

Cato Institute Policy Analysis No. 189: Energy Conservation and Efficiency: The Case Against Coercion

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Executive Summary

Energy conservation is becoming the political tonic of the 1990s. President Clinton promised in his campaign to make efficiency the keystone of his energy policy in order to increase the competitiveness of American business and conserve natural resources. Energy Secretary Hazel O'Leary has long been an outspoken advocate of subsidized energy-conservation measures. And Clinton's energy tax has been justified largely as a measure to increase energy efficiency, decrease America's reliance on foreign oil, and reduce pollution. State public utility commissions are relying on energy-conservation programs to meet 75 percent of America's anticipated energy needs by the year 2000.

Yet careful analysis reveals that, contrary to popular belief, energy is more abundant today than ever before; there is no wrenching scarcity on the horizon. And America is one of the most energy-efficient nations on earth, not the energy glutton of the media caricatures. Nor do free markets fail to provide for efficient energy use; the so-called market failures of the energy economy either do not exist or are more appropriately labeled "government failures." Finally, programs that subsidize energy-efficiency measures for consumers, known as demand-side management programs, impose unnecessary costs on consumers while wasting, not conserving, energy.

Experience has shown that the invisible hand of the marketplace is far superior in providing for efficient energy use and conservation than is the dead hand of government planners, even if they belong to the Clinton administration or state public utility commissions.

Introduction

[Stalin] seemed to live in a half-real and half-dreamy world of statistical figures and indices, of industrial orders and instructions, a world in which no target, and no objective, seemed to be beyond his and the party's grasp.

--Isaac Deutscher

Energy conservation is the great political tonic. Both Republicans and Democrats prescribe government-mandated energy conservation as the magic cure for perceived economic and environmental ills ranging from impending energy scarcity, foreign oil dependence, and decreasing international competitiveness to global warming and air pollution. Although there is some disagreement about how large the dose should be and how the medicine ought to be administered, the belief that government knows best how to efficiently use and conserve energy is nearly universal, not only in Washington but in the 50 state capitals as well.

That belief has gained currency because it rests on the theory of market failure and a Malthusian conviction that

resources are strictly limited and finite. Otherwise sober advocates of the free market succumb to the argument that energy markets are so riddled with imperfections and externalities that some degree of government intervention is necessary.

This study explores the case for government intervention in the energy economy to secure more efficient energy use. When put under the microscope, however, the arguments advanced by the conservation lobby display both theoretical and empirical flaws. Central planning for energy efficiency in the United States is doomed to fail for the same reasons that central planning has proved such an abysmal failure in Eastern Europe, the old Soviet Union, Cuba, and everywhere else it has been tried.

Unfortunately, the energy-management experiment is entering a new, more intensive phase in the United States, and its focus is the nation's electric utilities. Called "demand-side management," the idea involves changing the traditional role of the public utility from energy supplier to energy-use planner. Tens of billions of dollars and America's future supply of electricity are being gambled on an experiment in centrally planned conservation that is highly unlikely to succeed.

No one opposes energy conservation or efficiency. Yet it is abundantly clear that only a free and unfettered market, which reflects the desires and accumulated knowledge of millions of consumers, can give rise to efficient production, use, and distribution of energy.

Pressing the Panic Button

Energy conservation is virtually always discussed in the context of impending shortage. If we don't act to restrict the use of energy now, we are told, we will soon run out of energy altogether. Robert Watson of the Natural Resources Defense Council, for instance, argues that government intervention in energy use is urgent because "people are not willing to give up amenities right now. They're going to force our kids to do that." [1] A television host proclaimed recently, "If we don't act to conserve energy now, we may soon run out." [2] That perception of impending scarcity, hanging over society like the sword of Damocles, is one of the main reasons the public is receptive to calls for energy-conservation mandates.

Yet, as noted by MIT economist Morris Adelman, one of America's foremost energy experts, "The great oil shortage is like the horizon, always receding as one moves toward it." [3] Indeed, society has experienced a steady increase, not decrease, in oil reserves and energy capacity. The world now has almost 10 times the proven oil reserves it had in 1950 and twice the known reserves of 1970. Proven reserves of coal and natural gas have increased just as dramatically. [4] In fact, known oil reserves are greater today than at any other time in recorded history. [5]

Often misunderstood, however, is the fact that "proven reserves" are a function of the price of oil and the technologies of oil extraction. With low petroleum prices, there is little incentive for oil companies to explore for oil. There is little profit in it. When oil is scarce, however, increasing oil prices provide incentives for exploration and lead invariably to corresponding increases in oil supply, since companies are more likely to receive a return on their investment. The evolution of extraction technology, such as the development of horizontal drilling, also allows industry to extract oil previously considered unrecoverable and discover new reserves.

Unfortunately, many people continue to believe that the world's stock of known reserves represents an estimate of how much is left. If the proven oil reserves of 1950 had actually represented all the oil that was left on earth, the world would have run out of oil in 1970. [6] That misunderstanding of resource economics, Thomas DiLorenzo and James Bennett point out, has led otherwise intelligent people to make breathtakingly ignorant statements about energy supplies. [7]

_ The Department of the Interior announced in 1939 that U.S. oil supplies would run out by 1952. New oil found since then, however, exceeds the 13-year known reserves of 1939. [8]

_ The Department of State concluded in 1947 that no new oil reserves were left in the United States. Yet in 1948, 4.8 billion barrels of oil were discovered, the largest discovery in American history. [9]

_ The secretary of the interior announced in 1949 that the end of U.S. oil supplies was in sight. U.S. oil production then rose by more than 1 million barrels a day over the next five years.[10]

_ The State Department predicted in 1951 that global oil reserves would run dry by 1964. World oil reserves subsequently grew 1,000 percent by 1990.[11]

_ The International Energy Agency warned in 1979 that the world's 645 billion barrels of known oil reserves would be largely depleted by 1985. Yet by 1990 only 320 billion barrels of that oil had actually been drawn down, and global oil reserves approached 1 trillion barrels.[12]

Although no one really knows how much oil is below the earth's surface, today's best guesses are that, at current rates of consumption, 650 years' worth of oil remains for future generations.[13] Moreover, as those resources are used and demand outpaces dwindling supply, other energy sources will inevitably be found to replace petroleum. If oil prices were to rise to around \$30 a barrel, for example, liquefied coal, heavy oil, and tar sands would become worth developing and could provide 3.5 trillion additional barrels of oil.[14] At approximately \$40 a barrel, oil shale could provide another 2 trillion barrels.[15] Alternative fuels such as compressed natural gas and methanol could replace gasoline if oil prices ever rose high enough to make use of those fuels economical. Even in the distant future, seven generations hence, the depletion of oil will not mean that we will run out of energy.

The fact that oil is more plentiful today than ever before can be readily seen by examining historical price data. The more plentiful a resource is, relative to a given demand, the lower its price. It is therefore interesting to note that retail gasoline prices, in constant 1990 dollars, are 6 percent lower today than they were in 1972, 25 percent lower than in 1963, and 30 percent lower than in 1947.[16] Whereas 3.2 percent of total household expenditures were devoted to gasoline in 1972 (the smallest percentage since 1952), American households today devote but 2.6 percent of total expenditures to gasoline purchases.[17]

Of course, we cannot be sure that the market is right about the extent of future supply, given that a "price" is a distillation of conflicting facts and opinions. In light of the market's sensitivity to all available information, however, the market price is the best predictor of future supply and demand. Those who believe that oil is more scarce than is indicated by the market price are free to buy reserves and hold them off the market for future use and profit. Indeed, if future supply and demand for a commodity are poorly reflected by its market price, those individuals who know better have every incentive to act on their superior knowledge to garner large future profits. Fortunes have been built by such activity, and there is every reason to believe that if such a gross market error occurred, profit-seeking individuals would step up to ensure that society's future needs would be met.

In command-and-control economies, however, the consequences of errors are much greater. Unlike the marketplace, those economies have no means by which people can correct for the misjudgment or ignorance of experts. As Nobel laureate economist F. A. Hayek pointed out:

Industrial development would have been greatly retarded if sixty or eighty years ago the warning of the conservationists about the threatened exhaustion of the supply of coal had been heeded; and the internal combustion engine would never have revolutionized transport if its use had been limited to the known supplies of oil. . . . Though it is important that on all these matters the opinion of the experts about the physical facts should be heard, the result in most instances would have been very detrimental if they had [had] the power to enforce their views on policy.[18]

America the Wasteful

Another oft-heard refrain from the conservation lobby is that America is one of the most energy-wasteful nations on earth. Amory Lovins, founder and vice president of the Rocky Mountain Institute and a leading spokesman of the conservation lobby, argues that "the U.S. spends 11 to 12 percent of its GNP on energy, compared to 5 percent for Japan; this difference gives typical Japanese exports an automatic 5 percent cost advantage." Moreover, Lovins argues that "Japan is not only more energy-efficient than the U.S.; it is becoming even more efficient much faster. In four major industries, electric intensity per ton is falling in Japan but rising in the U.S. In 1986, a dollar of Japanese GNP used 36 percent less electricity than a dollar of American GNP." [19]

Comparisons of U.S. energy use per dollar of GNP with that of Japan or Europe, however, are misleading for several reasons. First, the standard of living in the United States is far higher than it is in Japan. The average American household has 2.5 times more living space than the average Japanese household, which obviously means more heating and cooling.[20] That difference is compounded by the fact that only 20 percent of Japanese homes have central heating and only a third of the housing units built since 1990 have that basic American comfort. Instead, millions of Japanese rely on kerosene-burning camp stoves, electric blankets, electric carpets, and even heated tables to provide warmth.[21] The typical Japanese apartment, the kind in which 80 percent of the population lives, is also unlikely to have a water heater, a washer, a dryer, a refrigerator, or a stove.[22]

Second, Japan has a much greater population density than does the United States, which means that energy consumption for transportation is naturally much lower in Japan (the entire country is roughly equivalent in size to the state of Montana).[23]

Third, the United States has historically held a comparative advantage in abundance of natural resources and energy supplies vis-Ö-vis the rest of the world. That has resulted in the development of large energy-intensive, though not necessarily inefficient, industries. For example, nine of America's most energy-intensive industries account for 70 percent of industrial energy use.[24] Those industries, such as petrochemicals, chemicals, primary metals, and paper, are major exporters not only because of their comparative advantages but because higher energy taxes and tariffs abroad encourage the importation of goods the production of which requires large amounts of energy. Thus, the industrial structure of the United States skews simple readings of energy intensity per dollar of gross national product.[25]

When standards of living, population density, and industrial structures are controlled for, the Energy Information Administration finds that the United States is no less energy efficient than Japan and more energy efficient than many of the Group of Seven (G-7) nations.[26]

Nor is Japan making greater strides in energy efficiency than the United States. Quite the opposite. From 1980 to 1987 the United States improved its energy efficiency at twice the rate of Japan.[27] In fact, no other nation save Canada increased its energy efficiency more than the United States did between 1980 and 1987.[28] The fact that electric intensity (the amount of electricity required per unit of output) is increasing in the United States and decreasing in Japan is one of the main reasons for those U.S. conservation gains (more on that later).

