficient end of the life-cycle cost curve are substantial because of the large aggregate energy savings that could be accomplished.

Significant problems may be encountered both in setting and in implementing government standards. Traditionally, building standards have been *prescriptive* in nature. This means that specific individual components (e.g., R-38 ceiling insulation) are required by a code, and deviation from these requirements is not permitted. The standards being developed by DOE are novel both in that they are *performance* standards, and because some flexibility is permitted in determining a budget through life-cycle cost analysis. Although most builders may prefer to follow the traditional prescriptive approach,

38. *See, e.g.*, ASSISTANT SECRETARY FOR CONSERVATION AND SOLAR APPLICATIONS, U.S. DEP'T OF HOUSING AND URBAN DEVELOPMENT AND DEP'T OF ENERGY, PHASE ONE/BASE DATA FOR THE DEVELOPMENT OF ENERGY PERFORMANCE STANDARDS FOR NEW BUILDINGS (1978) (TID 28825).

39. BEPS Advance Notice of Proposed Rulemaking, *supra* note 13.

40. This is shown in C.O.N.A.E.S., *supra* note 6. *See also* M. Levine et al., Economic Analysis of Building Energy Performance Standards (1979) (Lawrence Berkeley Laboratory).

the option of meeting the code in one of several ways should allow for a variety of prescriptive approaches to be tried.

For energy efficiency standards to be effective it is important that builders have enough information to install energy conservation measures properly. Experiments conducted at Princeton and elsewhere have shown that poor building practice can effectively negate the use of theoretically adequate conservation measures.[41] On the other hand, the application of a building energy code at Davis, California, has shown that given proper information, builders can be extremely effective in installing energy conservation measures in houses (and in designing houses to conserve energy).[42] Thus, the role of government in providing good information to builders could be one of the most important facets of the standards process.

It is essential that government energy conservation legislation encourage the development of new and innovative measures for reducing energy use in a cost effective manner—such as lower infiltration levels in houses or the use of passive solar designs—because the benefits of these approaches could be very great. It is also important that energy efficiency standards should be reviewed at specified intervals to allow for the incorporation of new information.

Title IV also relates to industrial energy efficiency.[43] Here the concern is limited primarily to providing information, especially labelling of equipment and testing of machines. While such information is vital to more efficient energy use, in many cases the information already exists. The performance efficiency of most industrial machines has been assessed thoroughly, especially from an energy point of view, as industries have responded to the recent large increases in industrial energy prices.

At the present time, Congress has not attempted to dictate energy efficiency for industrial operations, although NECPA leaves the door open for standards on electric motors. There is ample evidence that industrial energy use, particularly among heavy users, has been more sensitive to price than that of other sectors, even in periods of low energy prices.[44] Recent evidence[45] shows that a marked reduction

41. Wotecki, Dutt & Beyea, *The Two Resistance Models for Attic Heat Flow*, 3 ENERGY 657 (1978).

42. E. Vine, Planning for an Energy Conserving Society: The Davis Experience (1979) (report prepared by the Distributed Energy Systems Study Group, Lawrence Berkeley Laboratory, Berkeley).

43. 42 U.S.C.A. §§ 6311-6317 (Supp. 1979).

44. Pindyck, *supra* note 19.

45. J. MYERS & L. NAKAMURA, SAVING ENERGY IN MANUFACTURING: THE POST-EMBARGO PERIOD (1978).

in energy use has taken place since 1973 in most energy intensive industries, even with continuing use of existing equipment.

One important issue here is the appropriate discount rate for economic calculations involving industry. Typically industry requires more than a 20 percent pre-tax rate of return on investments, particularly those not related to plant expansion. If society demands a somewhat smaller return, should government subsidize conservation among those who still have higher discount rates? In Sweden the National Board of Industry has done so, paying up to 35 percent of the investment for retrofitting existing equipment.[46] Such subsidies exist in this country in the form of tax credits. The Swedish program has led to a savings of two to three percent of industry's energy use since 1974 in addition to savings from private projects. Moreover, some grants were rejected because the private rate of return was deemed great enough without subsidy. That is, the Swedish program had as its purpose the adjustment of the discount rate or time horizon so that society's overall investments in energy use and conservation might bring greater returns. Were these industrial investments foregone, Swedish research and development or energy supply monies would have been spent on more expensive energy.

