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Demand Overview and Findings

The National Energy Plan offers a series of principles and objectives that are sound and long overdue. If they are translated into policy, the Nation will take a major step toward solving its energy problems. An emphasis on conservation is particularly important because it offers the greatest potential for keeping U.S. dependence on imported energy within the limits imposed by total world production capability and world demand. The Plan's principle that energy should be priced at replacement cost is fundamental to achieving the needed conservation levels. The strategies and tactics proposed by the Plan are, for the most part, moves in the right direction to increase energy-use efficiency and expand the use of more abundant domestic energy supplies,

There are certain general features of the Plan with regard to demand that need to be strengthened.—The Plan's only provision for increasing supply, other than raising the price of new oil and natural gas, is to depend on the creation of demand to stimulate supplies. This is particularly true of coal, where the conversion proposals in the Plan are expected to be sufficient to bring forth the needed coal. It is important that there be constant monitoring of the Plan's proposals in this regard so that, if "midcourse" corrections are needed, prompt action can be taken. The Plan probably does not go far enough in moving the costs of natural gas and electricity toward replacements costs. The Plan's proposals could continue existing price distortions and reduce the effectiveness of price signals in motivating consumers to conserve energy. Finally, the Plan does not adequately coordinate its conservation and conversion goals with the need for research and development on more efficient ways to use energy, either in the near term or the long run. Care must be exercised that the Plan's proposals do not inhibit innovation and are flexible enough to permit rapid implementation of new technologies when they are ready for the commercial market.

The 1985 projections for energy demand given by the Plan appear achievable in most cases and may actually underestimate the potential energy savings, although uncertainties exist in some sectors.—The Plan's forecast for the energy growth rates, principally in the industrial sector, may be higher than what will actually occur. The energy price increases of the last few years are likely to accelerate efforts to increase energy efficiency. There is insufficient information in the transportation sector, because of the focus on automobiles and gasoline, to determine whether or not the Plan's projected 1.1-percent annual energy demand growth rate will be met. In the buildings sector, the Plan's provisions seem adequate to reach the projected 1.1 -percent per year growth rate in energy use. In the utilities sector, the 4.4-percent growth rate appears reasonable, although there is enough uncertainty, primarily about industry plans for electricity use, so that the rate could range from below this projection to higher than the 5.8-percent growth rate which present utility plant construction schedules anticipate. Finally, in

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the industrial sector, the Plan's projected energy demand growth rate of 4.6 percent per year appears to be much higher than what will occur, even considering the high rate of growth in the gross national product (GNP) assumed by the Plan. Continuing the historic relationship between GNP and industrial energy demand growth rates would result in a lower energy demand in 1985 than the Plan's forecast by the equivalent of 200 million tons of coal.

The Plan's proposals in the transportation sector appear to be too narrowly focused.— The Plan concentrates on automobiles and gasoline consumption and does not propose an overall transportation energy policy, The Plan's goal of a 10-percent reduction in all gasoline consumption by 1985 probably is too optimistic. Consumption of gasoline by automobiles alone is likely to be reduced by more than the 10-percent as a result of fuel-efficiency standards established by the Energy Production and Conservation Act of 1975, However, increased use of fuel by trucks could partially offset this, with the result that the overall goal is not reached. The standby gasoline tax proposed by the Plan probably will be triggered, but that alone probably will not reduce consumption by enough to reach the goal. Finally, automobile fuel-efficiency standards may be achieved even without the Plan's proposed excise taxes.

The Plan does not consider mass transportation in its proposals, Efforts should be initiated to increase the use of public transportation to promote gasoline savings in the long term. The Plan also should consider changes in transportation regulatory activities to improve overall transportation fuel efficiency.

The Plan's provisions for the buildings sector could be expanded in scope and consideration should be given to restructuring the Plan's proposed tax credit proposals.— While the 1985 goal of weatherproofing 90 percent of all homes and new buildings is overly optimistic, the emphasis of the Plan on improving the thermal efficiency of buildings should accelerate an important energy-saving trend. It may be necessary to require either that information on thermal efficiency of housing be made available to potential buyers or that housing meet specified thermal-efficiency standards at the time of sale if the goals are to be realized. The Plan's emphasis on single-family dwellings and duplexes could mean that large potential savings from conservation measures in commercial structures will not be achieved. Further, the Plan's lack of strong incentives for conservation in rental housing may result in a negative impact on the poor, because most low-income families are renters.

Homeowner tax credits proposed by the Plan may not be justified because rising fuel costs are already encouraging homeowners to reinsulate. Tax credits to encourage solar systems seem justified, but no consideration is given to potential savings that can be achieved through improved design and other elements of "passive solar" technology, The Plan should consider expanding application of buildings conservation tax credits to innovative technologies which carry higher risk than existing methods but which might result in greater long-term gains.

The Plan's proposed schedule for converting utility boilers from natural gas to coal can be met, but there are circumstances that could easily upset the timetable.—Although the capital required to convert present natural gas-fired utility boilers is manageable on a national scale, the concentration of gas boilers in Texas, Arkansas, Louisiana, and Oklahoma may place intolerable burdens on some utilities in these States, particularly if demand growth should exceed expectations. The conversion schedules that are necessary to reach the 1990 goal are so tight that the Plan's proposed oil- and gas-user tax probably cannot accelerate conversion rates. If there is a choice between converting and paying the tax, utilities may choose the tax with a result that some conversion will not take place on schedule.

The rate-reform proposals of the Plan move in the direction of cost-based rates but some provisions may hinder reaching the objective.—The Plan's proposal to prohibit declining block rates may not always be consistent with 'cost-based' rates, Small customers often cost more to service than large customers on a per-unit energy delivered basis, and a strictly flat rate across all customer classes may not resolve rate discrimination problems. Within a given class, however, a flat rate should increase the incentive to conserve. Time-of-day rates will be of limited effectiveness until economical storage systems are developed. Consideration also must be given to regional differences when setting time-of-day rate schedules. The probability of success of the Plan's rate-reform proposals can be enhanced if they are made more flexible.

The Plan's provisions on energy prices and taxes could lead to significant shifts in the market and operation of natural gas utilities.—The decline in natural gas consumption by industry which probably will be accelerated by the tax on gas consumption may be accompanied by an increase in residential use, provided existing prohibitions on new hookups are lifted. This will decrease load factors and could lead to increased costs to consumers. In some areas, reduction in industrial use and voluntary customer conservation will be sufficient to create a surplus. If these utilities are not permitted to sell this gas to new customers, the utilities are unlikely to promote additional conservation efforts and seek new gas supplies.

Much of the industrial switch from oil and natural gas, particularly for direct heat process, may be to electricity rather than to coal as contemplated by the Plan.—The Plan's objective to substantially increase industrial coal consumption with a series of price and regulatory incentives may not be met. The lack of coal marketing and distribution systems on a scale small enough to handle industrial loads contemplated by the Plan, the need for new coal handling and combustion equipment, and the requirement for pollution-control equipment are likely to make shifts to coal so expensive in many cases that industry will export the problems of conversion to the electric utilities. Under the Plan's provisions, conversion could be required for units that would need as little as 25,000 tons of coal per year. By comparison, a moderate-sized, coal-fired electric utility will use about 1.5 million tons per year, Conversion to electricity is not the intention of the Plan, but it is not necessarily an undesirable

result. The relative efficiencies between coal-combustion and electric-resistance heating in direct-heat processes would compensate for coal-to-electricity conversion losses. Research should be expanded to use electricity more efficiently in these processes.

The Plan's cogeneration provisions address the major problems inhibiting its growth, although the proposals need to be more closely coordinated with those for coal conversion.—The Plan offers a set of proposals which are necessary to remove barriers to cogeneration development. Utility interest in cogeneration probably will remain limited, however, because utilities are not likely to require more generating capacity for the next several years than the plants already under construction would provide. Utilities cannot be sure that they will receive an adequate return on resale of purchased cogenerated power. They also are concerned about the technical problems and costs of adding dispersed generating capacity over which they do not have complete control. If a rapid industrial shift to coal were to occur as a result of the Plan's proposals, and utility interest in cogeneration remained low, much potential cogeneration capacity would be lost because industry probably would install low-pressure, coal-fired boilers. To take advantage of the long-term cogeneration potential, the Plan's coal policy should have enough flexibility to maintain the 'cogeneration resource base' and accelerate research and development on technologies for coal-fired cogeneration.

The pricing and tax proposals of the Plan will increase incentives for industrial conservation and conversion, although the tax credits probably are not large enough to significantly accelerate industrial conservation investments.—The oil and natural gas consumption tax, the oil equalization tax, and the price increases proposed for natural gas will provide additional incentives for industrial energy conservation and accelerate a reduction in industrial use of natural gas. But price increases will occur even without a plan, and the proposed investment tax credit will probably do no more than accelerate industrial investment decisions in conservation technologies by a few months. Even though the proposed 10-percent credit would be added to an existing 10-percent investment tax credit, it will not substantially close the gap between what industry can expect as a rate of return on conservation investments and what it can expect from investments to increase production output. The designation of a list of items that qualify for the tax credit probably will inhibit innovation in other technologies and processes that might be much more effective in reducing energy use.

Issue 1

Expected Energy Use to 1985

The growth rates in energy use projected by the National Energy Plan, particularly in the industrial sector, could overstate actual increases in demand.

Summary

The National Energy Plan projects average annual growth rates for energy use of 1.1 percent in the residential and commercial sector, 1.1 percent in the transportation sector, **4.4** percent in the utility sector, and **4.6** percent in the industrial sector. Except for industry, these are all significantly below historical trends, particularly the 1960-73 period. For total energy use, the forecast is 2.5 percent, again below historical trends. However, the Plan's projections are higher than a number of others for the 1976-85 period, giving rise to the question of whether the Plan has understated the potential for conservation by 1985.

The growth rate for the residential /commercial sector appears to be achievable, although the original goal of insulating 90 percent of all residential buildings is probably too optimistic. The transportation forecast cannot be evaluated because the Plan focuses on automobiles and the effect of the Plan on the other components is not established. The utility sector projection appears achievable, provided the increase in demand for electricity from the industrial sector, caused by a large shift from oil and natural gas to electricity, does not exceed planned capacity additions. Alternatively, there is the prospect that the utility sector would have a substantial excess of capacity by 1985 if the Plan's projected energy growth rates prove correct and the generating plants now under construction are kept on schedule. Finally, the growth rate forecast in the industrial sector appears to be too high. The latter, however, depends critically on the growth rate of the gross national product (GNP) and could approach the Plan's value if the GNP growth rate projection of 4.3 percent per year holds. If industrial energy demand grows at a rate close to historical trends, industrial coal requirements may be as much as 200 million tons below the Plan's estimate.

Background

The National Energy Plan forecasts energy use in 1985 that would result from the Plan's proposals. The average annual growth rates derived from these projections are considerably below the historical trends, except for the industrial sector. This is shown in the following table:

Average Annual Growth Rate (Percent)

Sector	Plan, 1976-85	1950-1976	1960-1976	1950-1973	1960-1973
Residential/Commercial	1.1	4.0	4.2	4.2	4.7
Transportation	1.1	3.1	3.7	3.4	4.3
Industry	4.6	2.3	2.3	2.95	3.3
Electricity	4.4	7.1	5.9	7.7	6.6
TOTAL ENERGY	2.55	3.0	3.2	3.5	4.0

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As seen, the Plan calls for large decreases in the residential/commercial, electric utility, and transportation energy-use growth rates. On the other hand, the industrial energy-use growth rate is forecast to be double the rate between 1950 and 1976.