Another popular indictment of U.S. energy use is that, as noted by the Partnership for Sustainable Development, "with only 5 percent of the world's population, the United States consumes 25 percent of the total commercial energy used in the world each year," and that "the average American consumes 15 times more energy than the average citizen in the developing world." [29] Of course, the high American standard of living has something to do with the amount of energy used in the United States in comparison with the developing world. To live outside poverty is not necessarily to "waste" energy. Such comparisons also ignore the fact that, although the United States does consume some 25 percent of total commercial energy, it also produces about the same amount of the world's goods and services and produces more food than any other nation.

Indeed, the facts demonstrate that the United States has made tremendous strides in energy efficiency.

_ Producing one dollar's worth of goods and services today requires 39 percent less oil and gas than was required in 1973.[30]

_ The United States is 52 percent more efficient in its use of oil today than it was in 1973.[31]

_ The energy intensity of the U.S. economy (defined as the ratio of primary energy use to national output) has declined 28 percent since 1973.[32]

_ Between 1973 and 1989 the value of goods and services produced in the United States increased by 50 percent while industrial energy use declined by 6 percent.[33]

_ From 1980 to 1990 the amount of energy needed to produce a dollar of GNP fell by 21 percent while per capita energy consumption fell by 7 percent.[34]

_ Homes built today use 50 percent less energy than those built before 1973.[35]

Those gains in energy efficiency are part of a continuing trend in the U.S. economy. Energy consumption per \$1,000 of GNP has been declining at about 1 percent annually for the past 60 years. In 1989 the United States used 55 percent less energy per \$1,000 of GNP than it did in 1929.[36] The argument forwarded by the conservationists--that post-1973 energy-conservation mandates are primarily responsible for recent gains in energy efficiency--is clearly constrained by lack of familiarity with historical trends. In fact, a recent study has found that, after correcting for shifts in the industrial sector, higher energy prices (not government conservation mandates) account for 80 percent of total U.S. energy efficiency gains since 1973.[37]

Energy and Externalities

The idea that energy markets are rife with negative externalities is virtually universal among policymakers. Since those externalities impose costs on society, it is argued, they should be, but are not typically, reflected in the price of energy. Even President Bush's National Energy Strategy justified state intervention in the energy market by repairing to this externality doctrine:

The goals of a healthy environment and reduced dependence on insecure suppliers represent national security, foreign policy, and social benefits to which markets are unlikely to give adequate weight. Hence, government must act, alone or in concert with private markets, to incorporate these considerations.[38]

Conservation mandates are thus called for to correct for the overuse of energy resources that results from prices that are lower than they would be if those externalities were accounted for.

Although that argument is superficially attractive, it is based on dubious analysis and impossible assumptions. Let us examine the "externality" of foreign oil dependence and the recessions of 1973-74, 1979-80, and 1990-92. All three were alleged to have been triggered by sharply higher energy prices resulting from oil supply disruptions in the Middle East. Yet drawing from existing research and examining data from manufacturing sectors in Germany, Japan, Great Britain, and the United States, Douglas Bohi, a senior fellow at Resources for the Future, concludes that energy price shocks had little to do with those three recessions. Bohi convincingly demonstrates that deflationary monetary policy, not oil "price shock," was the true culprit in the recessionary 1970s.[39] How else to explain the fact that Japan, the nation most dependent on foreign oil imports in the 1970s, avoided those recessions while Great Britain, virtually self-sufficient in oil thanks to its North Sea reserves, was hit harder in 1979 than virtually any other industrialized nation? The key difference between the two economies was their monetary policies.

Bear in mind that the cost of oil is small in relation to the economy, accounting for about 2 percent of GNP. Even a large increase in oil prices will have only a small impact on the economy. The 1973 oil price shock, for example, is estimated to have accounted for only a 0.35 percent reduction in GNP during 1973-74.[40] And if oil prices play such a dramatic role in economic well-being, why did the dramatic collapse in oil prices in 1986 not usher in an economic boom as large as the economic collapse that rising prices had supposedly triggered twice previously?

Analysts have long observed that energy independence provides little protection against domestic price shocks because the energy economy is global in nature. A global shortage of oil production, for example, will be reflected in price hikes for West Texas crude regardless of America's relative dependence on oil imports. The argument that energy conservation will make us less dependent on imported oil, and therefore less vulnerable to oil price shocks, violates virtually any reading of economic theory or history. For example, two-thirds of the oil consumed in the United States before the 1973 oil embargo was produced domestically. The reserves of the Organization of Petroleum Exporting Countries accounted for only a small fraction of U.S. oil consumption, yet the United States was affected by the oil supply disruptions of 1973. As Bohi points out:

As long as the United States maintains an open economy, foreign oil disruption will drive up domestic oil prices in line with world oil prices no matter how much oil the U.S. imports. . . . The economic costs of oil

disruption caused by changes in oil prices cannot be lowered by reducing oil imports.[41]

Nor is it altogether clear that energy conservation will actually work to reduce pollution from energy sources. Consider the fact that the conservation lobby supports mandatory energy conservation as an alternative to the construction of new power plants. Deferring or canceling construction of new power plants, most of which would be environmentally preferable to older, existing plants, could result in more pollution than would otherwise exist. That is because older plants, which would be shut down as newer, more efficient, and less polluting plants began operations, are given an artificial lease on life.

Moreover, energy-conservation programs would, at best, displace the need for additional generation capacity and, if very successful, lead utilities to reduce energy output from their most expensive plants. Since energy output from the cheapest utility plants would be largely unaffected by energy efficiency programs, even Richard Ayres of the National Clean Air Coalition concedes that energy conservation would have little effect on pollution for at least 10 years. That is because the cheapest generating plants are the main source of energy-based air emissions since they are typically older and far more polluting than modern facilities.[42]

The idea that energy use is a major source of pollution, moreover, ignores the vast carrying capacity of the atmosphere and its demonstrated ability to absorb and dilute pollutants. For example, all of the pollution mankind has produced since Adam has been less in quantity and less toxic than that caused by just three volcanic eruptions: Krakatoa in 1883, Katmai in 1912, and Helka in 1947.[43]

It is also important to note that, although energy consumption has negative environmental impacts, our ability to quantify and price those impacts is limited. And it is unclear that the price of energy really fails to fully incorporate those costs since the cost of regulatory compliance is reflected in the price we pay for energy. The Environmental Protection Agency estimates that environmental regulations cost the economy approximately \$115 billion annually and will cost \$185 billion a year by 2000.[44] Even those figures are questioned by a growing number of economists who believe that the costs of environmental regulations are far greater than estimated by the EPA.[45] Are the regulatory costs of environmental compliance, then, greater or less than the costs of any environmental damage that energy consumption may cause?

Nobody really knows because, absent private ownership of environmental resources and a market structure for exchanges of and contracts for resources, prices for environmental goods are impossible to ascertain. Since we cannot "price" environmental goods outside the marketplace (any more than we can "price" tractors accurately in a command economy), we are incapable of ascertaining the actual "cost" of environmental degradation.[46] That is not, however, an example of market failure. It is an example of the failure of the government to provide for private ownership of environmental resources and to maintain legal institutions to protect property rights.[47]

The Myth of Market Failure

Given that market economies are, on average, 2.75 times more energy efficient per \$1,000 of GNP than are centrally planned economies (a margin of difference that has grown steadily over time), it should be abundantly clear to all that consumers are better able to provide for efficient energy use than are central planners.[48] Yet the conservation lobby has succeeded in convincing policymakers that there are inherent in energy markets numerous imperfections and failures that necessitate government intervention.

A brief examination of the alleged imperfections in the energy market, however, reveals that the assertion of market failure is spurious.[49] Accusations of market failure usually mean that markets fail to act as the critics would prefer.[50]

Regulated Pricing

Perhaps the most common charge of market failure is leveled at the regulated pricing practices of state public utility commissions (PUCs). PUCs typically set electricity rates on the basis of the average cost of electrical service, whereas most private businesses set prices on the basis of the cost of new, or marginal, production. Conservationists point out that, because it costs more to produce electricity from new power plants than from existing generation facilities, the

average cost of electricity is below its marginal cost, and thus consumers pay an unrealistically low price for electricity.

That was undoubtedly true during the mid-1970s and early 1980s, but it is not entirely clear that marginal costs for electricity today are higher than average costs. A survey conducted by National Economic Research Associates (NERA) found that 17 of 41 responding utilities (41 percent) would raise less revenue by charging rates based on marginal rather than average electricity costs. NERA also found that, when calculated on a capacity-weighted average basis, the existing electricity rates of those 41 utilities exceeded marginal costs by 22 percent.[51] Moreover, California's Standard Practice Manual for evaluating electricity conservation programs candidly notes that, for California utilities, "average rates substantially exceed marginal costs." [52]

Although the conservationists are correct that current PUC pricing standards are irrational, that irrationality is a result not of market but of government failure. Such practices can and should be easily remedied by reforming PUC ratemaking practices (or scrapping the PUC structure entirely).[53] In any case, there is little substance to the claim that electricity prices are in general artificially low today because of the relatively high marginal cost of new baseline power.

Future Price Uncertainty

"Leaving energy to the free market means leaving it to the roller coaster of alternating shortages and gluts," argues the Washington Post. "These wild swings in oil prices are characteristic of all commodity markets, and in the case of oil they are aggravated by the concentration of reserves in a place that, in terms of its politics, you can fairly describe as the world's least stable." [54] Because of price uncertainty, it is argued, consumers have no basis for planning and are thus reluctant to invest in technologies with high front-end costs.

But oil is like any other commodity. Would the Post argue that prices of other commodities should also be controlled by the government, or that the government has a right to regulate the purchase and use of all commodities because they undergo "wild swings" in price?

Most energy price fluctuations are the result not of naturally functioning energy markets but of government intervention in the marketplace. Oil prices spiked and then quickly came down in the summer and fall of 1990, for example, because of an international blockade of Iraq and Kuwait, not because oil is more price sensitive than other goods. Price instability in the 1970s was similarly a result of massive government intervention in oil prices, distribution, sale, and use. Artificial scarcities that affected energy costs were created. Again, that was a regulatory or government failure, not a market failure. One could certainly argue that the best way of correcting for price fluctuations would be to get the government out of the energy market entirely.

A recent study by Bharat Trehan of the San Francisco Federal Reserve found that "changes in the value of the dollar account for almost half of the variation in oil prices over the period 1958-85." [55] Since prices are by definition a function of the ratio of dollars to goods, it should be no surprise that changes in the supply of and demand for dollars, rather than changes in the supply of and demand for oil, account for half of all oil price changes.

Limited Access to Capital

Individuals and corporations, it is argued, use irrationally high discount rates because of their limited access to capital. According to Amory Lovins, the clearest manifestation of pervasive market failure is that most customers require payback horizons of one to two years for energy savings, even as utilities cheerfully accept power-plant payback periods ranging from decades to infinity. That disparity in discount rates makes society buy too many power plants and save too little.[56] Thus, government must step in to ensure the adoption of energy-efficient technologies that have long-term benefits.

Although there is obviously limited access to capital on the part of individuals and corporations (people simply do not have as much money as they would like), consumers are not generally averse to making long-term investment decisions incorporating low discount rates. If consumers actually used such high discount rates for all their investments, they would never save for their children's education or for a down payment on a house or car. Nor would

people put money in savings accounts, which pay single-digit returns. A cursory examination of common business practices also reveals that new product lines, plant expansions, and marketing activities all demand investments that take more than just a few years to pay off.