Does this mean that massive government intervention is necessary in order to speed progress in the industrial sector? We doubt that this is necessary for several reasons. First, energy price changes in the industrial sector have been dramatic, especially for natural gas and electricity. In fact, these escalating costs have rendered much current equipment obsolete in the energy intensive industries, in which most industrial energy use is concentrated. Second, historical evidence shows that industrial energy use was becoming more efficient even while energy prices were declining, because of economies of scale and technological advances.[47] In spite of the progress in reducing industrial energy intensities, however, it is not certain that the industrial investment in energy conservation is "optimal," even from the point of view of industry. This is partly because of the lack of data on industrial energy use by end-use function. Still, we do not believe that the federal government can or should require individual firms to make a socially optimal investment to conserve energy. In our judgment, the appropriate role for government should be to provide information about industrial energy conservation opportunities, and

46. BOARD OF INDUSTRY, EVALUATION OF SUBSIDIES FOR ENERGY CONSERVATION MEASURES IN INDUSTRY (1979) (Report SIND 1979:1, Stockholm, Liberförlag, in Swedish).

47. B. Carlsson, Introduction to Energy Conservation in Industry (1979) (prepared for Project Proceed, Massachusetts Institute of Technology).

tax incentives (or alternatively, taxes on energy) to stimulate investment in conservation (as investment in supply has been stimulated historically). A primary justification for these measures is that industrial energy prices in the past were so low that energy was viewed by many firms as essentially a "no cost" resource. Although the era of low-cost energy has passed, the adjustment to higher prices may be excessively painful for the nation without considerable leadership from government. The measures of NECPA provide some useful leadership, but much more could be done by government without actually regulating energy use by individual industries.

Another NECPA measure[48] relates to the energy bonanza lying in the greater use of recycled materials. This section mandates the setting of targets for recycling, including intensive study of the problem. In assessing the potential impact of this measure, it is necessary to pay attention to the host of political problems that always seem to arise in connection with legislation regarding materials and recycling.[49] For making the millions of tons of throw-away waste possible are low prices of virgin materials, continuing low energy prices, and failure to internalize environmental costs into the costs of basic materials processing. Unquestionably recovery of waste materials represents both an energy and an environmental bonus, but one must acknowledge that the above-mentioned factors, acting through the marketplace, inhibit the conservation of materials.

V. FEDERAL ENERGY INITIATIVES

Title V[50] is concerned with federal energy initiatives. We applaud the willingness of the federal government to stimulate development of solar energy technologies, particularly through procurement policies. Audits of federal buildings are also suggested in Title V. The fact is that the government's record thus far in "plugging leaks" in its own house has been excellent.

However, there are two potential problems with Title V. First, it demands life-cycle costing, which is admirable in principle. But, as stated earlier, the results of life-cycle costing depend upon assumptions about energy prices, inflation, and discount rates (particularly the latter). It is possible to select values for these factors in such a way as to bias the results towards or away from the use of solar energy. This suggests that political contests are even more likely to be fought over this section of the act than over others.

48. 42 U.S.C.A. § § 6344(a), 6346 (Supp. 1979).

49. T. PAGE, CONSERVATION AND ECONOMIC EFFICIENCY: AN APPROACH TO MATERIALS POLICY (1977).

50. 42 U.S.C.A. § 6361 (Supp. 1979).