Residential/Commercial. —Recent large increases in fuel prices, along with higher energy-efficiency standards for buildings and appliances, should act to reduce the growth rate of energy use in buildings. The measures proposed in the Plan are aimed at increasing the incentive to homeowners and building owners to install conservation equipment and to tighten regulations regarding standards for buildings and appliances. The Plan's goal of insulating 90 percent of the Nation's residential buildings by 1985 does not appear to be achievable. However, one analysis by the Oak Ridge National Laboratory indicates that the overall projections in this sector will be reached under the Plan. The principal areas of uncertainty are discussed in the issue papers in the buildings section of this chapter.

Transportation.—As described in the transportation section of this chapter, the plan focuses primarily on automobiles and gasoline consumption. Although cars and trucks make up the major portion of the transportation sector, other components are large enough to make overall demand goal unachievable even if the Plan's proposed 10-percent reduction in gasoline consumption is achieved 10-percent reduction is itself uncertain because the Plan is not clear about future fuel efficiencies of trucks. These uncertainties are discussed in detail in the transportation issue papers.

Electric Utilities.—The annual utility growth rate forecast in the Plan of 4.4 percent appears to be reasonable, if the Plan's other forecasts hold. There is considerable uncertainty in this sector, however, which results from a combination of the possibilities of a large shift by industry from oil and natural gas to electricity, of a considerable excess generating capacity by 1985, and of the likelihood that industry energy-demand growth rates, as forecast by the Plan, are too high.

Data from the Federal Power Commission indicates that enough new base-load generating plants have already been scheduled for construction by 1985 to meet an annual growth in electricity demand of between 5.1 and 5.8 percent. This is well above the Plan's projection, and brackets the 5.5-percent per year growth rate recently forecast by the Edison Electric Institute. Some of this construction can be deferred or canceled, as has been done over the past few years, and it is possible that environmental challenges and safety considerations may slow down or stop construction of other plants. While there is the possibility that excess capacity could be in place in 1985, it is by no means certain.

There are uncertainties in demand which further complicate the situation. The biggest uncertainty is the extent to which industry will shift to electricity rather than direct use of coal in its effort to use less natural gas and oil. This, in turn, depends on the growth rate of industrial energy use, the availability of natural gas and oil to industry over this period, and the willingness of industry to pay the user tax and higher prices for oil and natural gas if utilities can be assured that those fuels will be available. The electricity

demand, considering just these uncertainties in the industrial sector, would range from a value less than that projected by the Plan to a value that would endanger electric supply reliability even if all the plants presently under construction were completed by 1985. **An upsurge in electric use by the residential/commercial sector is not likely because** oil and natural gas prices for homes will be kept below prices of electricity. In fact, if moratoriums in hookups of natural gas to new homes are lifted, the present growth rate in electricity in this sector would probably decrease.

Such uncertainties about future growth in demand for electricity mean that utilities will have to monitor demand closely to balance their plans for new generating capacity with real demand growth. It should be noted that to the extent that demand growth for electricity exceeds presently planned capacity growth, cogeneration will become more attractive to electric utilities, because lead times for installation are shorter than those for cental powerplants.

Industry.—This sector is the most uncertain with regard to energy-use projections. The Plan assumes that industrial energy demand grows 0.35 percentage points per year faster than GNP, which is a substantial departure from the 1950-73 period, during which energy demand grew 1.1 percentage points per year slower than GNP. If this long-term trend were to continue, an industrial growth rate of 3.2 percent would be expected, leading to industrial energy use of 18.3 million barrels of oil per day equivalent by 1985. There is also a possibility that the 4.3-percent growth rate of GNP assumed by the Plan is too high in the light of historical trends. The principal reason for this is that during the 1963-73 period, the annual GNP growth rate of 4,2 percent was accompanied by a very large increase in employment, which grew at a rate of 2.5 percent per year. This compares to 1.4 percent per year from 1947 to 1963. The large increase was a consequence of the post-World War II baby boom, which will run its course by about 1980, with the result that the labor force growth rate should decline considerably. Therefore, even if the productivity growth rate resumes its 25-year average of 1.7 percent per year, the GNP rate would be less than the 4.3 percent forecast by the Plan.

This is not as clear-cut as it appears, however. Because of the large amount of unemployment and the increasing number of women entering the labor force for the first time, the growth rate in employment may not decline to pre-1 963 levels by 1985 even though the effect of the baby boom ends before then, although it may fall below the 1963-73 level. In addition, the Plan assumes a very large increase in the Manufacturers' Index-about 5.5 percent per year—in order to drive the unemployment rate down to 4,5 percent by 1982. This is a large departure from historic trends. The 0.9-percent per year difference between the index and the projected industrial energy-use growth rate is near the historical 1.1 -percent per year differential. Therefore the long-term efficiency trends are still maintained. Under these circumstances, the 4.6-percent per year industrial growth rate may not be as far out of line as it first appears. The crucial variables are the expected increase in employment and productivity, and the extent to which manufacturing will have to contribute to the economy over the next 9 years.

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Implications.—The Plan projects that total energy use will grow at an average rate of 2.5 percent per year to 1985. Combined with a 4.3-percent annual growth rate in GNP, a significant decline of the ratio of these growth rates is forecast. Whereas it has been about 1.0 for the last 25 years, it is now forecast to average about 0.6 for the next 9 years. This is a substantial change and serves to highlight the significance of the rate of GNP growth in affecting energy-use projections. For example, continuation of the 1950-76 GNP growth rate of 3.4 percent per year in conjunction with this 0.6 ratio would produce an annual average energy-use growth rate of 2 percent and an energy demand of about 44.4 million barrels of oil equivalent per day by 1985. This 2.0 million barrel per day reduction below the Plan's assumption is equivalent to about 200 million tons of coal. That amount represents nearly two-thirds of the projected increase of coal use by the industrial sector. Although the effect that any such reduction of energy requirements may have on coal use will depend on oil and natural gas availability and industrial conversion to electricity, it can be seen that the degree of difficulty in meeting the coal goals of the Plan depends intimately on the Nation's actual energy-demand growth rate.

Issue 2

Replacement Cost Pricing

The National Energy Plan's efforts to move energy prices toward long-term replacement costs represents a positive step in achieving the goals of economic efficiency and informed consumer choice.

Summary

The Plan proposes replacement cost pricing as an essential principle in any national energy policy, The provisions of the Plan move toward the principle, but not far enough to reach replacement cost in every case. The concept of replacement cost pricing will not be easy to implement, however. It will be difficult to account for externalities because of an extensive need for new information, and moves toward replacement costs must be phased in at a rate which will avoid severe economic impacts. At the same time, until full replacement costs are charged for all fuels, there will be less incentive to invest in alternative energy technologies that could compete with existing fuels at replacement costs. Present price policies clearly deter conservation; until they rise to replacement costs, they will inhibit wider introduction of such alternative technologies as solar energy.

Replacement costs are obtained for oil under the Plan's proposals, although not all consumers will pay these prices. Natural gas prices reach replacement levels only for industrial users and then on a schedule that

will raise oil prices first. Electric rates will approach replacement costs upon application of the Plan's rate-reform proposals, but consumer choice among these rates is voluntary. Coal costs are left to be set by the market, although they will be affected by other features of the Plan that affect the purchase price of competing fuels. While most of these price compromises are proposed to achieve a measure of equity, they should be carefully monitored to ensure that they do not forestall even greater benefits in resources allocation that would result from full replacement cost pricing.

Background

It is an accepted principle of economics that to ensure efficient operation of markets and allow maximum expression of consumer choice, the price paid for a product should reflect what it would cost to replace, or produce one additional unit of, the product in question, (This point is also called the marginal price.)

Where private markets function freely, the prices at which demand and supply are in balance can be said to reflect replacement cost values. The fact that U.S. energy prices have been controlled, both by Government policy and private action, has led to the present disparity among fuel costs.

For example, many people believe that the regulated rates for electric utilities, which are based on "historically imbedded" or average costs of production rather than on the incremental costs of adding new capacity, have created a continuous bias toward over investment in new facilities. As a result of average-cost pricing, electricity demand has been higher than it might be, and a barrier has been created to investment in conservation. For a consumer, paying the "average" cost of a unit of electricity is more attractive than making an investment in energy-saving measures that would elimi - nate the need for that unit of energy.

Similar choices have been made with natural gas. Past policy which set prices far below the replacement cost has discouraged conservation. The Administration now seeks to reinforce conservation with additional, offsetting Government policy, such as the proposed insulation tax credit. Finally, an unwillingness by policy makers to let prices rise above the controlled level has given rise to a policy debate over whether to subsidize substitute fuels, such as synthetics or foreign liquefied natural gas, which are likely to be much more expensive,

The failure to achieve replacement cost pricing also deters the introduction of alternative energy technologies which do not have the benefit of "rolled-in" or average pricing. The primary example is solar technology. There is evidence that there would be a larger market for solar equipment if all fuels were priced at their replacement level. As with conservation, additional Government policy has been proposed to stimulate this market, which will expand slowly as long as other energy sources are held at artificially low levels.

Although replacement cost pricing is a desirable goal, it could have undesirable side effects. For example, a preoccupation with the incremental cost of expanding electric-generation capacity might crowd out opportunities to experiment with peak-

load dampening by time-of-day rate schedules as an alternative. Another case in which replacement cost pricing may be an imprecise guide to decisions is where prices must account for externalities. Such externalities, interpreted literally, may place impossible data requirements on the pricing system and frustrate the realistic application of replacement cost pricing. A precipitate shift towards replacement cost prices from far lower levels may also cause marked impact on income and its distribution, and on employment and geographic development. These short-term costs must be weighed against the benefits of improved resource allocation resulting from the change.

Nevertheless, the Administration's effort to force energy prices towards long-term, replacement cost levels, as expressed in the National Energy Plan, represents a move towards the desirable goals of economic efficiency and informed consumer choice. The Plan's initiatives on pricing would affect all energy forms to some extent:

- By decontrolling some domestic crude oil production and imposing an equalization tax, domestic crude oil prices would move to current world price levels. Replacement cost principles are partially compromised by the plan's proposal to authorize a ceiling on price levels if world prices rise too sharply and by the Plan's provision for rebates of equalization taxes.
- New natural gas prices are allowed to reach a ceiling of $1.75 per thousand cubic foot. Replacement cost principles are substantially compromised by shifting the highest-cost gas supplies exclusively onto industry, setting the ceiling for other uses below the world crude oil price equivalent, and retaining "rolled-in" gas utility rate-making practices. The continued use of averaged prices shields homeowners and others from cost increases.
- Electricity-rate reform proposals call for study and subsequent implementation of pricing practices that more accurately reflect cost of service, including seasonal and time-of-day peak demands. While consideration is given to utility costs which increase as a result of capacity additions, the language of the Plan appears to call for placing financial responsibility for such additions on those customers who cause the increase. True replacement cost principles would distribute such incremental system costs to all users because those who do not help create a need for new generating capacity would still be using a commodity at a price below its replacement value,
- No pricing initiatives are proposed for coal, which remains the one energy source governed by the interplay of demand and supply. Coal will be indirectly affected by regulatory provisions governing the price of competing fuels in the electric power market.
- While gasoline could escape direct taxation under the Plan, the tax on fuel-inefficient cars is designed to dampen gasoline consumption. The differential tax on a car that will get 21 miles to the gallon instead of 27.5 is $600. If a car is driven 100,000 miles in 10 years, the differential gasoline consumption is about 1,000 gallons and the discounted value (at 10 percent) at

the time of purchase, at today's gasoline prices, corresponds to a gasoline tax of $1 per gallon. This is substantially above replacement cost at prevailing world petroleum prices, but presumably is justified by considerations of national security and the environment. This is one example of an attempt to include externalities in the price.