Actually, it is difficult to reach definitive conclusions about the discount rates used by consumers when making judgments about energy-conservation investments. Dozens of studies have been conducted and untidy results abound. Consumers, for example, appear to use different discount rates for different technologies: typically higher discount rates for air conditioners, refrigerators, and other appliances and lower discount rates for insulation, window replacement, sources of heating fuel, and overall residential energy efficiency in new housing units.[57] Researchers have also found that age, income, and homeowner status can have significant impacts on consumer discount rates, though the data are sometimes contradictory.[58]

If consumers are generally not averse to making relatively long-term investments in many areas of their lives, why are they so averse to making long-term investments in some energy-efficient technologies but not in others? The conservation lobby argues that it is simply a reflection of "market failure," although "consumer failure" would probably be a more apt term. The market has not failed to offer opportunities for the purchase of energy-efficient technologies. Consumers, according to the conservation lobby, have simply failed to act in what is evidently in their best interests.

Yet it is hard to reconcile the results of studies that show high implicit discount rates for certain appliances with the dramatic improvements in the energy efficiency of those very same appliances. From 1972 to 1978, for example, the energy efficiency of new refrigerators increased 29 percent; by 1980 the energy efficiency of new refrigerators was 46 percent higher than in 1972, and by 1990 average refrigerator energy efficiency more than doubled. Likewise, the energy efficiency of new air conditioners increased 46 percent from 1972 to 1990.[59] Moreover, those gains in the energy efficiency of refrigerators and air conditioners were made entirely in the context of the free market. There were no federal mandatory efficiency standards for those appliances before 1990.

When consumers prove reluctant to invest in certain energy-efficient measures, studies by NERA's Albert Nichols and Professor Douglas Houston of the University of Kansas indicate that the reluctance is due not to economic ignorance but to a perfectly rational judgment of economic gain. For example, energy-conservation investments yield uncertain gains given the steadily dropping price of energy and the unreliable performance record of many technologies. Consumers may also perceive additional costs not included in the conservationists' calculations, such as transaction costs or differences in quality or convenience. Lower income families may have little opportunity to make effective use of energy-efficient investments because of household and family constraints and instabilities. Many energy-conservation investments are "sunk"--tied to the house--and therefore the value of the conservation investment is linked with the property value of the house. Finally, the heavily front-loaded cost of many conservation investments requires the consumer to consider fully the costs of social goals unattained, economic investments not made, personal opportunities forgone, and desires unfulfilled.[60]

Likewise, businesses must consider the opportunity cost of a conservation investment. After all, \$1 million invested in corporate energy efficiency is \$1 million not invested in advanced research and development, product marketing, new product lines, or expanded plant capacity. For expenditures on energy efficiency to make sense to the businessman, they must not only prove profitable, they must also provide a higher rate of return than would alternative investments such as the ones mentioned above. The fact that a \$1 million investment in energy efficiency will pay for itself after five years is insufficient reason for making that investment. It must provide a higher rate of return than would other potential investments. In fact, in all the literature about the supposed cost savings of investments in energy efficiency, nowhere is the question of opportunity cost even addressed.

The conservation lobby is correct, however, to point out that there is limited access to capital, particularly given today's federal, state, and local fiscal policies. Cutting taxes and government spending would free capital for all kinds of private investment, including investments in energy efficiency. Moreover, as pointed out by the Heritage Foundation's William Laffer:

There is one very good reason to believe that market prices in the United States systematically fail to reflect future scarce conditions--and hence the value of investments in new technologies, or of

conservation--fully. Current tax and monetary policies in the United States substantially raise the real cost of capital, thereby shortening the time horizons of U.S. firms. As a result, it is quite likely that U.S. firms systematically undervalue future profits, and hence future profit opportunities, such as the opportunity to profit by saving some of one's oil to sell in the future, rather than selling it all now, or the opportunity to profit in the future by investing in the development of new technologies. Investment and conservation efforts which companies in other countries, such as Japan, may find attractive will be less attractive to American firms because they face a higher real cost of capital.[61]

Whether the conservation lobby will embrace laissez- faire economics in order to reach greater energy efficiency remains to be seen. Yet it cannot be denied that the government's voracious demand for private capital drains the economy of resources that might otherwise be invested in energy efficiency and discourages the very kind of long-term investments advocated by the conservation lobby.

Government Subsidies for Energy Production

To the extent that federal policies subsidize energy production, energy prices are lower than they otherwise would be and thus energy use is higher than it would be under optimal conditions. Although there are some subsidies for energy production (the Price-Anderson Act subsidizes the nuclear-power industry by providing government-backed insurance, for example), those subsidies are somewhat counter-balanced by the tax code's unfair penalization of energy production.[62] The conservation lobby, however, tends to argue that provisions of the tax code (e.g., accelerated depreciation allowances, investment tax credits, and tax- exempt bonds for publicly owned utilities) amount to "subsidies" for energy production.[63]

Subsidies, however, are hardly an example of market failure. Instead, they are an example of government failure. The best method of dealing with distortions caused by subsidies is to eliminate the subsidies in question, not to create a competing set of distortions in the marketplace.[64]

Inelasticity of Energy Demand

A coalition of energy-conservation lobbies recently released a much-heralded report entitled *America's Energy Choices: Investing in a Strong Economy and a Clean Environment*, in which it was argued that "the literature suggests that for most end-uses in the residential and commercial building sectors, energy demand is not very sensitive to changes in prices." [65]

Actually, the weight of economic literature concludes just the opposite. The long-run elasticity of total energy demand for industrial applications appears to be about -0.8. In other words, for every 10 percent increase in price, a corresponding 8 percent decrease in demand will probably occur. The evidence suggests that total demand for energy in the residential sector has a long-run elasticity of -1.1, while elasticity of demand in the transportation sector appears to be -1.0.[66] Thus, any theory of market failure is further discredited by the earlier examination of trends in American energy efficiency. Simply put, energy prices have been the dominant factor in America's increasingly efficient use of energy.

Limitations of the Supply Infrastructure

The conservation lobby points to several alleged market failures of the supply infrastructure. First, they point out that, because of limited demand, many technologies are available only in certain regions, and thus not all consumers have the option of using energy-saving devices. Yet the market is reacting rationally to the lack of demand for the technologies in question. The fact that professional baseball is not played in Sioux City, Iowa, for example, does not imply that the baseball market has somehow "failed."

Second, it is argued that a lack of skilled employees trained in energy efficiency proves that companies underinvest in conservation training programs. But lacking detailed knowledge of each company's position in the marketplace, how can anyone presume to know whether company x, or even industry x, is underinvesting in conservation training programs? Moreover, what specific flaw in the marketplace leads companies to underinvest in conservation training? Do companies underinvest in all types of employee training? If not, then why do they underinvest in conservation

training and nowhere else? Again, it appears that the conservation lobby has found that markets do not necessarily act as they would prefer. They therefore conclude that there obviously must be some imperfection in the market.

Third, it is argued that a chicken-and-egg problem exists with respect to new technologies and fuels that require an extensive investment in infrastructure. Automakers are reluctant to build methanol-fueled cars, for example, because few filling stations offer methanol fuel and there is no infrastructure to deliver or store methanol. Distributors and retailers of fuel are reluctant to invest in the expensive infrastructure necessary to provide retail methanol because few cars run on that fuel. Thus, unless government steps in, the promise of methanol will be forever unrealized.

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f that is true, how do we account for the fact that new technologies with similar problems--television, fax machines, compact disc players, and computer software, for example--developed without any help from the government? There is nothing that prevents an investor in methanol from providing both the vehicles and the infrastructure necessary to establish a market. Hardly any major technological advance would have occurred in the 20th century if the chicken-and-egg problem were insurmountable in the free market.

Negative Public Attitudes toward Energy Efficiency

Analysts at the Oak Ridge Laboratory argue that "the public places a high premium on comfort, ease, and convenience, goals that may appear to conflict with energy efficiency. Thus, it is unclear whether the positive attitudes that Americans have for improving energy efficiency will be reflected in their energy-related purchase and operating decisions." [67] The fact that free markets allow consumers to make choices about how they will live their lives is hardly market failure. If consumers perceive that the benefits of energy conservation outweigh the costs, then consumers will indeed conserve energy. If consumers' perception of energy-conservation costs is incorrect, then information campaigns, aggressive marketing, and innovative sales practices can certainly correct for any public misinformation. There is nothing inherent in the marketplace that prevents the public from developing positive attitudes toward energy conservation.

Perceived Riskiness of Investments in Energy Efficiency

Given the high up-front costs of many energy-efficient technologies, conservation lobbies argue that lingering uncertainty about long-term energy prices prevents people from making investments that would be in their own best interests. The public, however, has every reason to believe that energy prices will decrease in the future. After all, energy prices have been steadily decreasing for years. Moreover, consumers have good reason to believe that taking the advice of energy-conservation experts is risky, given their recent track record.

For instance, many people believed the conservation lobby's rhetoric about future gasoline prices and purchased diesel-powered automobiles in the late 1970s and early 1980s. The result was poor car performance, wasted economic resources, and far less energy savings than were promised. Similarly, in the 1970s policymakers listened to what the conservation lobby said about future gasoline costs and the promise of fuel alternatives. The result was that billions of dollars were sunk into one of the biggest government boondoggles in history, the federal Synfuels program.

Being prudent with one's own money is an example not of market failure but of rationality. Perhaps the reason would-be energy planners fail to exercise such caution is that the money they spend and the resources they invest are not their own but other people's.

Information Gaps

Analysts at Oak Ridge Laboratory also argue that "information regarding the technical and economic viability of such [efficient energy] technologies under full-scale, actual usage conditions is often scarce. The absence of such data leads to greater perceived risks and a reluctance to adopt such systems." [68] Moreover, energy supply curves, showing which technologies are cost effective at various energy prices "for most technologies, . . . are not available." [69] The authors of America's Energy Choices go even further when they assert that "because they [consumers] lack important information, businesses and consumers often fail to take actions that are in their own best interest." [70]

But if information about the actual cost and performance of technology is scarce, is society not well advised to consider such investments at least potentially risky? And how, without that information, do the authors of America's Energy Choices know what is in the best interests of consumers and businesses?

Although consumers clearly lack perfect information about energy-efficiency measures (at least the kind of omniscient knowledge assumed in elementary textbook models of rational economic decisionmaking), the same can be said about any area of economic life. If imperfect knowledge means market failure, then the market fails across the board and it is a wonder that our economy functions at all. In reality, however, information can be costly to obtain and process and there are often diminishing returns on the acquisition of additional information. The frequently heavy "transaction costs" associated with information gathering mean that perfect knowledge is rarely obtainable or even feasible in the economy.

If experts believe that consumers' perception of risk is unjustified or misinformed, an aggressive information campaign would certainly seem to make sense. In the past, other industries have used marketing and sales campaigns to fill public information gaps and have successfully convinced consumers of the wisdom of purchasing goods and services without government help.