The other problem with procurement is that it may create premature support for particular technologies. Suppose that federal procurement of a certain kind of photovoltaic cell or thermal collector were to put other ideas or concepts at a competitive disadvantage, and later it was realized that the idea singled out for support had less merit than presupposed. Such a sequence, caused by understandable zeal to get the most hardware in place for the lowest cost, could lead to the development of the wrong technology. Without a diversity of efforts this risk is real. Fortunately, solar systems show a great potential for diversity. The challenge that is implicit in Title V is to make use of this diversity, and to encourage the development of many forms of the solar resource.

VI. OTHER PROVISIONS

Title VI begins with a section[51] requiring continued reporting of energy use by major corporations and large users. This is an information effort which is vital to careful energy planning.

The remaining parts of Title VI cover a variety of measures, including studies,[52] increased funding for state energy conservation plans[53] (we applauded plans) and funding for an Office of Minority Economic Impact in DOE.[54] This last item bears comment. It is very important that, in our desire to let market forces play a major role in energy conservation, we not overlook the fact that there are many people in this country who may feel severe economic pressures from increases in energy costs and possibly from the implementation of some conservation strategies, whether spontaneous or through government action. While these equity considerations should not be taken as an argument to hold down the price of energy, there must be full awareness of the pressing economic needs of these groups and the political difficulties they have had in the past in influencing policy. Politically, however, the implications of this section are clear: the DOE and all other policy or rulemaking energy authorities must know how their actions will affect all citizens. Failure to deal carefully and sincerely with the problems of minorities can doom legislation or other programs; accurate information and compensatory measures, on the other hand, will allow energy policymaking to proceed much more smoothly.

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51. *Id.* §6296.
52. 23 U.S.C.A. §217, 42 U.S.C.A. §§6345, 6373 (Supp. 1979).
53. 42 U.S.C.A. §§6321, 6325, 6327 (Supp. 1979).
54. *Id.* §7141.

VII. LONGER TERM ISSUES

Is NECPA by itself adequate to meet the national needs for energy conservation in the next few years? We believe not. NECPA involves a number of compromises, which generally involve limited government action. Growing stresses on the United States and international energy system suggests that NECPA, even if vigorously implemented, may not prove adequate to dampen the increasing U.S. dependence on imports sufficiently to avoid serious economic and political repercussions.

What NECPA and related legislation actually do is establish a framework of rulemaking authority for regulations and incentives in a number of important areas. Although the overall impact of the program will depend on the outcome of many rulemaking decisions, we believe that this impact probably will be relatively slight. Indeed, the entire National Energy Act as submitted to Congress by the President in 1977 was estimated to have a total impact by 1985 of just 2.1 millions of barrels per day of oil equivalent, and the Congressional Budget Office analysis yielded even lower figures.[55] The impact is impossible to calculate in detail, however, since NECPA primarily establishes authority to establish regulations rather than the regulations themselves. Most of the rules are still to be made.

NECPA is a compromise package that indicates Congress has not perceived a strong need for conservation. That this is the situation in this country is indicated by the continuing political support for price controls on oil and gas. Yet, even in the brief period since NECPA's enactment, oil prices have escalated at a rate earlier thought improbable.[56] Gasoline prices of one dollar appeared in May of 1979.

These rapid changes lead us to question the adequacy of NECPA as the primary legislative tool for dealing with the stresses relating to energy use that the nation may face in the next few years. We express this concern in a series of questions which might be used as a starting point for a discussion of potentially more effective legislation.

1) Is there justification for a national policy to encourage greater symmetry of investment in supply expansion and end-use modera-

55. CONGRESSIONAL BUDGET OFFICE, PRESIDENT CARTER'S ENERGY PROPOSAL: A PERSPECTIVE (January 1977) (052-070-04044-1).

56. Compare the forecasts made by the Energy Information Administration, published in April 1979 but prepared earlier, with the present OPEC world oil prices. ENERGY INFORMATION ADMINISTRATION, U.S. DEP'T OF ENERGY, ENERGY SUPPLY AND DEMAND IN THE MIDTERM: 1985, 1990, 1995 (April 1979) (Report DOE/EIA/0102/52).

tion? A number of analyses[57] have made it clear that investment today in demand moderation generally is still substantially below that which would be justified by economic analysis, based on the concept that each marginal dollar should be invested where it will bring the greatest return. A dollar should be invested in supply if it buys the most there, or in demand if that is more cost effective. Such an approach to energy conservation, if embedded in national policy, could provide powerful guidance for establishing standards and incentives.