In assessing the Plan's proposed pricing policy, it is fair to recognize that, in the case of some depletable natural resources, there is a view that replacement cost is not an adequate measure of the fuel cost to society of energy production and consumption. This view holds that environmental damage and the denial of fuel resources to future generations must be factored into today's costs by pricing energy commensurate with the cost of so-called "income" or "replaceable" resources. The new costs would be based on the requirements for providing energy derived on a sustainable and ecologically benign basis from the sun. imposition of energy depletion taxes on current resource use would be one means of moving toward "permanent replacement costs." Another method would be direct rather than indirect pricing; the full costs of nuclear services provided by the Government, for example, would be paid by the electric utility and its customers rather than indirectly by subsidization and general taxation.

Had the Plan opted for complete decontrol, energy prices would have been governed by the OPEC world oil price, which is not a freely determined market price. As a result, there would have been sharply higher producer revenues. Such an approach might also have generated much higher prices. But if a price rise to OPEC crude-oil equivalents did generate unacceptable windfall profits, tax policy could be designed to reduce excess earnings and induce investment in new energy development.

A final question on the proposed price policies asks which course of action involves more Government intervention in the Nation's economic affairs. Mechanisms proposed to hold prices below replacement levels will require an extensive system of Government regulation, control, and monitoring. The extent to which this role is sought for Government will influence the acceptability of the policies.

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Transportation

Issue 3

The Automobile Excise and Standby Gasoline Taxes

The structure of automobile taxes and rebates in the National Energy plan may not be needed to meet standards set in the Energy Policy and Conservation Act of 1975 (EPCA), and the standby gasoline tax may not yield large enough gasoline savings to justify the difficulties it raises.

Summary

Existing penalties under the Energy Policy and Conservation Act of 1975 (EPCA) should persuade manufacturers to hold to the energy-efficiency schedule set out in the EPCA automobile tax/rebate system. If not, the penalty could be raised. The surcharge/rebate system proposed in the Plan for increasing costs of "gas guzzlers" and decreasing the costs of fuel-efficient automobiles substitutes a Federal pricing structure for one that manufacturers probably would impose themselves in order to maintain a balance of high-mileage and low-mileage cars to keep any year's production within the EPCA standards. The "standby" gasoline tax, if fully triggered, will reduce gasoline consumption, but its incremental effect in comparison to improved automobile efficiency is likely to be small. In addition, the combination of the gasoline tax and rebates would affect some segments of society more than others and questions as to its "fairness" are therefore raised. Finally, the Plan only proposes to tax gasoline directly and does not deal with other transportation fuels such as jet and diesel fuel.

Background

The National Energy Plan combines three policies in an effort to induce consumers to use less gasoline:

- an oil equalization, or wellhead, tax;
- a standby gasoline tax; and
- an excise tax for inefficient automobiles and a rebate on efficient cars (so-called "gas guzzler" tax).

Although the taxes influence automobile costs and usage as a package, gasoline price increases and automobile excise taxes are examined separately below.

Gasoline price Increase.—Under the Plan, U.S. prices for oil at the wellhead would be raised to world prices over a 3-year period by imposing a tax equal to the difference between the controlled domestic price and the world price. The passthrough from the oil equalization tax to motorists would be about 7 cents per gallon in the Plan's first year, assuming a world price of $14 per barrel and an equalization tax of $3 per barrel, to raise the U.S. delivered price to the world price. In addition, the Plan proposes, starting in 1979, to raise gasoline taxes by 5 cents per gallon in each year the gasoline consumption exceeds the Plan's targets, which move downward from an

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estimated consumption in 1977 of 7.3 million barrels per day to a goal of 6.6 million barrels per day in 1985. The tax could reach 35 cents per gallon in 1985 and 50 cents per gallon in 1988.

It appears likely that the year-by-year gasoline-use targets will not be met and the tax would be triggered. If the full tax is implemented and inflation increases at an annual rate of 5 percent, the net effect by 1988 would be a 29-cent per gallon increase in 1977 dollars. Combined with the oil equalization tax, the net effect will be an increase of around 32 cents per gallon by 1988. This is in addition to any increases in the world price of oil. Even with these tax-induced price increases, the improvements in the average energy efficiency of new automobiles would reduce the average real cost per mile of gasoline.

The increased cost of gasoline to the consumer due to these taxes will have two direct effects on consumption: (1) it will encourage people to replace fuel-inefficient cars sooner than they might otherwise; and (2) it will reduce automobile usage and increase use of other transportation forms such as carpooling, mass transit, bicycles, and jitneys. Several projections based on gasoline usage, although a majority of projected reductions will probably come from improved automobile efficiency. Of course, all such projections are uncertain.

In this connection, increased gasoline prices may have positive psychological effects. Although gasoline prices increased drastically immediately following the OPEC oil price increases in 1973-74, real (adjusted for inflation) gasoline prices have not increased since that time. This probably contributes to a wide-spread skepticism about whether there really is an "energy crisis." The gasoline tax would serve as a reminder that the energy problem is real and has not gone away. However, the standby tax as proposed in the Plan would probably be less effective than a predetermined tax in reducing consumption of gasoline. The Plan apparently assumes that consumers will curtail gasoline use to forestall annual tax increases, but it is just as likely that consumers will figure their individual purchases will have little effect on national consumption. If consumers know that a tax would increase regularly, they might be more readily persuaded to select a more efficient car sooner rather than later.

Probably the most sensitive issue regarding the gasoline price increases is whether they affect different segments of society equitably, The two groups of most concern are the poor, who generally spend a higher proportion of their income on gasoline than other income groups, and the rural population, which has no real alternative to the automobile. There is no doubt that these two groups (many citizens fall in both groups) will suffer greater adverse effects than others, although the expected net effects on the average poor or rural dweller should not be significant under the proposed tax-rebate system.

Another important concern raised by the proposed standby gasoline tax is that it focuses on iust one component of a barrel of oil, ignoring jet fuel, diesel fuel, and other refinery products. It is not clear why the

Plan specifies incremental increases in the cost of gasoline but not in the cost of jet or diesel fuel. An alternative to the standby gasoline tax would be to implement higher taxes on crude oil, both imported and domestic. Such tax increases would be progressive if they were covered by the same rebate schedule proposed for the wellhead tax.

Automobile Excise Taxes and Rebates.—The Energy Policy and Conservation Act of 1975 imposes fuel economy standards (FES) on new automobiles. A Department of Transportation study indicates that if manufacturers meet the standards, passenger cars will use 17 percent less gasoline in 1985 than they do now, even though there may be 20 percent more cars on the road.

One course that manufacturers could take to keep the fuel efficiency of their total mix of automobiles within the law is to charge more for cars that perform below the standard and use that money to cut prices and promote sales of cars that perform above the standards. Under such a pricing structure, the costs of gas guzzlers could climb high enough to substantially reduce their sales. In order to meet the standards in 1985, a manufacturer would have to produce five cars that got 36.2 miles per gallon in order to sell one car that got only 12.5 miles per gallon, assuming a mandated fleet average of 27.5 miles per gallon. (The figure is calculated in terms of a harmonic mean that assumes a total number of miles driven and not as an arithmetic mean.)

The Plan proposes to supplement EPCA fuel-economy standards with an excise tax on new cars that perform below standard, graduated according to their variance from the prescribed fleet average, and rebates for cars that are more efficient than the standard requires.

The requirements of the Energy Policy and Conservation Act prescribe the market within which automobile manufacturers must operate over the next 9 years (the time-frame of the energy plan). If the tax/rebate system is implemented, the excise tax would replace the higher price that a manufacturer might charge for a less efficient car. Those funds, then, would be taxed away and no longer would be available for the manufacturer to use to reduce prices of more fuel-efficient cars. In addition, the Plan's proposed tax/rebate schedule is fixed over a full 9-year period and could not be altered (except by amending the law) in a year in which the tax (or higher price) for a fuel-inefficient automobile might have to be raised substantially in order to discourage purchase of inefficient cars and keep a manufacturer's fleet in balance.

The Plan suggests that the tax/rebate structure is proposed because there is doubt that existing penalties are sufficient to keep manufacturers on the fuel-efficiency schedule outlined in EPCA. The penalty under EPCA is $50 on each car sold in a year for each mile per gallon by which the company's average falls short of the law's fuel-efficiency standard, Because the penalty is a fine and not a tax, it would be levied against after-tax profits and would be the

equivalent of at least $96 for each mile per gallon. For a company like the Ford Motor Co., selling about 3 million cars per year, the penalty for falling short of the standard by one mile per gallon would be equivalent to $288 million. If this is not considered to be sufficient to encourage manufacturers to meet the standard, Congress could increase the penalty, perhaps by doubling the $50, as an added inducement to meet the standards. All of this assumes that the current standards and penalties will be enforced. Experience with the Clean Air Act leaves some room for doubt as to whether this will actually be the case, although on May 25, 1977, one industry representative stated before the House Ways and Means Committee that the industry sees no alternative to meeting the EPCA standards.

Issue 4

The Impact of Truck Fuel Consumption on Meeting the Gasoline Consumption Goal

Without a goal for truck fuel consumption that is as unambiguous as that for automobiles, it will be difficult and perhaps impossible to measure the effectiveness of any set of policies designed to reduce transportation fuel consumption.

Summary

The National Energy Plan proposes a national goal of a 10-percent reduction in gasoline consumption by 1985. Although automobile gasoline consumption will decrease by more than 10 percent by 1985, such a decrease could be partially offset by increases in truck fuel requirements. The National Energy Plan does not offer a goal for trucks, nor does it consider policies to promote increased energy efficiency in truck transport.

Background

The National Energy Plan establishes a national goal of a 10-percent reduction in gasoline consumption by 1985. Automobiles presently account for about 72 percent of the Nation's gasoline consumption. The Department of Transportation m-e-

dieted, before publication of the National Energy Plan, that gasoline consumption by domestic automobiles will decrease approximately 23 percent by 1985 as a result of fuel economy standards established by the Energy Policy and Conservation Act of 1975. If the Transportation Department forecast is modified to include imported automobiles (which would show a smaller percentage increase in efficiency) the decrease in consumption would drop to about 17 percent. Automobile gasoline consumption, therefore, would be well within the target of a 10-percent reduction as proposed in the Plan.

Nonhighway uses account for about 6 percent of gasoline consumption and trucks for about *16* percent. These important shares are not specifically addressed in the Plan, however. If the overall goal of a 10-percent reduction in gasoline is to be met, truck gasoline consumption cannot increase by more than about 13 percent. The strategies needed to achieve this goal are not dealt with in the Plan, although light trucks (under 6,000-pounds gross vehicle weight) are subject to fuel economy standards beginning in model year 1979, and the President has directed the Secretary of Transportation to commence rulemaking for heavier trucks.