Misplaced Incentives

Industrial buyers, writers of product specifications, architects, engineers, and builders, it is argued, have little incentive to provide energy efficiency since they are not paying the full life-cycle cost of inefficiency. Yet if consumers truly demanded energy efficiency in products or homes, suppliers would have every incentive to provide it, and they would loudly advertise the energy-efficient attributes of their goods and services.[71] The fact that that is not happening to the extent desired by the conservationists proves, not that there is a failure in the market process, but that there is little demand for the kind of energy efficiencies preferred by the conservation lobby.[72] If that were not so, some investors would be getting rich right now by monopolizing a market niche and providing goods and services that the public desired. As Albert Nichols explained:

Profit-maximizing firms have strong incentives to take account of their customers' preferences. To the extent that they can provide a characteristic or feature at lower cost than the customer values it, they can earn profits (at least until competing firms also offer that feature). Problems can arise if the customer cannot judge the impacts of various characteristics, but those problems occur whether or not an "intermediary" is involved. Indeed, an important role of many intermediaries (particularly architects and engineers in the case of buildings) is to use their technical knowledge to better translate the customers' broader preferences (e.g., low operating costs) into action (e.g., the purchase of a more reliable or energy efficient heating system).[73]

Any empirical or theoretical analysis shows that charges of market failure are unfounded. If we define "market failure" as the failure of the free market to sustain "desirable" activities or to stop "undesirable" activities, then there is absolutely no evidence on which to base such a charge. As noted previously, the United States is one of the most energy-efficient nations in the world.

Moreover, the conservationists are unable to answer the most central question related to a charge of market failure: given that free markets are unexcelled in meeting public demands for desired goods and services (that, as a matter of fact, is how profits are made), exactly what economic barriers exist to the delivery of energy-efficient technologies that are unique to the energy economy? The barriers alleged by the conservationists, as we have seen, are either completely unrelated to the institution of the marketplace or are characteristic of every sector of the American economy. Since those barriers are demonstrably surmountable in the marketplace, they are not really barriers at all and thus fail to substantiate the charge of market failure.

The Theoretical Construction of Demand-Side Management

Although the number of government programs mandating, subsidizing, and regulating efficient energy use is legion, the most sweeping and ambitious attempt to intervene in the energy marketplace today is demand-side management of electricity generation and consumption.

Demand-side management (DSM) programs, which have been a growing part of utility planning since the 1970s, are designed to reduce consumer demand for electricity rather than increase generating capacity. The theory behind DSM is that energy conservation and increased efficiency are cheaper than generating new energy. Public utility commissions thus often require that utilities offer consumers services, such as free energy audits, and heavily subsidized technologies designed to reduce demand for electricity. The costs of those subsidies are then passed on to ratepayers, who in theory will be required to pay less for the conservation program than they would have had to pay for new generation capacity.

In fact, Lovins argues that energy conservation is actually a source of energy that he refers to as "negawatts" (that, of course, is akin to arguing that dieting is a major source of food, or "negacalories"). Today 31 states have some form of demand-side management program in place, and 10 others are considering adopting the practice. As of 1990, 500 utilities had undertaken over 1,400 DSM programs. Approximately \$2 billion was spent in 1991 on utility-sponsored conservation programs, and projected costs are staggering. In California and New York alone, nearly \$20 billion will be invested in DSM in the next decade.[74] The public utility commissions of many states are vetoing the construction of new electricity generating plants in the expectation that DSM programs will avoid almost three-quarters of the growth in electricity demand that would otherwise occur by the year 2000.[75]

Robert Wirtshafter of the University of Pennsylvania observes that DSM today dominates supply-side energy investments to nearly the same degree that nuclear power dominated supply-side investments in the early 1960s. DSM expenditures are nearly as large as nuclear power investments were during the boom era of the 1960s, and the unrealistic promises of DSM are but 30-year echoes of the "too cheap to meter" claims once made by proponents of nuclear power.[76]

Is the DSM bandwagon of the 1990s doomed to meet the same fate as the 1960s nuclear bandwagon? Wirtshafter, a proponent of DSM, observes that "the nuclear industry collapsed in large part due to stunning cost escalations and poor operating performance. These problems did not occur suddenly. . . . Using the nuclear experience as a guide, we can see a number of danger signs in the current development of DSM."[77]

The "Big Brother" Electric Company

Although it is certainly true that people in the marketplace ought to be comparing the cost of energy conservation with the cost of electricity generation (and making economic choices accordingly), it is not altogether clear that electric utility companies are the best candidates for that task. The energy market is far too large and complex to allow any one economic actor or state public utility planner to consider all the options involved in energy generation and use.

Suppliers can be relied on to produce fuel in the most efficient manner possible and to sell at prices reflecting the resulting costs. Utilities have no need to second-guess the decisions of the coal, oil, or gas industries. They are well advised to simply plan business activities on the basis of the price of the various fuel stocks available in the marketplace. By the same token, energy consumers and the firms that specialize in servicing them can be trusted to ascertain how to use electricity in the most efficient manner possible.

The decentralization and specialization of the economy, with each economic unit maximizing efficiency within its defined boundary and interacting with others through prices and markets, are far more likely to result in efficient use of resources than is reliance on dictates from central economic planners, even if they are perched in the corporate headquarters of electric utilities. F. A. Hayek outlined the reason for that at the turn of the century. He argued that knowledge is diffuse and concentrated in millions of tidbits of information that are hardly discoverable by central planners. Given the diffusion of economic information, only a decentralized economy, characterized by specialization, property rights, and free markets, could possibly assimilate the sum of that knowledge into economically useful information via the price mechanism.[78]

Yet the advocates of DSM presume otherwise. The explicit assumption of DSM programs is that the electric utility (or its consultants, such as Amory Lovins) knows better than consumers of electricity how to most efficiently use energy. The impossibility of such an assumption is explained by economist Larry Ruff.

The cost-effectiveness of any specific DSM device in any specific application by any specific consumer depends on details of the device, the consumer, the application, the timing, the delivery method, etc., in ways that are not directly observable or controllable by the utility. There are now high information and transaction costs involved in implementing a utility DSM program-- unless one is willing to accept the assumption . . . that utilities have, at near-zero cost, near-perfect knowledge of and control over the detailed preferences, options, and actions of millions of economic consumers.

There is a name for a utility with the knowledge and control necessary to implement a DSM give-away program efficiently: God. Even to come reasonably close to the truly cost-effective result in any but the simplest cases requires a degree of knowledge and control that is unrealistic for any real-world institution. Mere mortals or even utility regulators cannot hope to handle this job by centralized command-and-control methods.[79]

The economic experience of the 20th century has shown conclusively that central planning is incapable of efficiently allocating and using resources. The chief obstacles to efficiency faced by DSM programs include the negative consequences of subsidies; the difficulty of judging, outside the marketplace, whether a program is cost-effective; problems in measuring success; and the difficulty of projecting energy savings and costs of emerging technologies. It should not be surprising, therefore, that virtually every rigorous examination of utility-driven DSM finds that actual conservation gains are far less than projected and program costs spiral far beyond anyone's expectations.

Why Subsidize Efficiency?

The key element of DSM is the subsidy provided for energy-efficient technologies. As long as the subsidies are less than the cost of new generating capacity, however, they are deemed efficient. Of course, if investments in energy efficiency were wise in the first place, subsidies would scarcely be necessary. As noted earlier, American industry has made great strides in energy efficiency and is obviously not averse to investing in new technology.

The availability of heavy subsidies, however, means that consumers (commercial, industrial, and residential) have an incentive to take advantage of subsidized programs to meet investment needs that would have been undertaken regardless of the existence of DSM programs. Those consumers are known as free riders. Virginia Kreitler of Synegetic Resources Co. reviewed dozens of detailed studies of utility-sponsored DSM programs and found that free riders constituted, on average, 71 percent of all participants in refrigerator subsidy programs, 53 percent of all participants in air conditioner rebate programs, 62 percent of all participants in air conditioner loan programs, 60 percent of all participants in heat pump rebate programs, 31 percent of all participants in weatherization programs, 41 percent of all participants in efficient water heater purchase subsidy programs, and 38 percent of all participants in commercial and industrial lighting programs.[80] Kreitler's findings not only cast doubt on the economic wisdom of subsidy programs; they also bring into question the alleged gains of DSM programs, given that most of the gains would have occurred in the free market.

Moreover, consumers are given an incentive to put off major efficiency improvements not covered by existing DSM programs if they believe that subsidies for such purchases may be or could be forthcoming. James Clarkson of Southwire Co., a firm that has annual sales in excess of \$1 billion and consumes over \$100 million in electricity each year, notes that "anticipation of conservation subsidies will act to slow the overall natural pace of equipment upgrading by industry." [81]

Former New York Public Service Commission chairman Alfred E. Kahn also points out that subsidizing energy efficiency may actually have the effect of increasing energy waste.

There is a value in individual responsibility. If the only way consumers can be induced to do things that are in their own interests is to be subsidized by others, then many of us would contend that it is a better society that permits them to suffer the consequences of their errors rather than one that, paternalistically, does it for them, at the expense of others who behaved prudently. Departures from this principle have the unhappy side effect of discouraging responsible behavior by third parties as well. If the utility company is going to subsidize people who will not act in their own self-interest, it becomes rational for others as well to refrain, in anticipation of the subsidy.[82]

The Electricity Consumers Resource Council, a major association of industrial energy users, concurs fully.

Some companies have done more [toward energy efficiency] than others. Some have done more at some of their plants than others. That is part of the competitive process. There are winners and losers. Those that make the greatest efforts should be the winners. Unfortunately, the implementation of subsidized conservation programs helps the laggards at the expense of the farsighted competitors. That tilts the tables in ways that can be very harmful to competition.[83]

The degree of competitive harm being inflicted on certain commercial enterprises in the name of DSM was underscored recently in hearings in New York. Industrial energy users in that state that have long promoted energy-efficiency measures in their own facilities are now being soaked by New York's aggressive DSM efforts.

- Camden Wire received only \$740 in rebates for DSM measures from 1990 to 1992 but will be forced to pay approximately \$150,000 in DSM-related surcharges over a 12-month period. Since Camden Wire has long been an industry leader in energy efficiency, it has little opportunity to receive DSM rebates for additional improvements.

- Blud Circle Cement's Ravenna plant received slightly over \$100,000 in DSM rebates but will pay approximately \$683,000 in DSM-related surcharges.

- Bristol Myers' Squibb facility received less than \$2,000 in DSM rebates in return for a \$700,000 DSM bill payable over 12 months.

- General Motors' Inland Fisher plant received only \$3,415 in DSM rebates from 1990 to 1992 but estimates that it will pay approximately \$300,000 in DSM-related surcharges over a 12-month period.

