ENERGY FACTS

Cooperative Extension Service
Michigan State University

Energy Fact Sheet No. 16 | Extension Bulletin E-1164 | February 1978

Energy Conservation—The Tax Approach

By
Judith L. Brown[1]
Lawrence W. Libby
Larry J. Connor

The Case for Conservation

The case for energy conservation is a solid one. We are more dependent on imported oil today than ever before. Over half our intake of petroleum products is supplied from abroad, yet our current consumption of petroleum products has reached an all-time high: more than 19 million barrels per day, at a cost of over $4 million per hour (8). The cost will undoubtedly rise.

The United States, with only 5% of the world's population, uses over 30% of world energy, or two times the combined energy total for Africa, the rest of North America, South America and Asia, except Japan (14, 15). Countries such as Sweden, Switzerland and West Germany maintain standards of living comparable to, if not higher than, our own while consuming only about 60% as much energy per capita (11). Meanwhile it is estimated that one half of all energy currently used by Americans is wasted (5). Of all the nations on earth, this country is the largest consumer and the greatest waster of energy.

In short, our energy consumption habits must be changed. How?

A logical first step is to trim our excessive margin of waste. We are simply using too much energy for everything. We can get the same output for less energy. Saving energy is considerably cheaper—and environmentally safer—than developing new supplies. Experts have suggested that the cost of saving a barrel of oil or the equivalent amount of electricity or natural gas is about half that of producing the same amount of new energy (2). The United States thus has near at hand a large source of safe, clean energy. All that is required to make it available is that we increase our energy efficiency.

Again, how?

For years now the media has been full of "the energy crisis." What is going to finally induce industry, business and the man on the street to conserve?

Taxation

The favorite tool of economists for adjusting the demand for a commodity to its supply is the pricing mechanism. The tune is familiar: at a higher price, the consumer purchases less and the producer produces more; when demand at a particular price is greater than suppliers are willing to provide at that price, the price rises. And vice versa. Price adjusts to equilibrate supply and demand.

This mechanism, however, has not been allowed to operate effectively in the energy market. Government regulation has held the price of oil and natural gas artificially low. The result: huge quantities of scarce but cheap energy resources have been consumed. At this artificial price, consumers are willing to buy more than suppliers are willing to provide.

How is the pricing mechanism to be brought back into play? An obvious solution would be to remove the price rigidities: deregulate. It would return energy price-setting to the market place and let price play its full role in matching supply and demand. There are numerous objections to deregulation—it would hurt some people worse than others. Institutional barriers to deregulation are formidable. They will not fall quickly. Our energy intake must be cut now. There is a need for policies that can be implemented quickly.

An alternative to deregulation is taxation and subsidization. Through energy taxes, the price of energy could be increased almost immediately. Selective taxes would permit us to "buy time" for making the long term structural and behavioral changes in our society that the energy outlook calls for. Yet taxes and subsidies would provide a flexible means of inducing conservation, resting the final decision of how to adjust energy consumption with the consumer. Both the individual who is willing to turn down the thermostat but unwilling to give up long Sunday afternoon drives in a big car, and the individual who is willing to drive a Honda but unwilling to wear a sweater indoors could satisfy their wishes, for a price. In the following discussion, some of the other merits and demerits of taxing energy are reviewed and some advantages and disadvantages of several frequently suggested tax policies are highlighted.

Energy taxes: merits and demerits

Energy taxes conserve energy by relying on the response of consumers to higher prices. Using taxes is somewhat different from using prices to encourage conservation. When the price of a good changes, it evokes both a supply and a demand response. When a good is taxed, there is only a demand response. The buyer pays

[1]Research Assistant, Associate Professor, Professor, respectively, Department of Agricultural Economics, Michigan State University.

more, but not to the supplier of the product. The adjustment of supply and demand is lopsided. A tax is in this sense less than ideal. To be justified as an alternative to price flexibility, an energy tax should have more going for it than simply the argument that it cuts demand.

Taxes and subsidies (or rebates) may be directed at specific energy conservation objectives. They may encourage shifting among energy types, increased use of certain energy sources, adoption of conservation practices by the owner of a home or business and the development or use of new energy sources like solar, geothermal or wind energy. Taxes can be used to selectively stifle a particular kind of energy demand in a way that the pricing mechanism usually cannot. For example, it is unnecessary to burn natural gas at 1000 degrees for boiling water to generate steam to heat homes to around 70 degrees. A tax on natural gas as a boiler fuel would constrain this wasteful use. Similarly, rebates like those proposed on small car purchases can be used to selectively encourage energy-efficient behavior.