Any attempt to regulate fuel economy of heavier trucks raises a number of serious issues. These issues include:

- The great diversity of body types, power-train combinations, and cargo requirements,
- The equally great diversity of duty cycles, trip types, and loaded-to-empty ratios.
- The fact that fuel economy in trucking is a I ready a highly competitive-, marketable feature which has achieved some degree of optimization for each application.

As a consequence of these and other issues, the study concluded that a voluntary program of fuel economy improvement was the preferred course of action, and that mandated standards were inappropriate.

At the same time, however, many forecasts are predicting an increase in truck use in order to support economic growth. As a consequence, it may be extremely difficult to limit the increase in truck gasoline use to the 13 percent necessary to meet the Plan's goals. Accelerated conversion to diesel engines in trucks and automobiles would have the effect of reducing the level of gasoline consumption and could prevent the imposition of the tax on motor gasoline. Of course, switching vehicles to diesel fuel does not yield a proportional decrease in total oil consumption, but it does have some advantages in that diesel engines are more energy efficient and less energy is used in processing diesel fuel than gasoline at a refinery.

Department of Transportation **Photo**

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Issue 5

State, County and Local Government Transportation Fuel Conservation

The Plan does not address the potential for energy savings from changes in operation of State, county, and local motor vehicles.

Summary

State, county, and local governments own and operate large numbers of motor vehicles, and there is considerable opportunity for reducing the energy consumption of these vehicle fleets. However, the National Energy Plan does not explicitly recognize this opportunity nor does it address the role that the Federal Government could play in encouraging energy conservation in this area.

Background

State, county, and municipal governments operate approximately 1,862,000 cars, trucks, motorcycles, and other miscellaneous motor vehicles. While the implementation of energy-conservation measures in vehicle fleet operations requires that consideration be given to the greatly varying needs of the users, improvements in operation and management of these vehicle fleets presents a major opportunity for energy conservation.

An initial step that would have both immediate and long-term benefits is the maintenance of a detailed inventory of the vehicles owned, their use, and their gasoline consumption, Full-sized cars are often used to transport one person, large trucks to deliver small loads, a number of small cars to do the work of a large station wagon or van, pick-up trucks for site inspection when subcompact cars would be adequate, etc. Such surveys could provide a basis for matching existing vehicles with their most efficient use, and help to plan future purchases to meet real needs. Matching the existing fleet with its most efficient usage requires an administrative effort at the respective State and local government department level in order to:

- plan trips for most efficient vehicle use;
- combine trips whenever possible;
- match vehicles to job requirements to achieve maximum efficiency.

Once existing vehicles and their uses are identified, future vehicle purchases can be planned to optimize fuel economy by matching vehicle capabilities with needs. To promote these types of gasoline conservation activities, the Federal Government should consider the following:

- Development and distribution of guides to State and local governments outlining suggestions on how to promote gasoline conservation.

- Support actions by State governments by developing technical assistance teams, to assist State and local governments in their efforts.
- Incorporating energy conservation provisions into existing regulations on the use by State and local governments of general revenue sharing funds. (Many State and local governments use these funds to purchase and operate fleet vehicles).
- . Early action by the proposed Department of Energy, to identify specific programs and incentives which would encourage State and local governments to conserve gasoline.

Issue 6

The Role of Mass Transit in Transportation Energy Conservation

Although the Plan gives some recognition to the potential for energy savings with mass transit, no specific proposals are given for direct action to exploit this potential.

Summary

The expanded use of mass transit can assist in meeting energy conservation goals in the transportation sector. While the impact on energy conservation is relatively small in the near term (1 977-7985), increased use of public transportation could play a major role in promoting gasoline savings in the longer term.

Background

The National Energy Plan notes that mass transit must play a significant role in reducing energy consumption in the transportation sector. At the same time that the Nation is creating disincentives for inefficient transportation, it must begin to explore a system of incentives for more efficient alternatives to the private automobile. However, the Plan does not propose any direct action that would stimulate the development of mass transit ,systems.

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The Office of Technology Assessment conducted a study for the Congress in late 1975 on "Energy, the Economy and Mass Transit," which provides valuable insight into the mass transit - energy conservation issue. Listed below are selected major findings of the OTA report:

1. Transit's share of total energy consumption is very low at the current time-less than 1 percent.
2. The energy efficiency of bus transit is higher than for automobiles. A transit bus with 30 passengers is six times more efficient than an auto which carries an average of 1.4 persons. The operating energy efficiency of heavy rail transit is also high, but the construction of fixed guideway systems can consume large amounts of energy.

Department of Transportation Photo

3. Automobile energy conservation strategies of various kinds are much more effective in reducing oil consumption than any transit incentive strategy. **In particular, gas taxes or other actions which would raise the price of gasoline by 50 percent would result** in higher transit use and a reduction of about one million barrels per day of gasoline consumption-more than ten times the reduction resulting from a maximum pure transit strategy for oil conservation.
4. A combined strategy incorporating both transit incentives and auto restraints is the most effective strategy to promote energy conservation without lowering the efficiency of the transit fleet.
5. Achieving major increases in the use of transit and reducing energy consumption has long-run implications for national land-use and urban policy.

There is conflict among the various analyses conducted to estimate the energy saving of increasing public transport. A recent study by the Federal Energy Administration projected that doubling transit ridership by itself would produce a less than l-percent saving, or about 40,000 to 50,000 barrels per day. In another report, the American Public Transit Association implies that transit usage can save up to 178,000 barrels per day.[1] The OTA report notes that the amount of energy saved will depend upon how public transport ridership increases are achieved, incentives versus disincentives, or combinations of both.

[1] American PublIC Transit Association, "Energy Conservation & Public Transit," 1975.

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Because mass transit can have a favorable long-term impact on energy consumption, the National Energy Plan should address Federal policies to encourage the development of expanded, energy-efficient transit systems. The policies should consider the following points:

1. As petroleum supplies dwindle and increase in cost, transit systems should be capable of shouldering an increased burden of providing mobility. Ensuring that this capability exists requires continuing support of transit operations. In addition, mechanisms should exist to ensure fuel availability to transit.

2, Research and development programs centering on means to increase the energy efficiency of urban transportation systems should be emphasized. Improved technological solutions for vehicle efficiency are needed, along with greater understanding of energy savings possible through improvement of management systems. There should be increased support for investigations of the linkages between transportation facilities, development patterns, and energy demand.

3. To finance transit-related actions, gasoline taxes might be used (possibly with a direct rebate to State/local governments) to support ventures such as:
   - — A transit program for the construction, acquisition, improvement, and maintenance of mass transit facilities and equipment and for the operation of transit systems:
   - —Vanpooling or similar commuter programs with incentives for institutional purchase and management of vehicle fleets;
   - — Integrated communications and management for urban transportation systems incorporating taxi, van and car pools, bus service, and the special transportation needs of some citizens;
   - — Combinations of reserved lanes for multiple-occupied vehicles, restrictions on parking, and incentives for ride sharing which would promote high-occupancy commuting.

Federal actions can have dramatic impacts upon the shape and character of urban areas. For example, policies which promote energy conservation through such measures as encouraging growth in a manner that can be served by energy-efficient transportation should be explored. Long-term success in reducing transportation energy consumption will depend on the relative home and work locations of future urban dwellers.

Issue 7

Transportation Regulation and Energy Conservation

The Plan does not address transportation regulatory changes with regard to energy conservation even though there is a large potential among regulated carriers for fuel savings.

Summary

There are several transportation areas where regulatory actions could foster energy savings. These include changes in airline routing and duplicate flight allowances, relaxed restrictions on truck weight and empty backhauls, allowed joint rail-truck ownership, and encouragement of innovative urban transportation actions and rail operations. Economic, institutional, environmental, employment, or competitive issues usually dominate the discussion of such actions, rather than the energy-savings potential. The Plan should consider regulatory actions which have the potential for energy savings in transportation.

Questions

1. Are there reasonable modifications to Civil Aeronautics Board policies (e.g. reduction in duplicate routes with low load factors) that could improve the energy requirements without significantly affecting the quality of service?
2. Could policies or regulations affecting trucking be modified in order to promote energy conservation; for example, could actions be taken to promote full backhauls without other adverse effects ?
3. Could combined rail-truck or barge-rail companies save energy? If so, are the savings large enough to warrant reexamining existing policies in these controversial areas ?

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Buildings

Issue 8

Scope of Buildings Conservation Programs

The Plan's insulation* proposals do not adequately cover all opportunities for energy conservation in buildings.

Summary

The National Energy Plan places great emphasis on the conservation potential of voluntary, incentive-based decisions of homeowners to insulate and otherwise improve the thermal efficiency of single-family and duplex dwellings. Similar opportunities for savings exist in commercial and institutional buildings. Failure to provide adequate incentives for owners of rental and commercial property reflects a gap in the program which may not only have a strong adverse impact on renters but which will result in significantly lower energy savings than could otherwise be achieved.

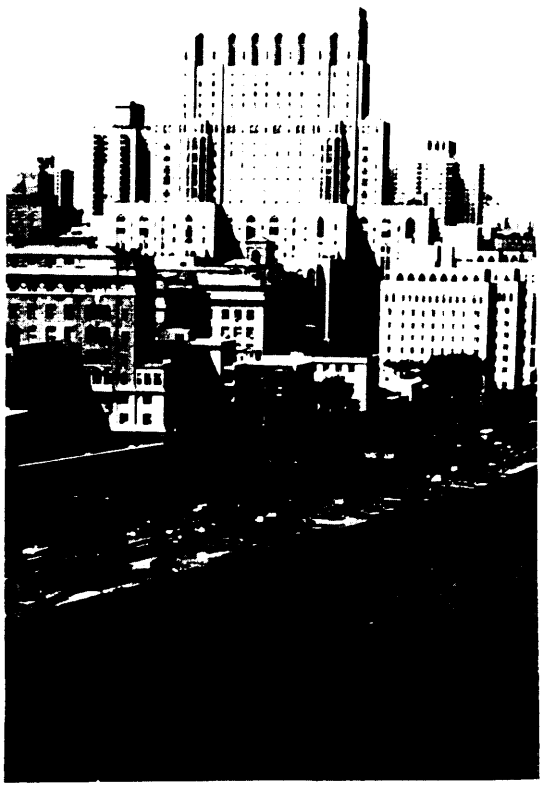
Questions

1. Why does the Plan focus almost exclusively on single-family homes and duplexes in promoting savings through insulation ?
2. What real incentives exist in the Plan for owners of multiple-family dwellings and commercial buildings to save energy ?
3. Why are buildings conservation programs voluntary in nature?