- Champion International qualified for a \$3,200 DSM rebate but will be forced to pay approximately \$900,000 in DSM-related surcharges over a 12-month period.[84]

Although energy audits and conservation services often make sense, utility entry into the energy-conservation industry, subsidized as it is by the ratepayers, will only serve to crowd out private enterprise and stifle competition. There are thousands of independent contractors and firms, known as energy service companies, selling and installing energy-efficiency technology. The growth of DSM, with its heavily subsidized services, will put most of those firms out of business

That is not just conjecture. In New Jersey, for example, the Coalition Against Unfair Utility Practices (CAUUP), which is composed of 14 trade associations including those representing plumbers, heating and cooling contractors, and sheet metal workers, argues that DSM programs, which are subsidized through the rate base, unfairly capture markets from existing private conservation firms and consultants. CAUUP alleges that over the past two years DSM programs in New Jersey have raised the utilities' share of the energy-conservation market from 5 percent to 85 percent and been directly responsible for the unemployment of approximately 5,000 private contractors.[85]

Finally, the same incentives that encourage utilities to provide power inefficiently will continue to exist under DSM planning and will lead to inefficiencies in the subsidized conservation programs. Utility companies, after all, do well by doing badly. Since the rate of return allowed a utility is determined by a set percentage of its annual business costs, utility executives have every incentive to raise costs; waste resources; ignore new, efficient technologies; and otherwise maximize business inputs. Thus, utilities have no incentive to minimize the cost of DSM programs. On the contrary, they are encouraged to run them as inefficiently as possible, or at least as inefficiently as they can get away with.[86]

Insufficient Energy Use: The Flip Side of the Coin

DSM programs also damage economic efficiency because of the double bonus that is given to the

subsidized industry. Observes economist Benjamin Zycher: "Electricity in this sense is no different than any other good; I am rewarded for not consuming an apple, thus releasing it for someone else to consume, by the money I save by not buying it. Were the supermarket to pay me the price of the apple that I do not consume, I would consume too few apples." [87]

This is typically a hard concept for conservationists to grasp: society can be just as easily harmed by insufficient energy use as it can by excessive energy use. Remember that energy is but one economic input typically competing with other inputs such as capital and labor. When energy prices go down relative to the price of other inputs, businesses are well advised to substitute energy inputs for other competing inputs wherever possible. That helps not only the business in question (by reducing overhead and increasing profit margins) but also society at large. The scarcest resources will have the highest prices, and substitution ensures that resources that are in relative abundance (reflected in their lower prices) will be used to the exclusion of scarce resources wherever possible.

Energy-conservation subsidies in situations in which energy is dropping in price will be very expensive to maintain and will act to distort the proper decisionmaking of resource consumers. Other resources that are scarcer than energy will be excessively depleted, and consumer prices in general will be higher than they would have been absent the subsidies

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Aggregate Conservation Potential: Crunching the Numbers

The energy-conservation lobby maintains that massive energy savings could be realized by adopting certain efficient technologies that, by and large, are not being adopted quickly enough or frequently enough to satisfy the conservationists. Lovins, for example, maintains that adoption of currently available cost-effective technology could cut U.S. electricity use by 75 percent. [88] The Electric Power Research Institute (EPRI), which is much more conservative, alleges that cost-effective technology could reduce electricity use by 24 to 44 percent. [89] The authors of America's Energy Choices believe that the potential for energy conservation is somewhere between those two estimates but closer to Lovins's estimate than to EPRI's. [90]

Those estimates vary a great deal, revealing the amount of speculation involved in such projections. Yet the conclusions are all the same--America is not using energy as efficiently as it should, and government intervention is warranted to ensure conservation.

But would the recommended investments be truly cost-effective in the sense that more would be saved than invested? Even aside from the question of opportunity costs, there are many reasons to doubt the conclusions of both the conservationists and EPRI.

Total Resource Cost Tests

DSM advocates make a superficially attractive case for conservation measures by arguing that, as long as a utility's DSM expenditure to save x kilowatt-hours costs less than a similar supply-side expenditure to generate x kilowatt-hours, efficiency and cost-effectiveness are served and ratepayers come out ahead. Consider, however, a situation outlined by economist Larry Ruff, in which that very scenario is played out.

Suppose a utility has avoided supply costs of nine cents per kilowatt hour, is charging a price of seven cents per kilowatt hour, and offers to pay five cents toward the cost of [conservation] measure "M" for any customer. For customer "X," measure M will save one kilowatt hour and seven cents (the retail rate) at a cost to X of only three cents, and hence X will accept the utility offer. When X does so, nine cents in utility generation costs are avoided for only eight cents (the five-cent utility program cost plus the three-cent customer cost)--the result is cost-effective. However, the utility loses 12 cents (the five-cent program cost plus the seven-cent loss in revenue) to avoid nine cents in production costs, and hence rates must

increase to make up the three-cent difference.[91]

It is striking that, although 12 cents is being spent to save electricity, which costs only 9 cents per kilowatt-hour to produce, the above scenario passes the DSM test for cost-effectiveness. That scenario is not an extreme case; it is typical of the economics-made-simple of DSMs.[92] Even Wirtshafter concedes that "if DSM is forced to satisfy strict, short-term cost justification, then it will never have the opportunity to develop fully." [93]

The conservation lobby argues, however, that the total costs and benefits of DSM must be measured before we make a decision about economic efficiency. Yet that is just what prices do: they measure the total costs--of capital, labor, energy, and other natural resources--of a good or service. Consumers then examine the price of the good and add to it other costs, such as opportunity costs, that are particular to their unique situation and compare them to the benefits they expect to derive from purchase of the good in question. Consumers are the best judges of what is cost-effective and what is not given their unique financial conditions, preferences, tastes, and personal circumstances.

DSM advocates support the total resource cost-effectiveness of their programs by marshaling purely hypothetical assertions about cost and benefits, even when the evidence from the real-world market points to contrary conclusions. A recent study commissioned by the Environmental Protection Agency underscored that fact by concluding that energy savings for DSM can be found only when total resource costs are disregarded. That study, commissioned from National Economic Research Associates, examined two of the purportedly most successful DSM programs in the nation: those of Massachusetts Electric Co. and Central Hudson Gas and Electric.[94] Although the utilities released rather sophisticated analyses showing that benefits outweighed costs by a factor of 2 or more, NERA found that upon closer examination, however, it becomes clear that costs and benefits reported by the two utilities are highly incomplete and bear little relationship to what most economists would regard as appropriate accounting for the costs and benefits to all relevant parties [emphasis in the original]. Both ignore some costs borne by the utilities (and ultimately their ratepayers or shareholders), and neither deals explicitly with the costs and benefits to the participants. Because their components are so incomplete, the reported benefit-cost ratios (or net savings) have little meaning.[95]

NERA's calculations indicated that Central Hudson's DSM programs cost ratepayers \$20.7 million and provided benefits of only \$9.2 million, for an overall net loss to ratepayers of \$11.5 million annually (\$7.4 million if the utility's optimistic projection of future units-avoided costs actually pans out). Similarly, Massachusetts Electric's DSM programs cost ratepayers \$192.6 million and provided benefits of only \$142.8 million, an annual net loss of almost \$50 million to the ratepayers.[96] Overall net costs to society were estimated at between \$5.7 million and \$9.7 million for Central Hudson's DSM programs (again, depending on projections of future avoided-unit costs) and \$29 million for those of Massachusetts Electric.[97]

Ruff appropriately challenges the DSM lobby to "prove that total resource costs are reduced by asking those who get the benefits to pay the (presumably lower) costs and see if they are pleased." [98] In other words, no subsidies.

Of course, conservationists argue that consumers (residential, commercial, and industrial) systematically underestimate the value of conservation measures for the various reasons described earlier.[99] Yet NERA concludes that the customers of Central Hudson and Massachusetts Electric, for example, would have to underestimate the benefits of energy efficiency by factors of 7 and 3, respectively, for program benefits to equal costs.[100] Misperceptions of the effectiveness of energy efficiency there may be, but of that magnitude? Such claims are particularly striking given that those two utilities devote almost 90 percent of their DSM expenditures to commercial and industrial customers. One can perhaps envision harried housewives or busy families overlooking the opportunities for energy savings in their homes, but businessmen concerned with the bottom line are very unlikely to have such extreme misperceptions. "Although it is clear that firms and households are highly imperfect at making estimates of costs and

benefits, it is hard to believe that they make the kinds of very large systematic errors that would be needed to explain away our results," says Albert Nichols. "If one believes that these large businesses make highly irrational choices about well-defined options like efficient lighting, presumably one should favor government programs to intervene in businesses' investment decisions about a huge array of issues, not just energy conservation."[101]

If bureaucratic planners could accurately judge the costs and benefits of goods and services without recourse to the marketplace, West Germans would have taken to the streets to demand an East German economic system.

The Rating Game: Discount and Interest Calculations

The conservation lobby does, however, make a compelling argument when it offers technology after technology that allegedly will "pay for itself" in energy savings after so many years. If a technology is capable of doing so, it is deemed cost-effective and qualifies for consideration under DSM programs. How quickly must a technology pay for itself in order to be deemed cost-effective? Lovins provides for an infinite pay-back time for investments, examining "long- term potential, however long it takes to achieve." [102] EPRI, on the other hand, variably limits pay-back time to qualify a technology as cost-effective.[103] The authors of America's Energy Choices require pay-back times of 14 years for residential and commercial technologies and 20 years for industrial technologies.[104]

Yet simple economic calculations of pay-back time are fraught with uncertainty, largely because assumptions about interest and discount rates can dramatically alter what we consider cost-effective. Nowhere in any of the estimates of pay-back time are interest rates even considered--they are assumed to be zero. Given the heavy front-end nature of those costs and the extremely long pay-back time for many of the technologies, interest is bound to dramatically restrict what can be considered cost-efficient and increase projected conservation costs.

Similarly, there is the question of discount rates. Both EPRI and Lovins assume a real discount rate of 5 percent. The authors of America's Energy Choices go even further and use a 3 percent discount rate. Those "social discount rates" supposedly are preferable to private discount rates because of imperfections in the capital markets (credit restrictions and limited availability of capital are the examples given), differing perceptions of risk from private and public perspectives, and "different values placed on future consumption." America's Energy Choices argues that "society may prefer to treat consumption for all generations as equally valuable, in contrast with individuals, who may value current consumption more highly than future consumption." [105]

There is little reason, however, to believe that free markets give scant attention to the needs of future generations. As discussed earlier, the profit motive ensures that people will act to ensure the well-being of generations to come. Government planners and regulators, however, have a notorious disregard for future generations; the budget deficit, the savings-and-loan fiasco, and numerous other examples prove the point.

There is no better "social discount rate" than the rate arrived at by millions of transactions among millions of savers and borrowers.[106] As was noted earlier, the discount rate used by private consumers investing in energy conservation can be as high as 20 percent. According to Douglas Houston:

The riskiness (and resulting high discount rates) applied by households means that consumers interpret DSM programs to be less beneficial than do the planners. When a DSM program's subsidies overcome a consumer's reticence to invest, this merely replaces the judgement of the consumer with the judgement of the planner far removed from the specific problems faced in this household. Since no information is added to the decision process, it cannot be said that DSM programs provide information that reduces uncertainty about the investment. Therefore, the standard practice of applying low "social" rates of discount to DSM investments amounts to a disavowal that these costs and risks involved are real, a denial that the realworld concerns of individuals matter.[107]

The discount rate used is important because it has a tremendous impact on the projected costs and savings of investments in energy efficiency. The Oak Ridge National Laboratory, for example, estimates that an ambitious national DSM program using a 5 percent discount rate could save \$205 billion over the next 20 years. Yet use of a real world 20 percent discount rate yields a net savings of only \$86 billion over the next 20 years.[108] Similarly, the authors of America's Energy Choices estimate that their scenario for aggressive conservation programs would yield, at a 3 percent discount rate, \$2.3 trillion in savings over the next 40 years. Even shifting the discount rate to 7 percent, the typical value used for most private-sector investments (the pretax return on investment), reduces savings to \$560 billion, only about one-quarter the savings estimated using a 3 percent discount rate.[109] Those adjusted savings are still significant, but they are from one-half to one-quarter the size alleged by DSM proponents. Even assuming that all the assertions of DSM effectiveness are accurate, the savings potential is still but a fraction of that alleged by the conservation lobby.