There are obvious administrative problems in using specific taxes. The major question is how high a tax is needed? Will a 10 cent per gallon tax on gasoline really affect quantity consumed? Is 25 cents too much? Responses to such questions depend on who is being asked, of course. Some people are more able or willing to bear such a gasoline tax than other people. The same is true of other such tax proposals. The use of economic incentives to adjust human behavior in certain ways is always a risky enterprise.

A final function of an energy tax may be provision of information for the shopper. For example, an extra sales tax on appliances with pilot lights may remind the shopper that pilot lights are energy wasters. The purchaser of a new stove minus a pilot light will realize substantial savings in gas bills throughout the life of the stove. However, a history of cheap energy has meant that the life-long needs of a new appliance are seldom part of a decision to buy. The information value of a tax might have more effect than efficiency labeling or other verbal reminders to be energy-conscious in buying decisions.

Some Specific Tax Policies: Advantages and Disadvantages

Energy consumption in the U.S. breaks down very roughly into the following categories: residential, 25%; commercial, 15%; industrial, 35%; transportation, 25% (3). Let us now turn to a brief examination of some tax policies that have been suggested recently.

Tax incentives for the commercial sector are very few, perhaps because commercial enterprises are relatively sophisticated users of energy. They can be counted on to independently undertake conservation measures (such as energy audits on buildings) when they are economically justified. At any rate, commercial conservation measures will not be considered here. The other sectors will be dealt with sequentially.

Residential: During the '60's the U.S. population increased 11% and the number of households increased 17%. Our residential energy consumption rose by a whopping 50% (18). There were several major causes for this astonishing growth—larger homes, more and more second homes and greater use of appliances. With larger houses came larger heating and cooling requirements, particularly if window placement was not well planned and insulation was inadequate. Second homes involved increased transportation costs. Appliances became more energy-intensive as new features were added to new models. A frost-free refrigerator, for example, needs 60% more electricity than a manual defrost refrigerator. Other appliances, such as dishwashers, require not only electricity but also quantities of hot water.

Tax proposals in this area have tended to offer deductions for initiating conservation measures rather than to impose increased taxes for continuing wasteful habits. Proposals have also concentrated upon the energy characteristics of the building rather than of the appliances within the building. There have been several proposed tax deductions for the cost of home insulation, storm windows and installing solar space heating/cooling or hot water heating equipment, both at the national level and in Michigan (13, 19, 20).

President Carter's National Energy Plan includes insulation and solar heating tax credits for homeowners. The insulation credits amount to 25% for the first $800 spent and 15% for the next $1400. The solar credit equals 40% of the first $1000 spent and 25% of the next $6400 for a maximum credit of $2000; the credit would gradually decrease from 1977 to 1985. Amendments to Michigan property tax laws (Public Acts 135 and 293 of 1976) are an attempt to remove some of the disincentives a property tax normally imposes on housing improvements, and hence to reduce the initial cost of energy conservation. P.A. 135 provides for assessing qualified solar installations at one-half their value. P.A. 293 completely exempts insulation, storm windows and other expenditures up to $4000 from assessment for up to 3 years.

Just how effective these laws and others like them will be is questionable. It has been estimated that tax subsidies of at least 35% on solar equipment would be necessary to make the cost of solar energy comparable to that of commercially produced electricity (21). Solar installations normally cost around $10,000, in which case the tax credit proposed by President Carter would be only 20%. Policies designed to influence the investment decisions of individual consumers might also be considered in terms of the effect they have on the payback period. Studies show that a given policy must drastically shorten the payback period (to 3 or 4 years) before it is given a significant role in decision-making (15). For a typical solar installation costing $10,000 the payback period on the initial investment would be 40 years even with the P.A. 135 exemption (4). Savings on utility bills over that period must also be considered, of course, but even then the incentive is weak. A further difficulty with these laws has been that property taxes are an important source of revenue for local governments and the Michigan Tax Commission has resisted adjusting assessments according to P.A. 293.

A type of tax policy yet to be tried as an energy conservation measure deals with the number of people living within a dwelling unit. Research has shown that single family units are the least energy efficient dwelling type; apartment houses are considerably more efficient, because of the economies of size in larger heating systems (16). Taxes designed to encourage multi-family units and apartment living might be a good way to reduce residential energy consumption.