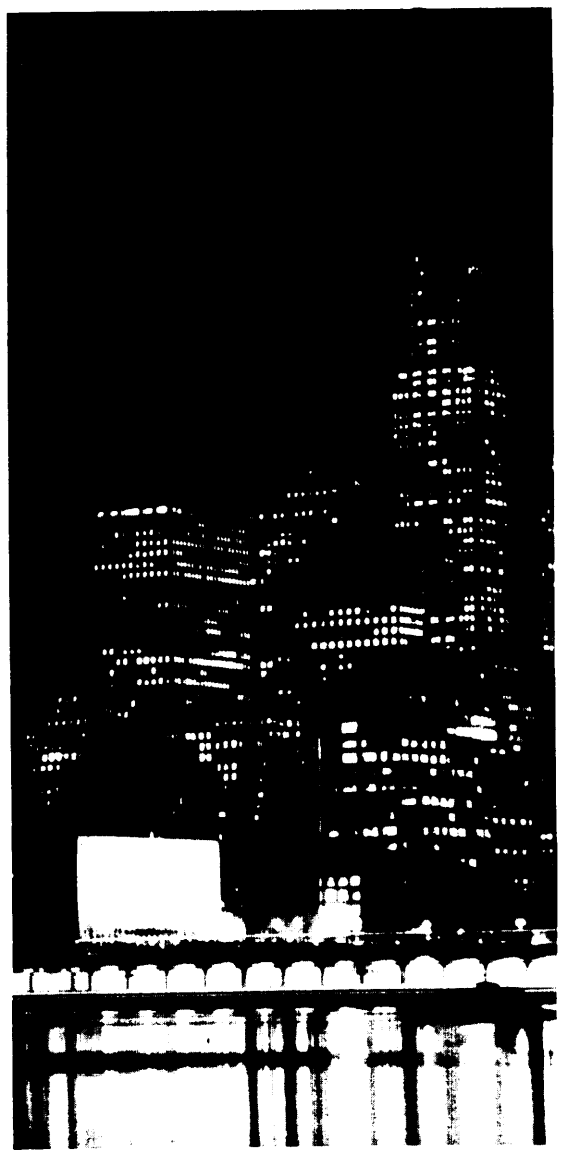
Background

Homeowners now appear to be reinsulating at a brisk pace to save money as costs rise and uncertainties grow about the availability of future fuel supplies. The Plan seeks to accelerate this trend with tax credits and utility-based financing opportunities. While single-family and duplex residential savings are important to aggregate reductions in fuel use, great potential for savings also exists in multifamily, commercial, institutional, and industrial buildings. Field studies indicate that the potential for energy savings in commercial and institutional buildings is between 25 and 50 percent of present demand (American Society of Heating, Refrigerating and Air-Conditioning Engineers). Since the types of equipment and labor required for these larger buildings are different from the materials and skills used for single-family insulation, the two efforts are not competitive. Overall savings can occur faster in the commercial/institutional area, because of high energy demand levels for these buildings and the smaller number of owners.

*"Insulation as used in this paper and elsewhere in this section refers to the covering of a building with nonconducting material to prevent or reduce the transfer of heat; it is meant to include caulking, weatherstripping, and other actions which achieve this goal.



Environmental Protection Agency Photo



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The incentives for homeowners to invest in conservation are already strong. It is generally accepted that an insulation project will pay for itself in 3 to 5 years. On top of that, the Plan would allow a homeowner to write off up to **25 percent of the initial** investment.

The Plan relies solely on a new IO-percent investment tax credit to provide incentives for owners of rental units to improve insulation. More research needs to be done to determine whether this incentive is sufficient or whether other rewards or motivations (such as expansion of the Plan's utility financing program to include these buildings) are needed. An apartment building owner who does not pay utility or fuel bills for tenants has little incentive to make a major investment in insulation; the only return would be a credit against the cost. Tenants would profit from the fuel savings. Owners of commercial property who pass on heating and cooling costs would be in the same position.

A low level of insulation activity by apartment owners who provide rental units is likely to have the most severe impact on low-income families, who must either pay fuel costs directly or through rent increases.

A related problem may occur with the Plan's proposal to prohibit electric utilities from providing service to new buildings with master meters. The measure is designed to foster conservation by tenants—in some cases, up to 30 percent, according to the Plan-but it also would have the effect of requiring tenants to pay utility costs in electric heat buildings, thus freeing a building owner from fuel bills and removing the motivation to insulate.

in view of the high percentage of income which the poor pay for energy, and the large number of people who would be eligible for direct assistance in reinsulating their homes (approximately one-half of the poor own houses) funds for the insulation grant program established under the Energy Policy and Conservation Act probably should be increased by more than the Plan proposes. The Federal Energy Administration estimates that 14 million families are considered poor or near-poor, with incomes for a family of four ranging from $5,850 to $7,300. At the proposed level of funding, fewer than 1 million families would be assisted over the 3-year life of the program.

Consideration also should be given to expanding the proposed 40-percent matching conservation grant for insulating public and nonprofit schools and hospitals to include all publicly owned buildings and facilities.

The Plan purposely makes all buildings conservation efforts voluntary, but states that it may be necessary to invoke such mechanisms as required minimum levels of energy performance for buildings at time of sale. While this approach avoids imposing requirements which impinge on the private lives of citizens, it also entirely relies on the decision to avoid higher utility bills as the motivator for installation of energy-saving devices. This raises questions of equity,

such as the problem of a low-income tenant who bears the direct costs of heating fuel. There also are questions as to whether voluntary decisions will meet the Plan's goals for reducing the amount of fossil fuel used to heat and cool homes, offices, and factories. Establishing standards for measuring the energy efficiency of buildings might produce stronger conservation efforts. Such standards could be used for energy performance labeling. Requiring that information about expected fuel costs be provided to potential home buyers could be an additional incentive for insulating.

Issue 9

Materials Availability for Building Conservation

Shortages of insulating materials may delay achievement of the National Energy Plan's conservation goals for buildings.

Summary

It is not clear that adequate material supplies will be available to insulate 90 percent of U.S. homes and all new buildings by 1985. It may be necessary to design and test new types of electric meters and accelerated production of such meters will be necessary. For insulation and other products, increased demand may inflate prices.

Questions

1. What consideration has been given to the availability of materials in setting Plan goals for insulation?
2. Can private industry supply the types of meters which will be needed for proposed utility-rate reforms at reasonable prices?

Background

In response to an expanding market for insulation, many manufacturers of insulating materials have already expanded capacity. Expansion of capacity cannot be expected to continue at a level necessary to meet a

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sharp, short-term increase in demand caused by a one-time push for insulating existing buildings. If increased demand leads to higher prices for material, the incentive to insulate may be partially offset,

The cellulose insulation industry can be expected to expand, but there are difficulties involving standardization and quality control in this industry. Also, some shortages exist in the raw materials needed to manufacture cellulose insulation, particularly paper and chemicals,

The section of the Plan that addresses electric utility rates requires that utilities offer their customers either time-of-day (peak load) pricing or the opportunity to install load management devices. This provision may create an abrupt and large demand for sophisticated metering devices capable of recording usage at two or three different rates. Such meters, containing small computers similar to pocket calculators, are not now mass produced and are consequently not available at a reasonable price for small volume electricity consumers. Manufacturers are not likely to begin the necessary research and development until they know the form that peak-load pricing programs will take. Manufacturers also will need large orders before they can begin the kind of mass production that will reduce prices. Thus, a meter supply problem is very likely to cause a bottleneck in the implementation of utility rate reforms.

Other delays in reaching Plan goals may be caused by the uncertainty as to what performance standards will be required under new energy criteria for minimum property standards. The Plan calls for the Department of Housing and Urban Development to release these new standards, required by the Energy Policy and Conservation Act, in 1980. Materials and devices manufactured for new construction will be responsive to these standards.

Issue 10

Tax Credits for Energy Conservation in Buildings

The proposal to encourage home energy conservation with a Federal income tax credit may result in losses of revenue that are larger than could be justified by the tax credit's effectiveness in accelerating energy savings.

Summary

A substantial increase during the last 3 years in home insulation and other conservation measures raises doubts about whether the Plan's tax credit proposal could accelerate the pace. Unless a tax credit provides a major increase in home insulation projects, the reduction in tax revenues could not be justified. It may be more effective to direct the tax credit at innovative technologies which carry higher risks but which could result in higher long-term gains.

Questions

1. What is the likely impact on the Federal budget of the proposed tax credits ?
2. Does available evidence suggest that privately initiated insulation programs will accomplish much of the Plan's goal even without a tax credit?
3. **Should consideration be given to the use of an "energy budget" for qualifying** buildings for a tax credit?

Background

The National Energy Plan calls for a tax credit to homeowners of **25** percent on the first **$800** and 15 percent on the next $1,400 invested in residential conservation measures. This effort to upgrade the thermal efficiency of buildings could result in a substantial impact on the Federal budget. If as the Energy Plan says, "conservation pays" at today's energy prices and will pay even more handsomely as energy prices rise, it may not be necessary to offer tax credits to stimulate home energy conservation. Private investment in home insulation and other

Federal Energy Administration Photo

heat-retaining measures has increased sharply as homeowners have reacted to increasing fuel prices. A tax credit would increase the reward to owners who invest in conservation, but it is not clear that the national benefits would be commensurate with the loss of revenue or that greater gains could not result from the use of these tax expenditures as direct subsidies for alternative programs to save energy.

The Plan correctly assumes that investments in insulation and other measures such as storm windows and furnace-efficiency devices will lead to energy savings. In some circumstances, however, these savings may not occur. It is also possible that consumers will invest any money they save from insulation in energy-consuming devices such as air-conditioners or balance out the dollar savings with higher thermostat settings after insulation is added.

In light of these possibilities, it may be desirable to direct the tax credit at actual energy savings rather than at designated hardware. A tax credit, for example, could be triggered upon demonstration that total energy consumption in a household had been reduced below a given base period. This approach would also allow for continuing flexibility in implementing the tax credit proposal, and avoid the problems inherent in a program based upon a list of devices specified as acceptable for credits,

Citizens in local jurisdictions which implemented district heating systems could also receive tax credits in amounts related to the quantities of energy saved.

Issue 11

Mandatory Standards for Major Appliances

The Plan's proposal to make home appliance standards mandatory could be expanded to make it more effective.

Summary

The proposal in the National Energy Plan to make mandatory the home appliance energy efficiency standards developed under the Energy Policy and Conservation Act (EPCA) could be strengthened by setting a short-term standard based on existing technology for immediate application, and a long-term standard so that research and development could begin now. Additionally, the Plan should clarify whether or not States could establish more stringent standards where these are shown to be more cost-effective.

Questions

1, Are there plans to provide sufficient lead time for efficiency standards which will go beyond present technological capacity?

2. What measures are being taken to ensure Federal-State coordination in selling standards and to allow maximum flexibility for regional differences?

Background

The National Energy Plan proposes the replacement of the present voluntary program, as established by the Energy Policy and Conservation Act of 1975, with mandatory minimum standards on certain major home appliances. Presumably, the mechanisms set by EPCA for establishing the standards, with the National Energy Bureau of Standards performing technical evaluation, will remain. The proposal could be more effective if a two-part standard was set. The first part would be based on existing technology and could be applied immediately. Studies at the Oak Ridge National Laboratory have shown that significant energy savings can occur over the next 25 years if more efficient major appliances, including heating and cooling systems, are introduced into the market at this time. To allow for continued development, a second standard could be set now and introduced at a later time. This would act as an incentive to begin extensive research and development to improve major appliance efficiency even further.

Federal Energy Administration Photo

While energy labeling for small appliances is important in providing correct information to consumers, by far the largest energy savings will accrue through greater efficiency in heating, air-conditioning, and water heating. Appliances generating central heating account for more than 50 percent of residential energy use. in *setting* performance standards, emphasis should be given to these devices. There are well-established standard tests to measure the coefficient of performance of heat pumps and the steady-state, full-load efficiencies of direct combustion furnaces. Use of these standards will make consumers more aware of the sources of various reductions in seasonal performance such as cycling, pilot light, and hot air duct losses. Finally, the standards should make homeowners more willing to replace their existing central heating systems as they become aware of the economic benefits of using more efficient heating systems.