Shooting in the Economic Dark

In addition to the micro- and macroeconomic distortions caused by subsidies (e.g., free-rider problems, corresponding overuse of competing resource inputs, competitive inequities, none of which are considered in the calculation of DSM costs), there are a number of other dubious assumptions built into the estimates of the cost savings of DSM.

The aggregate costs of DSM and energy-conservation programs estimated by EPRI and Lovins ignore direct administrative costs. Program design, market research, advertising, bid development and review, inspections for quality control, recruitment, staff training, metering, accounting, evaluation, periodic reporting, legal fees, office space, and the obvious high cost of personnel and consultant services are all rolled into utility DSM costs. A review of studies available on current utility DSM programs indicates that those costs are extremely high--they typically account for 20 to 50 percent of total program costs.[110] MIT Professors Paul Joskow and Donald Marron found administrative costs to be even higher, ranging from 70 to 107 percent of direct measured costs of the utilities they examined.[111]

Energy cost savings estimated by both EPRI and Lovins include not only reductions in energy use but the avoided cost of building new generation capacity. Those estimates of avoided costs, however, assume that the marginal cost of constructing new capacity will be 5 cents per kilowatt-hour. Although they assume rapid technological advances in efficiency, EPRI and Lovins also assume that electricity production technologies and efficiencies will remain stagnant. That is hardly realistic.

Finally, there is the question of the specific cost estimates for each technology that went into the aggregate savings projections used by EPRI and Lovins. As noted earlier by the Oak Ridge Laboratory, "Information regarding the technical and economic viability of such [efficient energy] technologies under full-scale, actual usage conditions is often scarce." Moreover, an energy supply curve, showing which technologies are cost effective at various energy prices "for most technologies, . . . is not available." [112] In other words, the various cost and savings projections of EPRI and Lovins are little more than speculation. (113

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Since so little is known about the cost and savings potential of many advanced energy-saving technologies, it comes as something of a shock to hear Lovins state with such certainty that "the long-run supply curve for electricity [savings] is so flat and slopes so gently that the market-clearing price [of electricity] will never be high enough to justify building more central thermal power stations." [114] Economist Benjamin Zycher asks pointedly:

How can anyone know the slope of any cost or supply function for technologies that Lovins claims are now newly emerging and which are continuing to evolve rapidly? Even for the most mundane and familiar goods and activities, cost functions are difficult to estimate econometrically. Functional forms are not known with any degree of certainty. Accounting

data obscure the more relevant parameters of opportunity cost. Statistical problems affect the reliability of estimates, often in ways that are subject only to guesswork. Despite all this, we have Lovins making confident assertions about cost functions for things that are newly arrived and that have yet to be invented![115]

Likewise, Lovins's "Competitek" data base, which he cites in support of his aggregate energy-saving claims, "seeks . . . adequate accuracy more than utterly rigorous completeness in every detail." [116] Zycher points out that "since 'adequate' is not defined, errors, omissions, and other violations of rigor can fit nicely within Competitek's methodology." [117]

Since we are dealing with presumably "educated" guesses about costs and benefits, how confident can we be about the general accuracy of projections? A cursory examination of Lovins's published writings and public testimony provides little reason to trust the figures so often bandied about by the conservation lobby. Analysts who have double-checked Lovins's facts and figures on the availability, performance, and cost of technologies have found that his work is replete with misleading conclusions, errors in calculation, factual inaccuracies, and wildly speculative assumptions.[118] Zycher concludes bluntly that "Lovins has distorted and/or fabricated virtually all of his 'evidence.' "[119] The EPRI report and America's Energy Choices share many if not most of those flaws.

The Failure of Central Planning

Analysts who have examined conservation programs closely have found that actual energy gains have been but a fraction of what had been expected. An examination of three energy-conservation programs administered by the Bonneville Power Administration indicated that observed savings were only 50 percent of what had been expected by the program administrators.[120] Six demand-side management programs administered by Central Maine Power were found to produce only 27 percent of the energy savings expected at triple the cost projected by the utility, making the programs far more expensive than the marginal cost of new generation capacity.[121] Similarly, homes participating in a refrigerator rebate program administered by Wisconsin Electric Power Co. actually increased their energy consumption.[122] An examination of conservation programs administered by the San Diego Gas and Electric Co. found that actual electricity savings were 50 to 80 percent of the estimated savings and gas savings were less than 50 percent of the estimates.[123]

Moreover, those findings are not aberrations; they are typical of the actual performance of utility-sponsored energy-conservation programs. Economist Phoebe Caner examined 34 DSM programs recently and found that actual savings for 27 of those programs were less than projected by the managing utility. More than half of those programs yielded less than 50 percent of projected savings.[124] Likewise, Steven Nadel of the American Council for an Energy Efficient Economy (an active proponent of DSM) and Kenneth Keating of the Bonneville Power Administration examined 37 separate DSM programs and found that retrofit, residential appliance, and lighting programs yielded substantially less energy savings than had been projected. Residential retrofits, typically involving energy audits and weatherization, saved 52 percent less energy than had been estimated by the various utilities; residential appliance programs likewise saved 57 percent less than estimated. And commercial and industrial lighting programs saved 43 percent less energy than projected.[125]

Studies to date indicate that utilities that have instituted DSM programs have experienced no reduction in customer electricity demand relative to utilities that have yet to jump on the DSM bandwagon. Central Maine Power, for example, has experienced a slight increase in residential consumer demand for electricity per meter over the past 10 years despite its aggressive DSM efforts. By contrast, Green Mountain Power of Vermont has experienced a slight reduction in consumer demand per meter without having adopted any major DSM program until recently.[126] The patterns of residential customers' kilowatt-hour usage exhibit similar fluctuations for both utilities, indicating the similarities in regional climate and demographic profiles of their respective consumers. Likewise, Osage Municipal Utilities in Iowa (OMU), a utility much heralded for its aggressive DSM program, has experienced a significant

decline in natural gas consumption per meter over the past 20 years, but that decline has been offset by an even greater increase in per capita consumption of electricity. Yet even OMU's decrease in natural gas use per residential meter is reflected by similar trends experienced by other Iowa utilities (Iowa Southern, Iowa-Illinois, and Midwest Resources) that have not embarked on the advanced DSM path blazed by OMU.[127]

Clearly, if DSM programs were successful in reducing demand, evidence of that fact could be found by examining the bottom-line demand figures of utilities. Yet virtually all the utilities participating in DSM today fail to show any reductions in consumer demand per meter beyond those experienced by non-DSM utilities.

Studies that purport to show successful DSM programs invariably report calculated savings rather than actual results based on extensive monitoring, fail to adjust for savings in consumption that occurred independent of the program (such as price variation and weather changes), ignore the impact of free riders who would have invested in energy efficiencies regardless of the program's existence, fail to use control groups to ascertain legitimate comparisons of behavior, or incompletely total resource costs.[128] Consequently, the General Accounting Office concluded that "regulators in states we selected expressed limited confidence in the accuracy of a utility's estimates of demand-side management electricity savings." [129]

There are many additional reasons for the failure of centrally planned conservation programs. First, programs directed at premature replacement of relatively energy-inefficient machinery and appliances are doomed to fail because of what we might call "the refrigerator effect." When an old refrigerator is replaced by a new energy-efficient refrigerator, consumers often put the old appliance down in the basement to serve as a reserve storage space for food and beverages. Thus, rebates or subsidized sales of appliances to consumers often result in increased energy use.

Second, according to analyst Kent Anderson, "engineering models simply exaggerate the effectiveness of conservation devices in practice. This may reflect the practical problems that occur in installing and using these devices in real-life circumstances." [130] Synergic Resources Corporation (SRC), for example, recently examined 16 types of commercial buildings that had participated in the Bonneville Power Administration's pilot DSM program. After extensive investigation, SRC found that half of the participants had abandoned energy-efficiency measures instituted under the program, claiming for the most part that design and performance problems were the chief reasons.[131]

As noted by NERA's Albert Nichols:

Estimates of the savings from DSM programs are plagued by many difficulties that limit their accuracy. Estimates based on engineering analysis appear to be especially unreliable, particularly when behavioral factors (such as free ridership or snapback) are important. In many cases, engineering estimates also suffer from inaccurate assumptions about such basic factors as hours of operation; not surprisingly, these kinds of errors tend to be most severe when the calculations rely upon generalized assumptions rather than site-specific estimates.

The evidence available suggests that not only are engineering estimates often inaccurate, they generally have a strong upward bias. Some of the bias results from the fact that most engineering calculations make no adjustments for free riders, but even if the free-rider issue is eliminated, there appears to be a tendency towards overestimation.[132]

Compounding that problem, of course, is the speculative nature of many of the cost-savings estimates being relied on in the first place, as was mentioned earlier.

Third, most energy-saving projections are based on the profile of an average user: the statistically "average" house, manufacturing plant, or appliance. Consumers who use energy most intensively are more likely to already have efficient equipment than are smaller energy consumers. Thus, using data based on

the "average" consumer in a user category will probably overstate the amount of energy savings possible under a given program.

"Negawatts" vs. "Ecowatts"

Paradoxically, the energy-efficiency programs endorsed by the conservation lobby may actually act to increase energy use and reduce efficiency gains that would otherwise occur. That is because those programs generally address the one form of energy that has been responsible for most of the efficiency gains experienced over the past 20--electricity.

"Electricity, being the costliest form of energy, is the most lucrative form [of energy] to save," argues Lovins.[133] Nothing, however, could be further from the truth. A recent report issued by Science Concepts, Inc., points out that the myth that electricity is wasteful results from ignoring the efficiency with which fuels are used in the marketplace. For example, the best power plants convert 40 percent of the energy consumed into electricity. However, electric motors convert 90 percent of electricity into useful motion. By comparison, even the most efficient automobile converts less than 20 percent of its fuel energy into the drive shaft. In other words, the efficiency with which electricity can be used more than offsets the inefficiency of making electricity. Meanwhile, the efficiency with which fossil fuels can be used is remarkably low in most applications and, for reasons of fundamental physics, inherently limited.[134]

Thus, the electrification of society is not a symptom of energy wastefulness but a crucial element of energy efficiency. For example, fax machines, powered by electricity, have substituted for the much more energy intensive practice of transporting mail via the postal service. Laser cutting tools have reduced the number of product rejects and the amount of cutting waste that would require energy to replace. Microwave ovens are far more efficient than gas stoves. It is no coincidence that since 1973 electricity generation has increased by 50 percent while energy efficiency has actually improved by 40 percent when measured against GNP.[135]

The tremendous potential for further gains in energy efficiency through electrification--termed "ecowatts" by Science Concepts, Inc.--far outweighs the potential of "negawatts." Even using the dubious assumptions of EPRI, the full use of existing energy-conservation technology would save 220 gigawatts of energy a year. EPRI concedes that, even if restricted to only "cost-effective" conservation technology, total savings would drop to 69 gigawatts annually. On the other hand, according to Science Concepts, the full use of existing electrical technology--"ecowatts"-- could save a total of 970 gigawatts annually, 300 gigawatts of which would be cost-effective.[136]

Subsidizing or mandating energy-conservation technologies will stymie, not advance, continuing gains in energy efficiency. As Science Concepts points out:

Programs devoted to achieving energy efficiency consume capital. Regulators can provide an artificial environment in which investments in energy efficiency are more fiscally attractive to businesses. If this reduces the capital available for the installation of more productive equipment, the overall long-term effect will be to delay fundamental technology progress and its associated improvements in energy use and environmental quality.[137]

The Danger of Coercion

Energy policy debates often serve as cover for hidden agendas concerning how life should be lived, resources used, and incomes distributed. Markets are distrusted by the conservation lobby because they allow choices that the conservationists would restrict. Control over the lifeblood of modern society--energy--would transfer tremendous power to the state at the expense of the individual.