Energy taxes on appliances and machines are possible as well, but the relationship between the tax level and energy use is imprecise, at best. A tax could easily be imposed at the time of purchase. The rate could be based upon some estimate of the average energy consumption of the appliance under normal use. Returns to this tax alone would likely be modest. In concert with other conservation measures, though, it could make a difference.

Industrial: Consumers of industrial energy, like consumers of commercial energy, are highly sophisticated. There is one aspect of our economy, however, that lends conservation taxation a vital role in the industrial sector. The price of a good gives more weight to the short term than to the long term. No distinction is made between renewable and non-renewable resources. The price of coal, for example, reflects the costs incurred in extracting it from the ground but not the fact that the ultimate store

of coal is finite. In this sense, total endowments of natural resources are essentially treated as free goods. When an industry produces a good from a natural resource, it is basically consuming its capital stock, not a very sound practice in the long run, but one that is encouraged by current energy prices. The present tax system as well underwrites the use of virgin resources through such policies as favorable capital gains treatment of timber and depletion allowances on minerals.

Tax measures can provide economic incentives for private industry to reduce the depletion of non-renewable natural resources and encourage recycling and re-use. Representative Ullman's Energy Conservation and Conversion bill of 1975 addressed this issue (6). It proposed substantial recycling tax credits (100-200 %) for purchases of certain classes of recyclable wastes, and rapid amortization for solid waste burning equipment and electric power generating facilities not using petroleum or natural gas.

Cogeneration, the generation of electricity from steam produced as a by-product in many industries, is particularly promising. A study of the Dow Chemical Company estimated that cogeneration would produce half the electricity needed by U.S. industry by 1985, saving the equivalent of two to three million barrels of oil per day (15). The Energy Conservation and Conversion Act suggested as well a graduated tax on the industrial use of petroleum (from 11 cents per taxable unit in 1977 to 66 cents per taxable unit in 1982) and natural gas (from 3 cents per 1000 cubic feet in 1977 to 12 cents per 1000 cubic feet in 1980), coupled with a lifting of taxes on the sale of lubricating oil for re-refining.

What are some of the arguments against these industrial tax policies? One is that prices of scarce natural resources are going to rise anyway, promoting recycling and re-use without the tax breaks. The time element is the crucial consideration. Energy consumption tends to grow at a geometric rate, increasing by ever-larger amounts. In the United States, energy consumption grew by 2-3% in 1976 (9). Such geometric increases in consumption, relative to a diminishing supply, allow the market less and less response time. Can we depend on the price system to bring about these adjustments in time to avoid real crisis? Another argument against these industrial tax policies is that the taxes might produce a substantial windfall for companies that have not undertaken these changes in the past.

One of the largest sources of recyclable material is municipal solid waste (7). Few municipal government budgets permit the investments necessary for recycling. Rapid amortization schedules might stimulate the development of a very profitable industrial solid waste disposal industry.

Transportation: The transportation sector offers the broadest scope for conservation taxes. More than one fourth of U.S. energy consumption is for transportation, with autos accounting for the largest share. Auto registrations increased about 40% from 1960 to 1972. In the same time period total auto mileage increased 80% (18). New models have become less efficient than older models, with widespread adoption of energy-costly options such as air conditioning, power steering and automatic transmissions (and pollution control devices). The U.S. public is notoriously unwilling to adjust their travel preferences. The Ford Foundation Energy Policy Project (10) has suggested several viable possibilities for travel taxation, two of which are summarized below.

First, taxes might be increased on highway use. These would be relatively simple to rationalize, though not so easy to sell to voters. Use of the private auto involves many costs not paid directly by the user: the car pollutes; parking facilities are expensive; highways affect near-by property values, and the extra cost of wide highways to handle rush-hour traffic is subsidized by non-rush-hour traffic.

Highway taxes could be collected as tolls. The Highway Act of 1956 implicitly decided to forego tolls on the Interstate system but that could be changed. Properly graduated tolls could force heavier users of the roadways to shoulder a larger share of the costs.

Taxes on fuel might be increased. An effective gas tax could be implemented in several ways. The most straightforward would be to simply increase the current tax. The standby gasoline tax included in the National Energy Plan (20) calls for tax increments of 5 cents per gallon per year (that is, unless voluntary cut-backs are forthcoming). However, gasoline purchases are based on the price of gasoline relative to the prices of other goods and services. Consumer polls indicate that, relative to today's prices, a price of over $1 a gallon would be necessary before people start to adjust their habits (21). Tax hikes of 5 cents a year, remembering that other prices are simultaneously rising, are not going to do the trick. Alternatively or additionally, highway construction (financed by gasoline taxes) might be cut back. Expenditures on highway use appear to have at least as much effect on increasing highway use as gasoline tax has on decreasing it (10). Finally, income tax law allows a deduction of the state gasoline tax (7 cents per gallon in Michigan) on private nonbusiness use of automobiles. This deduction could be removed, or in fact reversed.