A final consideration is the question of interaction between State and Federal governments in setting standards. Some States have already set major appliance efficiency standards and the Plan is not clear on how its proposals will coordinate with those. For example, it might be useful to allow States to set more stringent standards than the Federal Government for some appliances when it can be shown that that is more cost-effective for residents of a State. This would most likely be the case for heating and cooling systems because of large regional climate differences. Before such an allowance is made, its effect on appliance manufacturers who could be required to build to a number of different standards, should be carefully examined.

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Issue 12

Communication of Conservation Information

Effective implementation of a major insulation program will require increased access to technical and cost/benefit information for homeowners. The commitment of homeowners to conserve will be reinforced by Government actions showing serious efforts to conserve.

Summary

Although the importance of energy conservation in buildings has been widely publicized, many owners find it difficult to decide which technical information is valid when they are making conservation decisions. General public skepticism about the importance of conservation is underscored when governmental agencies appear to be wasting energy, A national energy policy should emphasize better communications programs as well as highly visible Government conservation programs.

Questions

1. How can correct and useful information on the technical aspects of buildings conservation best be made available to the public?
2. What can be done to reduce energy consumption by governments to provide a symbol of equitable sacrifice?

Background

Many homeowners express a desire to conserve energy, but surveys indicate that many also are unsure about which actions are most cost-effective, and many others believe that "someone else should do it". Homeowners have little faith in existing sources of conservation information such as utilities and oil companies because they perceive the sources to have a financial interest. Consumer surveys also indicate that Government efforts to encourage conservation through general slogans such as "Don't be fuelish," have little or no effect on consumer behavior. These surveys suggest a need for specific practical advice on how to conserve, preferably delivered by parties perceived to be objective, trustworthy, and well-known to the consumer.

Many organizations with long histories of public service can provide energy saving information. Financial institutions, professional organizations, labor unions, and other groups with national and local chapters or units could effectively participate in a national effort to disburse correct and credible information. Existing State energy offices and the energy extension services already authorized by Federal law could play a major role in providing information to the consuming public. These organizations could be particularly effective in dealing with special local or regional needs and could maintain contact with civic organizations which are close to the people affected by energy policy changes and price increases. An energy plan should be explicit in providing both a role and the necessary financing for such agencies to help promote conservation policies.

Public skepticism about the importance of conserving energy is reinforced when Government agencies and officials appear to waste energy. Every Government car that exceeds Federal speed limits, every Government building that is lighted for purely decorative purposes, every Government office that is too warm in winter or too cool in the summer contributes to public doubt that the energy crisis really exists. It probably is necessary to reduce Government consumption of energy for symbolic reasons as well as conservation.

Issue 13

Crude Oil Equalization Tax and Heating Oil Use

The proposal to spare homeowners from the full impact of the crude oil equalization tax is at cross-purposes with the National Energy Plan's efforts to reduce energy consumption in homes.

Summary

The National Energy Plan proposes a crude oil equalization tax to raise oil prices to world levels over a 3-year period. The Plan also proposes to reduce the tax—through a refund to distributors-n domestic oil delivered to residential and small commercial consumers of heating oil. The effect of this provision runs counter to the Plan's goal of reducing energy use, because these customers would be buying oil at prices that would reduce their incentive to conserve. The administrative burdens of the proposal on heating oil distributors may put them at a disadvantage compared with electric and natural gas utilities; the proposal also may cause regional inequities.

Questions

1. Could the conflict between the Plan's proposals for conservation and its proposals for lower cost home heating oil be resolved by distributing the rebate

on an annual lump-sum basis rather than as a current price reduction or withholding tax reduction ?

2 Will the rebate scheme place excessive administrative burdens on fuel oil distributors?

3. Since imported oil is not eligible for the rebate, will the rebate create inequitable benefits and hardships in different regions according to the relative availability of domestic supplies in those regions ?

Background

The National Energy Plan proposes to assure lower prices for home heating oil primarily by subsidy payments to distributors who do not pass on the full crude oil equalization tax to users of home heating oil.

The proposal to cushion residential energy users from sudden and significant cost increases is in conflict with another—and central component of the energy plan: conservation. The more secure homeowners are against oil price increases, the less inclined they may be to reduce consumption.

If the rebate were given as a lump sum at years end-as is proposed with gasoline taxes and the general crude oil equalization tax revenues—there would be a significant time delay between payment of the higher cost and receipt of the refund. A relative price increase for fuel oil would then be apt to dampen demand, despite the fact that the real income effect of a subsequent lump-sum rebate would reduce net savings slightly.

It may be that concerns other than those for energy savings compel the proposed treatment of residential oil heating customers. If, for example, the proposed scheme is dictated by concern for low-income families, other solutions may be available that will not undermine conservation impulses.

Another concern raised by the home heating oil tax-rebate system is the administrative burden it will place on distributors. Under the Plan, distributors would be primarily responsible for holding down the purchase price of home heating oil. The Plan also requires separating domestic from imported distillate oil when giving the rebate because imports do not qualify. Aside from the problem of convincing customers that all of this is being done correctly, the mechanics of implementing the Plan may be a burden for some heating oil distributors, particularly small companies. The approach also is likely to create intense competition for domestic supplies. Consumers in regions heavily dependent on imported distillates will not benefit from the rebate unless a complex allocation system is devised to spread domestic supply equitably across the country. Such a system is likely to be unworkable. If the tax rebate proposal is to be carried out, other means for administering it should be explored.

Issue 14

The Role of Financial Institutions

The Plan's proposals probably are not strong enough to encourage financial institutions to increase the funds available for loans for home energy conservation projects. However, the impact of rising fuel prices on homeowners may force a more active role on these institutions.

Summary

Financial institutions have not promoted loans for residential insulation for two reasons: 1) most such loans are too small to provide an attractive return to lending institutions; and 2) banks and savings and loans associations have not been able to package such loans and pass them on to the secondary mortgage market.

Questions

1. **What incentives are needed to encourage more activity among primary financial institutions in financing energy conservation ?**
2. **What types of new financing mecha-**nisms can be created to meet the specific needs of homeowners, particularly those planning to invest less than $1,000 in projects?
3. Is it appropriate for utilities to function as federally insured lending institutions for insulation projects as proposed by the Plan?

Background

The National Energy Plan offers a number of mechanisms to expand the role of financial institutions, both primary and secondary, in making loans for home energy conservation measures. While these mechanisms may make some difference in the flow of funds, the market signals being generated to homeowners and mortgage holders by rising fuel prices may exert more influence on the attitudes of banks and other lenders.

The Plan would amend the Federal Home Loan Mortgage Corporation Act to allow the Corporation to deal in packages of small residential energy conservation loans. This should help generate more loans. The high fixed costs of servicing small home improvement loans could, however, continue to be a barrier to real growth in volume of such loans. other efforts that could be made to make small loans profitable to lenders include uniform processing requirements and arrangements to permit homeowners to reopen their existing mortgage instruments and borrow a "future advance" against accrued equity.

Barriers to home ownership arising from fuel costs are now beginning to block home purchases for growing numbers of Americans. Delinquent payments and even mortgage defaults could grow as utility costs rise. An erosion of savings already has begun as homeowners draw on funds to compensate for high winter fuel payments. These factors alone may encourage first-line institutions to make small conservation loans if for no other reason than that they might protect the investment of the lender and reduce the rate of mortgage foreclosures.

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A possible signal to lending institutions of the magnitude of energy costs would be the inclusion of information on ability to meet fuel costs on forms used to qualify borrowers for federally backed loans. In addition to present calculations used to determine principal, interest, taxes, and insurance (PITI), energy costs could be indicated (PITI + E). This would focus attention on this cost component of home ownership, and, because of the widespread use of these forms, might also increase general awareness of energy problems.

The problems of financing insulation investments seems to affect middle-income families most severely. More affluent homeowners tend to purchase energy saving improvements without outside financing. Low-income families must rely on Federal grant programs.

The Plan proposes a 2-year study by the Secretary of Housing and Urban Development to determine an actuarially sound premium rate for energy conservation loans, as the basis for setting such a rate. This should be a valuable base for reflecting risks of, and the proper rate of return on, innovative or ''unproven" technologies.

Financial institutions could play a larger role in providing information on the costs and benefits of energy conservation in all buildings. However, lenders are often reluctant to quantify the savings which might result from a specific investment, because they might be held accountable if the savings were substantially below expectations. Lenders, utilities, and contractors might do well to cooperate in developing technologies for performing energy audits so that estimates of potential energy and dollar savings would be a shared responsibility of experts in finance, energy, and construction.

Under the Plan, utilities would become federally insured lending institutions for purposes of energy conservation loans to residences. This proposal raises many questions about competition with lending institutions, and about the ability of utility companies to conform with the regulations imposed on lending institutions. For many utility companies, the required paperwork may not be worth the Federal loan insurance or guarantees that the Plan seems to offer.

Utilities

Issue 15

Conversion of Electric Utilities From Natural Gas

It may not be possible to achieve the National Energy Plan's goal of a ban on the use of natural gas to generate electricity by 1990.

Summary

The goal of eliminating the use of natural gas by electric utilities by 1990 can be met, but the schedule could be easily upset. The total investment required to make the conversion from natural gas to coal is manageable on a national scale, but regional differences may place intolerable burdens on utilities in some locations. A major uncertainty is the extent to which industry may shift from the use of oil or gas to electricity rather than coal. If the trend is to electricity, the added capacity requirements, coupled with the ban on the use of gas, could easily exceed the financial capabilities of some utilities. The Plan's proposals could pose other problems as well. The Plan excludes only those peak-load plants which are a "substantial portion of the total generating capacity" from the ban on use of natural gas, which means that minor uses of gas must be converted, These conversions may be very difficult and costly relative to the amount of gas that would be saved. Finally, the Plan's proposed restrictions on converting to oil, even on a temporary basis, may force some facilities out of service if an equivalent coal capacity cannot be developed by 1990.

Background

The National Electric Reliability Council reports that in June of 1976, 59,000 megawatts of gas-fired generating capacity was in operation in this country, approximately 12 percent of the Nation's total. The Edison Electric Institute estimates that the conversion of this capacity would, under favorable circumstances, take 8 to 10 years and cost at least $22 billion in current dol-

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lars. Virtually none of the gas-fired generators is capable of operating with coal and conversion would essentially involve building a completely new steam supply system.

An incremental expenditure of $22 billion for the industry as a whole is a significant, but perhaps manageable, undertaking. However, Federal Power Commission data indicate that during 1976, utilities in four states consumed nearly 70 percent of all of the natural gas used to generate electricity: Texas, Oklahoma, Louisiana, and Arkansas. Due to rising prices for, and declining availability of, natural gas, electric utilities in those four States are already on crash programs to reduce their dependence on natural gas; their construction budgets are heavily committed to this purpose, For instance, one major Texas utility system which relied exclusively on natural gas in 1972 had converted approximately one-third of **its** powerplant capacity to coal by 1976 and expected **to** produce more than two-thirds of its **power with coal and** nuclear units by 1982. Additional expenditures of the magnitude which would be necessary to accelerate these existing construction programs will be very difficult, if not impossible, to achieve.