The past statements of many of the leaders of the conservation lobby call into question their true motivation in this debate. "It would be little short of disastrous for us to discover a source of clean, cheap, abundant energy because of what we might do with it. We ought to be looking for energy sources that

don't give us the excesses of concentrated energy with which we could do mischief to the earth and each other," says Lovins.[138] Professor Paul Ehrlich argues that "giving society cheap, abundant energy . . . would be the equivalent of giving an idiot child a machine gun." [139] The universal alarm expressed by the conservation lobby at the possibility of cold fusion betrayed an anti-growth mentality inconsistent with their public allegiance to "negawatts" as a cheap, affordable, and painless energy source. Jeremy Rifkin, for example, cried that the discovery of cold fusion would be "the worst thing that could happen to our planet." [140]

America is not running out of energy. The free market has provided and will continue to provide for energy efficiency. The invisible hand of the market is far superior to the dead hand of central planning. By eliminating the remaining barriers to energy exploration, generation, distribution, and use, America will ensure that affordable and abundant energy is available for future generations. By reducing the size of government, we can provide for energy efficiency gains and technological advances that are undreamed of today without sacrificing the freedom to live as we choose.

Notes

[1] Martha Hamilton and Warren Brown, "Conservation Complacency in the U.S.," Washington Post, August 12, 1990, p. A26.

[2] The Real Story, Cable News and Business Network, December 6, 1991.

[3] Morris Adelman, "Oil Fallacies," Foreign Policy 82 (Spring 1991): 10.

[4] "Energy and the Environment: A Power for Good, a Power for Ill," The Economist, August 31, 1991, Survey, p. 5.

[5] Michael Canes, "Oil's Tenacious Lock on Health of Economy," Forum for Applied Research and Public Policy 7, no. 1 (Spring 1992): 18.

[6] "Energy, Economy, and the Environment: A Balanced Policy for the 1990s," Hudson Institute, Indianapolis, September 1991, p. 19.

[7] James Bennett and Thomas J. DiLorenzo, Official Lies: How Washington Misleads Us (Alexandria, Va.: Groom Books, 1992), pp. 142-43.

[8] U.S. Congress, House of Representatives, Presidential Energy Program, Hearings before the House Subcommittee on Energy and Power on the implications of the president's proposals in the Energy Independence Act of 1975, 94th Cong., 1st sess., 1975, p. 643.

[9] Ibid.

[10] Ibid.

[11] "Fear Is Expressed of U.S. Oil Scarcity," New York Times, June 11, 1950, p. 49.

[12] Richard McKenzie, "The Sense and Nonsense of Energy Conservation," American Petroleum Institute, Washington, July 1991, p. 12.

[13] "Energy and the Environment."

[14] Michael Lynch, "Future Oil Supplies: Is Wolf Really at Door?" Forum for Applied Research and Public Policy 7, no. 1 (Spring 1992): 25.

[15] Ibid.

[16] Daniel Yergin, "Gasoline and the American People," Cambridge Energy Research Associates, Cambridge, Mass., June 1991, p. 15.

[17] Ibid., p. 17.

[18] F. A. Hayek, *The Constitution of Liberty* (Chicago: University of Chicago Press, 1960), pp. 369-70.

[19] Amory Lovins, "Balancing Energy Supply and Demand," in *Meeting the Energy Challenges of the 1990s: Experts Define the Key Policy Issues*, GAO/RCED-91-66 (Washington: GAO, March 1991), p. 40.

[20] Likewise, the average European household has 50 to 80 percent less living space than its American counterpart. "Energy and the Environment," p. 12.

[21] T. R. Reid, "Japan's Housing: Pricey, Chilly, and Toilet-Poor," *Washington Post*, March 4, 1991, p. A9.

[22] Thomas J. DiLorenzo, "Japanese Mercantilism," *The Enterpriser*, August 1991, p. 7.

[23] If Japanese energy use is compared to that of New York City, a comparison which is more appropriate given population density, one finds little difference between the two in terms of energy efficiency. "Energy, Economy, and the Environment," p. 19. Although the U.S. population is 5 to 10 times less concentrated than that of many of the G-7 nations, the amount of energy used for transportation is only 5 to 10 percent greater than in those countries. That is all the more impressive when one considers that the distance between population centers makes mass transit less practical for the United States than for our G-7 counterparts. See "Energy Policy: What Now?" *Nuclear Industry* (First Quarter 1991): 39-40.

[24] U.S. Department of Energy, *National Energy Strategy*, 1st ed. (Washington: Government Publishing Office, February 1991), p. 24.

[25] When industrial energy use is measured in terms of energy intensity per unit of non-raw-materials manufacturing, there is little difference in energy use among the G-7 nations. See "Energy Policy."

[26] Ibid. Further evidence of the fallacious nature of per capita energy comparisons appears when one considers the fact that energy use varies greatly from state to state; some states use 4.5 times more energy than others. The biggest U.S. energy users are Alaska, Wyoming, Louisiana, Texas, and North Dakota. Does that mean that residents of those states are more "wasteful" than others? Of course not. It reflects the fact that those states have low population density and are home to industries that by their very nature require large amounts of energy to operate. Roughly two-thirds of the energy those states consume is devoted to their respective industrial sectors. U.S. Department of Energy, p. 26.

[27] "Energy, Economy, and the Environment," p. 5.

[28] Ibid.

[29] "For the Record," *Washington Post*, June 18, 1991, p. A20.

[30] Matthew Wald, "Gulf Victory: An Energy Defeat?" *New York Times*, June 18, 1991, p. D9.

[31] Hamilton and Brown, p. A1.

[32] U.S. Department of Energy, p. 76. This figure under-estimates actual efficiency gains by failing to account for the indirect energy savings stemming from electrification. The use of fax machines, for example, reduces the energy demands of traditional mail transportation. Laser cutting produces less waste material and reduces the number of rejected products. Dozens of examples such as those are not normally calculated or accounted for in energy conservation models or programs.

[33] Ibid., p. 55.

[34] "U.S. Energy Efficiency," Response no. 451, American Petroleum Institute, Washington, October 3, 1990.

[35] H. Jane Lehman, "Interest in Energy Efficiency Expected to Heat Up," Washington Post, August 25, 1990, p. E1.

[36] Mikhail Bernstam, *The Wealth of Nations and the Environment*, Occasional Paper no. 45 (London: Institute for Economic Affairs, January 1991), p. 27.

[37] "Energy Security White Paper: U.S. Decisions and Global Trends," American Petroleum Institute, Washington, 1988, pp. 83-85.

[38] U.S. Department of Energy, p. 2.

[39] Douglas Bohi, *Energy Price Shocks and Macroeconomic Performance* (Washington: Resources for the Future, 1989).

[40] Douglas Bohi, "Thinking through Energy Security Issues," *American Enterprise*, September-October 1991, p. 34.

[41] Ibid., p. 33.

[42] "Conservation Could Help Reduce Acid Rain Control Costs, Study Says," Bureau of National Affairs Environmental Reporter, May 5, 1989, p. 11.

[43] Dixy Lee Ray and Lou Guzzo, *Trashing the Planet* (Washington: Regnery Gateway, 1990), pp. 37-38.

[44] Environmental Protection Agency, Office of Policy, Planning, and Evaluation, *Environmental Investments: The Cost of a Clean Environment: A Summary*, EPA-230-12-90-084 (Washington: EPA, December 1990), p. 2-1.

[45] See, for example, Michael Hazilla and Raymond Kopp, "Social Cost of Environmental Quality Regulations: A General Equilibrium Analysis," *Journal of Political Economy* 98, no. 4 (1990): 853; William Niskanen, "The Total Cost of Regulation?" *Regulation* 14, no. 3 (Summer 1991): 23-25; and William Niskanen, "The Costs of Regulation (continued)," *Regulation* 15, no. 2 (Spring 1992): 25-26.

[46] Roy Cordato, "Assessing the Case for Energy Taxes," Paper presented at Cato Institute conference "National Energy Strategy: Markets or Mandates?" Washington, January 16, 1992.

[47] See generally Terry Anderson and Donald Leal, *Free Market Environmentalism* (San Francisco: Westview, 1991); and Cato Symposium on Pollution, *Cato Journal* 2, no. 1 (Spring 1982).

[48] Bernstam, p. 24.

[49] This roster of alleged market failures is drawn largely from arguments found in Roger Carlsmith et al., "Energy Efficiency: How Far Can We Go?" ORNL/TM-11441, Oak Ridge National Laboratory, January 1990, pp. 26-30; and Alliance to Save Energy et al., *America's Energy Choices: Investing in a Strong Economy and a Clean Environment* (Cambridge, Mass.: Union of Concerned Scientists, 1991).

[50] For a more complete examination of this issue, see *The Theory of Market Failure*, ed. Tyler Cowen (Fairfax, Va.: George Mason University Press, 1988).

[51] Hethie Parmesano and William Bridgman, "The Role of Nature and Marginal and Avoided Costs in Ratemaking: A Survey," Working Paper no. 15, National Economic Research Associates, Inc., White

Plains, N.Y., February 1992.

- [52] California Public Utilities Commission and California Energy Commission, "Standard Practice Manual: Economic Analysis of Demand-Side Management Programs," Staff report, December 1987, p. 3.
- [53] See generally *Electric Power: Deregulation and the Public Interest*, ed. John Moorhouse (San Francisco: Pacific Research Institute for Public Policy, 1986).
- [54] "Still Not Serious about Energy," *Washington Post*, February 12, 1991, p. A18.
- [55] Alan Reynolds, "Malign Neglect," *Forbes*, December 10, 1990, p. 318.
- [56] Amory Lovins, "Invited Comments on Kenneth W. Costello's Article 'Should Utilities Promote Energy Conservation?'" *Electric Potential*, March-April 1986, p. 4.
- [57] Albert Nichols, "How Well Do Market Failures Support the Need for Demand Side Management?" National Economic Research Associates, Inc., White Plains, N.Y., 1992, pp. 21-24.
- [58] *Ibid.*, pp. 21-22.
- [59] Lewis Perl, rebuttal testimony before the Florida Public Service Commission, Docket no. 910883-EI, November 20, 1991, p. 27.
- [60] Douglas Houston, "Demand-Side Management: Conservation for Conservation's Sake?" Draft monograph, Institute for Energy Research, Houston, October 1991, p. 9; and Nichols, "How Well Do Market Failures Support the Need for Demand Side Management?" pp. 24-25.
- [61] William Laffer, "The Effect of Taxes and Regulations on Time Horizons," Heritage Foundation, Washington, July 31, 1991, p. 2.
- [62] The lack of an oil depletion allowance (every other industry is allowed capital depletion), a 24 percent tax on "intangible drilling costs" (only the petroleum industry faces a tax on normal business expenses), the "Superfund" tax, and gasoline taxes are all unique tax penalties imposed on no other industry in America (except that the Superfund tax is also applied to the closely related chemical industry).
- [63] Benjamin Zycher, "The Theoretical and Empirical Fantasies of Amory Lovins," Paper presented at the annual meeting of the Western Economic Association International, Seattle, June 29-July 3, 1991, p. 5.
- [64] This point is underscored strongly by Douglas Koplow of the Harvard Business School in an upcoming study for the Alliance to Save Energy titled "Federal Subsidies to the U.S. Energy Sector in FY 1989."
- [65] Alliance to Save Energy et al., p. 24.
- [66] Richard Pindyck, "Inter-fuel Substitution and the Industrial Demand for Energy: An International Comparison," *Review of Economics and Statistics*, May 1979, pp. 169-79.
- [67] "Energy Efficiency," p. 29.
- [68] *Ibid.*
- [69] *Ibid.*, p. 30.
- [70] Alliance to Save Energy et al., p. 24.
- [71] This holds true even for rental markets that are, according to conservationists, less likely to reflect

energy efficiency in rents, which in turn leads to underinvestment in energy efficiency. Nichols, "How Well Do Market Failures Support the Need for Demand Side Management?" pp. 26-29.