Taxes might also be focused directly on the automobile and specific parts of it. The Energy Conservation and Conversion Act (6) proposed several, including taxes on auto air conditioners (which reduce mileage up to 10% (3)) and a repeal of the excise tax on radial tires (which can improve mileage by as much as 10% (3)). The National Energy Plan (20) calls for graduated taxes based on fuel mileage rates, increasing for example from $130 in 1978 to $1600 in 1985 on a new car averaging 15 miles per gallon. A similar tax proposal would levy a tax on autos according to their weight; it has been estimated that reducing the average vehicle size from 3600 pounds to 2700 pounds would reduce U.S. gasoline consumption by one-quarter (11). One aspect of the latter two taxes worth noting is that they would not affect cars now on the road. Consumers would be given an incentive to purchase more efficient new automobiles, but they would not be penalized for decisions they made in the past.

Tax incentives designed to increase the number of riders per car are also in the interest of energy conservation. Taxes on parking and subsidies on carpooling have been suggested (10, 12), although the reductions in commuter driving might be partially offset by the availability of more vehicles for nonwork travel. In general, taxes affecting both work and nonwork travel are likely to produce better results for two reasons—work trips account for less than half of automobile gasoline use, and nonwork trips are likely to be more discretionary and therefore more responsive to changes in cost.

A common but perhaps not very valid criticism of the above taxes has been that they are second best solutions to the real problem, over-use of the automobile and trucks. Some attention has been given to transferring travel to more efficient modes of transportation. Rail transit (requiring 2600 BTUs per passenger mile) and bus transit (requiring 3000 BTUs per passenger mile) are both much less energy intensive than automobile transit (requiring 6700 BTUs per passenger mile) (12). There have been proposals to revive the railroad system through preferential tax treatment and to subsidize mass transit with gasoline tax revenues. Both of these proposals need careful consideration. A study by Bezdek and Hannon (1) indicates that rail freight is not always energy efficient compared to truck freight, depending on the distance, the speed and the size

of shipment. Preferential treatment of rail transit would require careful attention to these variables or the result could be decreased transportation efficiency. Eric Hirst (12) points out that, although mass transit may be socially desirable for a number of other reasons, increased use of mass transit may not cut energy consumption much. Fare reductions may increase ridership significantly but the fraction of urban travellers carried may still be tiny and only a small proportion of the increased ridership may come from auto drivers. Other transportation tax policies, however, might be more successful at dislodging drivers from their cars if mass transit is available.

Energy royalty: A final tax proposal that must be mentioned is one that cuts across all sectors. Both the Ford Energy Policy Project and the recent Wolfcreek Statement of the Georgia Conservancy (an independent citizen's environmental organization based in Atlanta) have endorsed a general energy royalty, a tax to be levied on all non-renewable energy resources (coal, oil, uranium) (10, 11). The energy royalty would be based upon the BTU content of non-renewable fuels and could be geared as well to their relative scarcities. Such a tax would promote conservation and a gradual shift from non-renewable to renewable sources. It could be gradually increased over time, with the ultimate level set so that the cost of non-renewable energy is higher than the renewable.

One difficulty is choosing the point in the flow of energy use at which to levy the tax. Administratively, the two easiest alternatives focus on the ends of the energy chain: a tax could be levied on utility bills, or a tax could be placed on the production of energy resources. The Georgia Conservancy suggests the latter. Levying the tax at the point of extraction or severance would produce price increases in all goods and services in proportion to the energy required in their production and marketing. Consumers, industry and commerce could accordingly be expected to shift to less energy-intensive goods and services and technologies. Studies indicate that a tax of 50 cents per million BTUs over a period of 5 years would result in an 8% reduction in energy consumption (11).

This tax could be troublesome if there were to be many exemptions. A decision would have to be made as to whether it is a tax on scarce resources or a tax on scarce energy resources. For example, a considerable amount of petroleum is used in the chemical and pharmaceutical industries. Are these uses to be taxed too? Another possible disadvantage is that the price changes in final goods and services could be so subtle as not to be useful in keeping the public informed of the energy conservation issue.