A number of uncertainties greatly diminish the likelihood of meeting the 1990 **natural gas goal. One is whether demand for electricity will increase because industrial plants decide to use electricity instead of oil and natural gas. It appears that this will be the choice** for a large share of industry which will try to avoid the difficulties and unknown costs of direct coal use. Such an increase **in demand would** occur at the same time that utilities were trying to replace natural gas units with coal units.

Two aspects of the Plan seem to compound the gas conversion problem. The primary emphasis of the utility industry conversion program is directed at converting intermediate and baseload equipment, where most of the natural gas used by utilities is burned. Present utility plans do not contemplate accelerated replacement of peak-load generators because they consumed minor amounts of natural gas and because costs of replacing facilities would be very high compared with the small amounts of natural gas that could be saved. However, the Plan may upset the utility timetable with its proposal that peak-load plants may be exempted, only if it can be shown that a peaking plant "is a substantial portion of the total generating capacity" of a utility system. The Plan's goals might be better served if it required conversion only of peak-load plants that provided a significant amount of a system's total capacity. In any event, some effective exemption for small use of gas in peaking plants should be considered, especially where utilities face a significant conversion burden under the 1990 deadline for ending the use of natural gas. Another potentially serious problem arises from the Plan's apparent intent to restrict conversion of gas-fired plants to oil. Most of the units involved are designed **for gas firing, but could burn oil at reduced capacities. Utility conversion plans generally anticipate moving some gas units to oil as part of a phased shift to coal or nuclear power.** If natural gas is to be eliminated as a boiler fuel by 1990, utilities may have to be permitted to shift gas-fired units to oil as an interim measure.

Issue 16

Electric and Natural Gas Utility Rate Reform

Some of the specific utility rate design and regulation provisions in the National Energy Act might reduce the likelihood of achieving the objectives of rate reform.

Summary

The rate reform proposals in the National Energy Plan provide an opportunity to move electric and gas utility rates closer to a "cost-based" level. More flexibility is needed in the proposals, however, to increase the probability that this goal will be achieved. In particular, the prohibition of declining block rates may not always be consistent with "cost-based" rates. As for time-of-day rates, flexibility is also needed to account for regional differences and to ensure that implementing such rates does not create new peaks. Time-of-day rates for residential customers will also be of limited effectiveness until economical storage systems are developed and the public is made more aware of the advantages of, and opportunities for, load shifting. Finally, more consideration should be given to the use of marginal or incremental costs in setting rates which would more closely approach replacement costs.

In the administrative area, the Plan should consider extending the coverage to all utilities generating at least 200 million kilowatt hours per year to pick up some of the Nation's fastest growing utilities. The Plan should also consider financial assistance to State utility commissions to help them carry out the Plan's provisions more effectively.

Questions

1. Would the suggested reforms bring about a large enough decline in electricity growth rates and new capacity needs to justify the Plan's proposal for an unprecedented Federal intervention in a traditional State jurisdiction?
2. Is there an irreconcilable inconsistency, at least in some instances, between the goal of cost-based rates and the prohibition of declining block rates?
3. Is the legislation too rigid because it specifies the kinds of rates which must be offered—i.e,, time-of-day, seasonal, and interruptible?
4. Should Federal energy policy require that rates be based on marginal or incremental costs, which reflect the expense of providing additional generating capacity, rather than the "embedded" cost of existing capacity?
5. Does the Plan apply to enough utility systems across the country to provide maximum coverage and effectiveness ?

Background

The avowed purposes of the proposed utility rate reform measures are to encourage economic efficiency, reduce consumption of oil, natural gas, and other energy resources, ensure additional generating capacity, provide fair and reasonable rates, and prevent States that adopt such

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reforms from being at a competitive disadvantage with States that do not.

Current utility rates and practices do not necessarily discourage conservation and create demands for new capacity to the extent that mandatory federally imposed and enforced reforms are justified. The Administration's estimate of 1985 electricity demand under the Plan is only the equivalent of 800,000 barrels of oil per day lower than the demand would be without the Plan, but it is not clear how much of the projected reduction in demand would result from rate reform, It is possible that tampering with peak loads might simply create new peaks, without reducing new capacity needs. Questions have also been raised about the constitutionality of the proposed Federal role,

Residential customers who use relatively small amounts of electricity often are the most expensive customers to serve, due to requirements of meter installation and reading, bill collection and processing, connection and disconnection, and the ratio of transmission costs to usage. True "cost-based" rates must reflect these costs, yet the Plan proscribes rates which decline as consumption increases. In apparent recognition of a possible conflict, the Administration's draft bill adds the caveat, "to the maximum extent practicable, " to the mandate for cost-based rates. Yet there is no room for compromise in the proscription on declining block rates.

Utilities can be expected to recover the added costs of serving low-volume customers by imposing two-part billing systems consisting not only of an energy charge (a per-kilowatt-hour rate reflecting generating costs), but a "demand charge" (based on a customer's peak demand during the billing period, and reflecting capacity costs). Spreading demand charges over greater kilowatt-hour usage inevitably tends to reduce the unit cost of demand. This would appear to violate the requirement that the effective rate per kilowatt hour not be allowed to decline as usage increases. Spreading metering costs and other fixed customer costs over varying consumption levels poses the same problem.

This raises a question as to the wisdom of the extreme specificity of the rate-design requirements in the proposed Plan legislation. Greater flexibility of actual rate design, subject to review by the Administration for consistency with national policy goals, may be more productive.

To illustrate, the table below shows three rate options for a given situation. Rate No. 1 is the true apportionment of each customer's costs to the charge he pays, as mandated by the Plan. It is actually a declining effective rate. Rate No. 2 is a single flat-commodity rate which observes the Plan's prohibition on declining rates, but fails to reflect true costs of serving each customer. Rate No. 3, a traditional declining block rate, relieves the small user of part of his full cost, but still recovers from him more of his costs than does the flat-commodity rate. These examples suggest that greater flexibility in the specifics of rate-design judgments may be desirable.

Example:

	Customer A	Customer B	Customer C	Customer D
Monthly usage	250 kWh	500 kWh	750 kWh	1000 kWh
cost of service (in dollars)	37.50	45.00	52.50	60.00
Rate 1. Charge under 2-part rate	37.50	45.00	52.50	60.00
Effective cost per kWh	15¢ per kWh	9¢ per kWh	7¢ per kWh	6¢ per kWh
Rate 2. Under flat single rate (7.8¢$ per kWh)	19.50	39.00	58.50	78.00
Rate 3. Under declining block rate (9¢ for first 500 kWh; (6¢ for next 500 kWh)	22.50	45.00	60.00	75.00

The blanket prohibition of declining block rates for natural gas utilities also should be reconsidered. As with electric utilities, it is not clear that prohibiting declining block rates for natural gas is consistent with the concept of basing rates on the actual cost of service. About 60 to 70 percent of the total revenues represent the cost of natural gas. The rest covers fixed costs and the cost of storage to meet winter peaks, Further, as a system's load factor declines, the fixed costs make up a higher percentage of the total revenues and the cost per unit of gas to the customer increases. Since small users (residential customers with high seasonal peaks) have the lowest load factor, the cost of servicing these customers per unit of gas is usually highest among all classes of customer. Current rate schedules are set to reflect these differences, although they may more than compensate, leading to subsidies of large volume users by small users. A flat rate would eliminate this subsidy, but probably would go too far and favor small users at the expense of large volume customers. A provision which permitted more flexible rate setting, perhaps determined after experimentation and on a regional basis, could eliminate the problem. Elimination of declining block rates within a given class, but not among consumer classes (i.e., residential, commercial, and industrial), would increase the incentive to conserve. A two-part rate schedule probably would be required, however, as in the case of electric utilities.

As a general proposition, time-of-use rates are effective in reducing peak demands, improving load factors, and reducing needs for additional generating capacity. However, there has been little actual experience with these rate devices to date, and it remains to be seen how effective they are in actually changing load patterns. Additional measures could be adopted to substantially increase their effectiveness. For example, a concerted Federal R&D effort in developing economical thermal-storage

devices could eventually enable many more consumers to shift their use to off-peak periods. In addition, a vigorous public education campaign is a necessary part of any peak-load pricing scheme, Utilities must help customers adapt to new rate structures, for example, by showing them how to change their daily habits with regard to such uses as water heating and air-conditioning. Presumably, these would be part of a utility's conservation program.

There is some concern, too, that peak-load pricing could backfire in certain cases by creating new peaks. This could be a serious problem in summer-peaking areas where there is a rapid increase in electric heating. Care should be taken to design rates which do not encourage off-peak uses likely to create new peaks, It may be desirable, too, to test load-management options before mandating that they be offered.

Finally, it may be desirable for the legislation to go a step further, requiring that rates be based on marginal, or incremental, costs, which reflect the expense of providing additional generating capacity rather than the "embedded" cost of existing capacity. Under the Administration's draft legislation, customers who increase on-peak consumption pay historic costs for that increased use, even though the marginal cost of meeting those needs is much higher. Thus, the consumer has an economic incentive to use more electricity, even though conservation might be a considerably cheaper alternative under marginal cost pricing.

Dramatic and sudden price changes should be avoided; gradual changes will permit adjustments to be made in an orderly manner and, at the same time, provide appropriate signals for future prices. One means to achieve the same result as marginal pricing would be to include construction work-in-progress (CWIP) in the current rate base. Although this would result in slightly higher prices in the short term, price increases would be more gradual than with orthodox marginal cost pricing.

The utility regulatory proposals in the Plan and the draft legislation apply only to utility companies which sell more than 750 million kilowatt hours (kWh) per year. This excludes approximately 50 (out of 200) investor-owned companies and the majority of publicly and cooperative owned companies, but it does cover between 85 and 90 percent of the Nation's electricity generation. it contrasts with electric rate-reform legislation introduced in the House of Representatives earlier this year, which covers all companies selling over 200 million kWh annually. The extra administrative burden which would be imposed by the lower cutoff may be justifiable in order to cover some of the Nation's fastest-growing electricity companies, such as the rural electric cooperatives.

The Plan's electric-rate proposals do not include Federal financing aid for State utility commissions. The workload of these agencies is bound to increase as a result of these Federal requirements and most are already understaffed and underfunded. It is not likely that many State governments can afford to follow the proposed Federal regulatory policies. The Plan should provide Federal funding for State commissions to help cover the higher costs.

In sum, the Plan's rate proposals need refinement and added flexibility, but they can be effective tools for encouraging conservation,

Issue 17

The Impact of the Plan's Tax Proposals on Electric Utilities

The tax proposals of the National Energy Plan could affect electric utilities in ways which would be contrary to the Plan's long-range goals.

Summary

The Plan proposes a series of fuel taxes and tax credits which will affect electric utilities both directly and indirectly. These proposals may produce unintended consequences that would impede progress toward the Plan's overall goals. The most serious of these could arise from the consumption tax on oil and natural gas, which is intended to discourage the use of oil and natural gas to generate electricity. Since utility conversion schedules are fairly rigid, many utilities might choose to pay the tax on oil and gas rather than push construction projects to meet the conversion schedules. The Plan's tax proposals also may result in a temporary price advantage for homeowners who use oil and gas for home heating over those whose homes are heated with electricity. Owners of all-electric homes will not receive rebates under the Plan; in addition, they will be paying fuel taxes to the extent that the utility in their service area uses oil and natural gas. Finally, the question of whether electric utilities are entitled to tax credits for cogeneration and conservation technologies needs to be clarified.