[72] Matthew Wald, "Saving Energy: Still a Tough Sell," New York Times, March 30, 1991, p. 25.

[73] Nichols, "How Well Do Market Failures Support the Need for Demand Side Management?" p. 30.

[74] Written statement of the Electricity Consumers Resource Council to the House Banking Subcommittee on Economic Stabilization, November 6, 1991, p. 3.

[75] Lawrence Prete et al., "Electric Utility Demand-Side Management," Electric Power Monthly, April 1992, pp. 19-33.

[76] Robert Wirtshafter, "The Dramatic Growth in DSM: Too Much, Too Soon?" Electricity Journal, November 1992, pp. 36-46.

[77] Ibid., p. 39.

[78] F. A. Hayek, Individualism and Economic Order (South Bend, Ind.: Regnery Gateway, 1948), "The Use of Knowledge in Society," pp. 77-91.

[79] Larry Ruff, "Equity v. Efficiency: Getting DSM Pricing Right," Electricity Journal, November 1992, pp. 27, 29.

[80] Virginia Kreitler, "On Customer Choice and Free Rider ship in Utility Programs," in Energy Program Evaluation: Uses, Methods, and Results, Proceedings of the 1991 International Energy Program Evaluation Conference, Chicago, August 21-23, 1991, p. 304.

[81] James Clarkson, Southwire Company, Testimony before the Georgia Public Service Commission, June 1, 1992, p. 7.

[82] Quoted in Written statement of the Electricity Consumers Resource Council, p. 20.

[83] Ibid., p. 4.

[84] John Hughes and Barbara Brenner, "DSM: When Should Industrials Just Say No?" Abstract, forthcoming in the Proceedings of the 6th National Demand-Side Management Conference, March 24-26, 1992, Miami Beach, p. 6.

[85] "State Lawmakers Eye Plan to Ban Utilities from Servicing Appliances," Electric Power Alert, April 15, 1992, p. 32.

[86] Bernstam, p. 49.

[87] Zycher, p. 7.

[88] Amory Lovins et al., "Efficient Use of Electricity," Scientific American, September 1990, pp. 65-74.

[89] General Accounting Office, Electricity Supply: Utility Demand-Side Management Programs Can Reduce Electricity Use, GAO/ RCED-92-13 (Washington: GAO, October 1991), p. 12.

[90] Alliance to Save Energy et al., pp. 45-49.

[91] Larry Ruff, "Least-Cost Planning and Demand-Side Management: Six Common Fallacies and One Simple Truth," Public Utilities Fortnightly, April 28, 1988, p. 23.

[92] For a more thorough discussion of the economic fallacies surrounding least-cost planning, see Paul Joskow, "Should Conservation Proposals Be Included in Competitive Bidding Programs?" in *Competition in Electricity: New Markets and New Structures*, ed. James Plummer and Susan Troppman (Palo Alto: QED Research, Inc., and Public Utilities Reports, Inc., 1990), pp. 241-52.

[93] Wirtshafter, p. 45. DSM would "satisfy strict, shortterm cost justification" if the subsidy were restricted to those cases in which marginal electricity costs exceeded average costs, and then they would be limited to only the difference between price and marginal cost. In the example provided by Ruff ("Least Cost Planning"), for instance, if the marginal cost of producing another kilowatt-hour of electricity is 9 cents, but the price to the consumer is only 7 cents, it is worth up to 2 cents (not 7 cents!) to induce that consumer to reduce consumption by a kilowatt-hour. See Joskow and Nichols, p. 9.

[94] As the NERA notes: "It is clear that in some ways the utilities examined in this study are unrepresentative. However, for the most part, these unrepresentative characteristics seem likely to increase the attractiveness of DSM for these utilities relative to others. Both utilities are investor-owned and have relatively high costs; most proponents of DSM believe it is most attractive when supply-side options are expensive. Both are located in states that have been requiring DSM programs for a relatively long time, so that both are likely to be relatively experienced, and are unlikely to have unusually high start-up costs. Both utilities have focussed their efforts on the commercial/industrial sector, emphasizing lighting, which is widely considered the most cost-effective type of DSM effort. Moreover, both have sponsored extensive evaluation efforts. Taken together, all of these factors suggest the programs considered here are likely to be substantially better than average." Albert Nichols, "Estimating the Net Benefits of Demand-Side Management Programs Based on Limited Information," National Economic Research Associates, Inc., revised draft, prepared for Energy Policy Branch, Office of Policy, Planning, and Evaluation, Environmental Protection Agency, January 25, 1993, p. 38.

[95] Ibid., p. 3.

[96] Ibid., pp. 23, 25.

[97] Ibid., pp. 26-27, 29.

[98] Ruff, "Equity v. Efficiency," p. 34.

[99] Studies such as the NERA's rely on demand curves to measure the net benefits of conservation measures to DSM program participants. That technique is not unique to DSM studies; it is a standard, accepted tool for economic analysis.

[100] Nichols, "Estimating the Net Benefits," pp. 32-33.

[101] Ibid., p. 35.

[102] Lovins, "Balancing Energy Supply and Demand," pp. 42-47.

[103] Lovins et al.

[104] Alliance to Save Energy et al., p. 82.

[105] Ibid., p. 35.

[106] Ironically, the conservation lobby has long opposed the use of similarly low discount rates by the Army Corps of Engineers in justifying dam construction. The corps, like the conservation lobby, argues that the social rate of discount is lower than that revealed in the marketplace. Consistency is apparently not the conservation lobby's strong suit. See Houston, pp. 9-10.

[107] Ibid., p. 10.

[108] Ibid., p. 20.

[109] Alliance to Save Energy et al., p. 49.

[110] Kent Anderson, "Key Issues in Least-Cost Planning," Working Paper no. 10, National Economic Research Associates, Los Angeles, August 1991, p. 9.

[111] Paul Joskow and Donald Marron, "What Does a Negawatt Really Cost?" MIT Economics Department Discussion Paper no. 596, December 1991, pp. 28-31.

[112] Carlsmith et al.

[113] Alliance to Save Energy et al., p. 4.

[114] Amory Lovins, "Saving Gigabucks with Negawatts," Public Utilities Fortnightly, March 21, 1985, p. 21.

[115] Zycher, pp. 9-10.

[116] Ibid., p. 20.

[117] Ibid.

[118] Zycher, pp. 22-39. See also J. M. Gallagher, "Lovins' Data Source," Science, December 22, 1978, pp. 1242-43; and P. L. Olgard, An Experience from the Energy Debate: Mr. Lovins and Manipulations, Technical University of Denmark, Department of Electrophysics, June 1978; cited in Petr Beckmann, Why Soft Energy Will Not Be America's Energy Salvation (Boulder: Golem, 1979), p. 9. The Illinois Commerce Commission concluded after hearings in 1985, for example, that "the evidence reveals that Mr. Lovins has underestimated the total costs of his proposed energy savings. . . . In large measure, Mr. Lovins' testimony was not based on actual conservation experienced in the Edison service territory. . . . The Commission is not persuaded of the accuracy of Mr. Lovins' estimates of the cost of energy technologies." Cited in Kenneth Costello, "The Debate Continues," Electric Potential, July-August 1986, p. 15.

[119] Zycher, p. 39.

[120] Anderson, p. 10.

[121] Ibid., p. 11.

[122] Eric Rogers, "Evaluation of a Residential Appliance Rebate Program Using Billing Record Analysis," Energy Program Evaluation: Conservation and Resource Management: Proceedings of the August 23-25, 1989, Conference (Argonne, Ill.: Argonne National Laboratory, 1990), pp. 263-69.

[123] Frederick Sebold and Eric Fox, "Realized Savings from Residential Conservation Activity," Energy Journal, April 1985, pp. 73-85.

[124] Phoebe Caner, "The Drive to Verify Energy Savings," Electricity Journal, May 1992, p. 45.

[125] Steven Nadel and Kenneth Keating, "Engineering Estimates v. Impact Evaluation Results: How Do They Compare and Why?" Energy Program Evaluation: Use, Methods, and Results, 1991; cited in Nichols, "How Much Energy Do DSM Programs Really Save," pp. 4-6.

Nadel and Keating did find that 11 miscellaneous commercial, industrial, and agricultural programs saved

only 11 percent less energy than was projected, yet those 11 programs were fairly unique and specialized efforts tailored to particular facilities. Of course, engineering estimates of savings are going to be more accurate in those cases, but the very uniqueness of those programs makes it more difficult to define appropriate control groups for impact evaluations. Nadel and Keating, in fact, were not able to assemble control groups to more accurately measure energy savings, so their findings with regard to those 11 programs are a bit suspect.

[126] Andrew Rudin, Presentation before the Florida Public Service Commission, August 17, 1992, p. 6.

[127] Ibid., p. 9.

[128] See generally Nichols, "Estimating the Net Benefits of Demand-Side Management Programs Based on Limited Information"; idem, "How Much Energy Do DSM Programs Really Save"; and Anderson, pp. 9-12.

[129] General Accounting Office, Electricity Supply: Utility Demand-Side Management Programs Can Reduce Electricity Use, GAO/RCED-92-13(Washington: GAO, October 1991), p. 29.

[130] Anderson, p. 8.

[131] Rudin, "DSM--An Exorbitant Free Ride," p. 5.

[132] Nichols, "How Much Energy Do DSM Programs Really Save," p. 13.

[133] Amory Lovins, "Abating Air Pollution at Negative Cost via Energy Efficiency," Journal of the Air and Waste Management Association, November 1989, p. 1432.

[134] Science Concepts, Inc., Ecowatts: The Clean Switch, (Bethesda, Md.: Science Concepts, Inc., April 1991), p. 4.

[135] Ibid., p. 8.

[136] Ibid., pp. 24-25.

[137] Ibid., p. 28

[138] Mother Jones, November-December 1977; cited in Beckmann, p. 12.

[139] "An Ecologist's Perspective on Nuclear Power," Federal Academy of Science Public Issue Report, May-June 1975; cited in Beckmann, p. 14.

[140] Paul Ciotti, "Fear of Fusion: What If It Works?" Los Angeles Times, April 19, 1989, p. 5-1.