Conclusion

We have concentrated on the relationship between tax policies and energy conservation. Tactics for formulating an opinion about energy-conserving tax policies have been pointed out, emphasizing that conservation strategies should attack the causes, not just the symptoms of energy waste. Tax policies may improve energy thrift in the consumption of today's basket of goods and services, and may influence longer term life styles.

There are important distributional impacts of any tax proposal. Some people are hurt more than others by any such change in the rules for distributing the "goods" of society. Policy-makers must be concerned about those impacts. A tax to discourage large autos can affect employment; a tax designed to shift from gas to coal or to encourage use of renewable resources can entail severe local consequences for people whose livelihood depends on the current pattern of energy use. Perhaps the good outweighs the bad, but that is small comfort for those individuals or regions of the country bearing the short-lived pain. Tax policies have immediate impacts on distribution of income. There will also be political battles.

Besides affecting buyer decisions, taxes generate revenue for the public treasury. Revenue from energy taxes might be used as positive incentives for composting or recycling as suggested. Further research of alternative energy sources might be an appropriate use for these revenues. In addition the revenues could be used to offset some of the distributional impacts caused by the taxes: the weatherization program of the National Energy Plan could insulate large numbers of low-income homes, and thereby protect people not only from the cold but also from rising fuel bills, or the revenues collected could simply be returned to consumers, perhaps through progressive rebates to low-income persons. Energy use should still drop while the real income of consumers would not be as severely affected. In short, wise use of revenue is a vital aspect of an effective tax policy.

References

1. Bezdek, Roger, and Bruce Hannon. "Energy, Manpower, and the Highway Trust Fund," *Science* (August 23, 1974).
2. "Cheaper Warmth," *New York Times* (February 1, 1977).
3. *Citizen Action Guide to Energy Conservation* (Washington, D.C.: Citizens' Advisory Committee on Environmental Quality, 1974).
4. Collias, Frank. "Energy, Property Tax and Solar Legislation."
5. Commoner, Barry. "A Reporter at Large," *The New Yorker* (February 2, 1976).
6. Energy Conservation and Conversion Act (H.R. 5005, 94th Congress, 1975).
7. *Energy in Solid Waste* (Washington, D.C.: Citizens' Advisory Committee on Environmental Quality, 1974).
8. "The Energy Situation—January 1977," *Energy Perspectives* (Batelle Memorial Institute, January 1977).
9. "Energy: Will 1977 be Different?" *Resources* (Resources for the Future, January-March 1977).
10. Ford Foundation, *Studies in Energy Tax Policy* (Cambridge, Massachusetts: Ballinger Publishing Co., 1975).
11. Georgia Conservancy, "The Wolfcreek Statement: Toward a Sustainable Energy Society" (1976).
12. Hirst, Eric. "Transportation Energy Conservation Policies," *Science* (April 2, 1976).
13. Homestead Improvement Act (P.A. 293, 78th Michigan State Legislature, 1976).
14. Leonard, William N. "In Search of an Energy Policy," *Challenge* (May-June 1976).
15. Lovins, Arnory. "Energy Strategy: the Road not Taken?" *Foreign Affairs* (October 1976).
16. Morrison, Bonnie M. "Residential Energy Consumption: Socio-Physical Determinants of Energy Use in Single Family Dwellings" (Paper prepared for the Environmental Design Research Association, 7th Annual Meetings, Vancouver, British Columbia, 1976).
17. "Owners Helpless Against Tax Man?" *The State Journal* (February 4, 1977).
18. Simmons, Henry. *The Economics of America's Energy Future* (Washington, D.C.: U.S. Energy Research and Development Administration, 1975).
19. Taxation—Exemptions: Solar, Wind, or Water Conversion Devices (P.A. 135, 78th Michigan State Legislature, 1976).
20. "Text of Speech by Carter on His Energy Program to a Joint Session of Congress," *New York Times* (April 21, 1977).
21. Tyner, Wallace E. and Otto C. Doering III. "The President's Energy proposal: Is It Enough?" (unpublished paper).

Cooperative Extension Service Programs are open to all without regard to race, color, creed, or national origin. Issued in furtherance of cooperative extension work in agriculture and home economics, acts of May 8, and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Gordon E. Guyer, Director, Cooperative Extension Service, Michigan State University, E. Lansing, MI 48824. *1P-10M-2:78-UP. Price 5 cents. Single copy free to Michigan residents.*

Michigan State University Printing