2) What are the social benefits of conservation? Conservation offsets negative social impacts of energy in many categories, for example in reducing land use for energy supply facilities and reducing air pollution from combustion. Consideration should be given to ways that these social benefits can be made explicit in conservation legislation and standard setting.

3) What is the value to the United States of an avoided barrel of imported oil? Oil imports contribute directly to inflation.[58] Our linkage by a long chain of oil tankers to a politically unstable region of the world assures us of uncertainty of oil supply.

Under circumstances of this sort reduction of imports may have a national security value that far exceeds the direct dollar cost of the oil. This value is difficult to assess, however. The Harvard Energy Study, reporting in a recent issue of Foreign Affairs, speculates that the value may be two to three times the current price.[59] Others find it considerably lower.[60] Three administrations and several U.S. Congresses have talked with the higher figure in mind but acted on the basis of the lower one. Although we believe that national security considerations would justify substantially stronger conservation policies than those of NECPA, we point out that these considerations also have been invoked to promote more rapid development of high-cost supplies.[61]

4) Should the government stimulate conservation and solar technologies more vigorously? The issue is especially relevant to the solar

57. C.O.N.A.E.S., *supra* note 6. *See also* Hatsopoulos et al., *Capital, Investment to Save Energy*, 56 HARV. BUS. REV. 111 (1978).

58. HARVARD BUSINESS SCHOOL, ENERGY FUTURE: MANAGING AND MISMANAGING THE TRANSITION (R. Stobaugh & D. Yergin eds. 1979).

59. Stobaugh & Yergin, *After the Second Shock: Pragmatic Energy Strategies*, 57 FOREIGN AFFAIRS 836 (1979).

60. Pindyck, *OPEC's Threat to the West*, 30 FOREIGN POLICY 36 (1978). Pindyck suggests that the free market price of oil, in the absence of the Cartel, would be significantly lower than even the 1977 price, hence it would seem difficult to consider paying many tens of dollars per barrel to avoid buying something that might only cost much less.

61. Numerous statements by Congressional leaders in the spring of 1979 in support of the Synthetic Fuels proposals reflected this sentiment.

industry. If energy prices continue to rise, there will eventually be a large market for solar technologies. Although the solar industry has expanded substantially in the past few years, it is still quite unstable. One role of federal incentives is to help an industry to become economic in advance of the time when this would occur naturally. The incentives offered under NECPA move in this direction, but only slowly. The push of NECPA is very soft in comparison with the 55 percent solar tax credit that now exists in California; yet even with this incentive, the use of solar systems is expanding only slowly in California.[62] We believe that NECPA is deficient in this area.

The government is also being asked to back many other high-cost ventures on the energy supply side. We stress here that the balance between investment in high-cost fuels and electricity production and in energy conservation technologies should take into account the greater risks involved in the rapid expansion of energy supplies.[63]

It would be prudent for the government to place highest priority on backing measures designed to reduce energy demands that are more immediate in impact, probably cheaper and ultimately cleaner, while making best use of the additional time gained to solve the many difficult problems plaguing our future supply alternatives.

5) Are oil and gas scarce? They are scarce in the sense that the historically low prices paid for them today still inhibit both their production and the tremendous potential for end-use conservation at higher fuel prices. Much of the language of the act and its predecessors, as well as the debate within DOE, tends to emphasize saving "scarce" oil and gas, especially by replacing these fuels with electricity. It should be pointed out that oil and gas can be saved at less cost per unit by end-use conservation than by substitution of electricity.[64] Although we do not foresee an endless supply of oil and gas at rising prices, we do see the prospects for conservation of these fuels as bright enough to prolong their economic usefulness to society for heat and power well into the next century, provided that a serious conservation program is pursued continuously over the coming decades and that prices rise to reflect the relative scarcity of these fuels.

62. STATE OF CALIFORNIA, FIFTY-FIVE PERCENT SOLAR TAX CREDIT (April 1978) (AB 3623); Communications with California Energy Commission, Solar Office, Diana Rains (July 1979).

63. COMMITTEE ON NUCLEAR AND ALTERNATIVE ENERGY SYSTEMS, REPORT OF THE PANEL ON RISK (to be published by the National Research Council, National Academy of Sciences, Washington, D.C. 1979).

64. *See, e.g.*, A. Rosenfeld, Some Potentials for Energy and Peak Power Saving in California (October 1977) (LBL-5926, Lawrence Berkeley Laboratory, Berkeley) published in PROCEEDINGS OF INTERNATIONAL CONFERENCE ON ENERGY USE MANAGEMENT (1977).

6) In what other ways could the federal government play a significant leadership role in encouraging energy conservation? We have seen that NECPA promotes three major roles for the government in energy conservation: setting of energy standards, disseminating information about energy conservation opportunities, and assisting operators of federal buildings. Tax policy is another instrument that is likely to be consistent with our general framework of employing cost-effective conservation measures largely through the operation of market forces. The issue of whether the tax laws discriminate against industrial energy conservation is important. In industry, money spent on fuel serves to reduce profits, which are taxed directly. However investment in conservation is a capital outlay and is taxed accordingly. Since conservation and fuel use compete directly the different tax treatment of the two can lead to market signals that are not appropriate. This issue requires considerable analysis and is a proper area for future legislation.

An appropriate activity of the federal government regarding conservation is research and development. Because many conservation measures (e.g., more efficient electric motors) may have diffuse applications throughout the economy, private sector research and development is often very limited, and in these areas government-sponsored programs could make an important contribution. The emphasis of federal energy conservation research and development should be related directly to the potential contribution that conservation could make to reducing future energy supply problems.

Another area worthy of investigation is the strategy of the government with respect to commercial implementation of new conservation measures. Although the government has devoted considerable attention to the possibility of purchasing solar energy equipment to stimulate the market response to these new technologies, little attention has been given to similar programs for energy conservation. Many novel energy conservation measures are close to commercial readiness and might benefit considerably from an assist from the federal government. Purchase programs, testing and certification, effective information transfer, and other means are available as alternatives for the government in encouraging commercial use of cost-effective energy conservation measures.

To summarize our evaluation of NECPA, we find three major characteristics:

1. The principles of energy conservation legislation, while still typically vague, have evolved to recognize more explicitly the economic nature of energy use and conservation. NECPA makes a step

(unfortunately, far too small) along this course. But no legislation, strong or weak, can succeed unless market signals support it.

2. The specific measures of NECPA are generally mild. They are, however, roughly consistent with the reservations many people had in 1977 and 1978 about the need to let energy prices rise. But prices rose dramatically in the first two quarters of 1979. This sequence always will make it difficult to assess how much conservation was "caused" by a relatively mild act of Congress, and how much developed anyway because prices increased.

3. Some of the measures of NECPA are questionable or difficult to understand; some reflect old political battles; some leave the door open to enlightened—or misguided—manipulation through the rule-making process. Ultimately the provisions of NECPA probably reflect the feeling in Congress and the White House that something of apparent substance had to come out of the 18-month energy debate without that debate ever really having been resolved. The clouds have gathered again, with long lines at some gasoline pumps and fingers pointing blame in many directions. If these clouds have a silver lining, it may be the greater understanding that is developing of the need for and nature of energy conservation as an important step in resolving the nation's energy problem.