Questions

1. What side effect will the oil and gas taxes on utilities create?
2. What effect will the crude oil equalization tax and rebate program have on the consumption of electricity and on utility load factors and expansion plans?
3. What effect will the proposed tax credits for energy conservation expenditures and solar expenditures have on utility load factors, peaks, and capacity needs?
4. Will utilities be eligible for the 10-percent business energy tax credit which the Plan proposes for cogeneration and other conservation measures? If not, will there be sufficient incentives for utilities to enter into cogeneration arrangements ?

Background

Utility Oil and Gas Consumption Tax and Rebate.—Beginning in 1983, utilities will be taxed for the oil and gas they use to generate electricity. The companies will be eligible for rebates of these taxes if they make investments in equipment needed to convert to coal or energy sources other than oil or gas. The tax/rebate combination is intended to provide both a penalty and an incentive, which together will induce a rapid shift of generating plants away from oil and gas. The essential question is whether these provisions will, in fact, accelerate such fuel

conversions. There appears to be little or no flexibility on conversion schedules between now and 1983, and the tax and rebate proposal may have little effect on conversions even after that date. In fact, if the tax is imposed without a parallel mandate to stop using oil and natural gas, some utilities may choose to pay the tax and stretch out their conversion schedule. This becomes plausible when the impediments to conversion are considered. These include the long-lead times required for capital expansion planning; the uncertainties associated with complying with ambient air-quality standards; "best available technology" requirements; nondegradation policies; limits on the capacity of the mining industry to meet rapid increases in coal demand; and bottlenecks in the acquisition of boilers and other equipment needed for conversion to coal. In short, it may be both easier and cheaper, in many instances, for utilities to pay the tax and forgo the rebate rather than accelerate their conversion schedules. Although taxes can be rebated up to amounts equal to conversion costs, there can be no net financial gain. A more appropriate mechanism for accelerating conversion might be a direct requirement to meet conversion schedules, coupled with exemption from the user tax if the schedule is met.

Crude Oil and Equalization Tax and Rebates.—From a utility company standpoint, the major impact of the crude oil equalization tax is a sharp increase in the cost of fuel. This can be expected to dampen demand, but it also could cause economic hardship for all-electric residential customers. Because the Plan provides for means to keep residential costs of natural gas and heating oil lower than the industrial price, the lack of a similar price break for all-electric residential customers will be discriminatory to the extent that electricity is generated by oil and natural gas.

Tax Credits.—The portions of the bill that provide tax credits for homeowners who invest in conservation measures and/or solar facilities and for businesses that make similar investments, do not appear to affect utilities in major ways. There is a possibility that peak-load problems could be aggravated by extensive shifts to solar heating and heat pumps as a result of the tax credit incentives. Extremely cold weather could cause sudden increases in peak loads as heat pump and solar-unit owners switched to electric backup systems, It may be that specific incentives should be provided for heat pumps that use oil rather than electricity as a backup. Incentives also are probably needed for onsite storage systems that can provide energy when heat pumps and solar systems cannot bear the full load.

The tax credits for residential users who invest in nonsolar conservation measures apply only to houses built by April 20, 1977. Drafters of the National Energy Plan apparently felt that new construction standards would require investments in conservation measures, so there was no need for a

reward in the form of a tax credit. However, there will be a time lag of 3 years before such standards must be adopted by the States. In the meantime, utility companies might be required to refuse service to new residences that lacked specified energy-conserving features.

The energy bill is unclear about whether the 10-percent business tax credit for cogeneration facilities could be taken by utilities for their portion of a cogeneration arrangement. It is not clear, in fact, whether the business energy tax credit applies to utilities at all. If utilities are ineligible because of the separate consumption tax rebate there may not be enough incentive for utilities to invest in cogeneration, combined-cycle plants, or other conservation measures.

Issue 18

Impacts of the Plan on the Gas Utility Industry

The pricing and regulatory provisions of the National Energy Plan regarding natural gas use will significantly alter the market for and operations of natural gas utilities.

Summary

The provisions of the Plan which discourage the use of natural gas by industry and electric utilities could lead to substantial shifts of natural gas to the high-priority, residential-commercial sector, provided moratoriums on new service are lifted. This appears to be an implied goal of the Plan, which states that natural gas supplies should be reserved for high-priority use. This shift, however, would decrease a gas utility's load factor and increase its storage requirements, which would, in turn, increase a customer's fixed charges. Prohibition of new hookups, however, would deter utilities from finding new supplies and encouraging conservation measures. The provision which permits large volume customers to be compensated if their supply contract is terminated will ease the burden of making the shift. However, not all industrial customers have entitlements to their gas supplies and customers who do not have entitlements will not be able to obtain compensation. Therefore, inequities

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would be created, possibly between direct competitors, which could be avoided with a more flexible compensation policy.

Background

The National Energy Plan contains provisions which are designed to decrease industrial and electric utility use of natural gas. The Plan dedicates the highest priced gas to industrial customers and requires that there can be no natural gas used as a utility boiler fuel after December 31, 1990. These proposals are designed to accelerate a shift away from gas that began 3 to 4 years ago. In some service areas, natural gas surpluses are forecast for the next few years. Because the lowest priced natural gas is reserved for high-priority users (residential and small commercial), there could be a substantial shift from the industrial and utility sector to the residential sector. This would take place if moratoriums against new hookups that occur in many service areas were lifted. Such a shift appears to be an implicit goal of the Plan, because it specifies that natural gas should be reserved for the highest priority customers who would have the most difficulty converting to alternative fuels.

There would be some difficulties with this shift, however. First, the greater the percentage of residential customers in a utility's load, the smaller the load factor. As the load factor decreases, the average cost per unit of gas to a customer rises because fixed charges represent a greater percentage of the total cost of servicing a customer. Therefore, as the shift occurs, residential customers will see increased bills if the utility is to maintain its financial health. Further, increased storage capacity would be needed to take care of the relatively higher winter peaks. This will also cause the customer's bill to rise. One method of reducing the problem would be to increase gas use in the summer with a higher air-conditioning load, preferably through efficient gas-fired heat pump/air-conditioner systems now under development. The benefits of doing this would have to be weighed against the increased use of gas that would be created.

Another path that may be taken by the utilities is to encourage industrial customers to keep using gas and pay the higher prices. Since most industrial customers appear to be more concerned with availability of natural gas than with the possibility that prices will rise to levels comparable to alternative fuels, they will be inclined to use gas if a utility can assure supply. This would benefit the utility since it would maintain their load factor and keep revenues steady.

The second situation is even more likely to occur if moratoriums are not lifted; utilities would otherwise face the prospect of losing surplus gas to regions where supplies are curtailed. If this occurs, it would deter utilities from finding new supplies and encouraging conservation. An aggressive conservation effort could free-up a substantial volume of gas in any given region. If a utility were forced to give up this new supply of gas to another region in short supply-even in an emergency situation—rather than sell it to new customers, the utility would have no reason to promote conservation programs. Therefore, if one of the purposes of the Plan is to shift as much gas as possible to the residential market, it

appears that the moratorium on new hookups will have to be lifted.

One other provision in the Plan is involved in this issue. The proposal to permit customers who shift away from gas to sell their contract entitlements will ease the financial burden of making the conversion and will add to the industry's incentives to do so. But not all users can take advantage of this compensation because many customers do not have such contract entitlements. These cases usually occur with large gas utilities who offer "full service" to industrial customers and do not sell to them under specific sales contracts. Therefore, inequities will arise among firms which do and do not have these contract rights. In certain cases, such firms may be direct competitors and some could be placed at a severe competitive disadvantage. By permitting a more flexible compensation policy under which all customers would be compensated upon termination of the contract, this problem would be removed. This would require involvement of a gas utility in those cases where entitlements were not owned by the customer, with the consequence that the utility would probably have to receive some compensation too,

Issue 19

Electric and Natural Gas Utility Conservation Programs

The National Energy Plan's proposal to put utilities in the energy conservation business is a departure from present practice that raises legal, technical, and economic questions for which there are presently no answers.

Summary

The National Energy Plan's utility program may be an appropriate and effective means of insulating 90 percent of existing homes by 1985, although the goal probably is too optimistic. However, it is not clear that the utility conservation program is the only, or even the best, means of meeting the Plan's objective, The proposals raise several legal questions, including those of liability, restraint of trade, and fraud; the potential effects of the program on consumer interests and on the financial integrity of utilities are not clear; there could be adverse impacts on competing suppliers of conservation measures; and there is a possibility that a prescribed list of measures will stifle innovation.

Questions

1. Do the difficulties associated with making such a program mandatory for utilities outweigh the advantages, in light of other potential means of ac-

complishing the goal of insulating or reinsulating 90 percent of existing homes?

2. Are State utility rate-making authorities to implement the conservation program?
3. How far will utility companies be required to go in pressing their conservation services on their customers?
4. How are utility companies to deal with potential legal problems arising from the program?
5. What are the financial implications of the program for the utility companies ?
6. What will be the criteria for determining whether a utility is offering its conservation services at "fair and reasonable prices and rates of interest" and is not engaging in "unfair, deceptive, or anticompetitive acts"?
7. Will utility programs have an adverse effect on existing businesses and on consumer interest?
8. Does the legislation take the proper approach in listing conservation measures to be included in the utility programs ?

Background

It is not clear that the utility program should be mandatory, in view of the fact that other means of conservation delivery and financing are available, including a voluntary utility program. The proposal to use convential lending institutions to finance weatherproofing projects also may present obstacles, including a general reluctance to make loans of less than $1,000, and the prohibition against refinancing mortgages that have been purchased by the secondary market. It does seem clear that adding financing and marketing of conservation devices to the traditional functions of utility companies is a break with past custom that should at least be preceded by careful analysis to determine whether the benefits are worth the difficulties.

The Plan and the draft legislation require utilities to offer conservation services to all customers, to inspect residential buildings, and to estimate the energy savings that can result from weatherproofing and other conservation measures. Customers are not required to accept an offer of such services. To meet the terms of the Plan, a utility must go well beyond its traditional relationship with residential customers-reading electric or gas meters and billing for services.

The change in relationship raises a number of legal issues. Does a utility's use of a particular product of the services of a contractor imply a warranty of products or services ? When a utility supplies its customers with lists of alternative financing and servicing options, does the implied warranty extend to these alternative sources? If a utility fails to list or recommend a particular source, does the installer or manufacturer have legal recourse against the utility company?

The draft legislation gives a proposed Secretary of Energy responsibility for determining whether utilities are charging fair prices and interest rates, or are engaging in

anticompetitive practices, but the draft does not spell out criteria for these decisions. Presumably this will be done by rulemaking. It is not clear, however, whether uniform critiera can be applied to all utilities and/or al l states, since applicable laws vary widely. For example, does a Government determination of "fair and reasonable prices" imply price fixing, restraint of trade, and a potentially anticompetitive practice? Most States have delegated interest rate-setting (or at least ceiling-setting) authority to agencies that regulate financial institutions. Does the proposal create legal and economic conflicts? If so, how will they be resolved?

Under the Plan, a utility company's conservation program must be designed and administered as an integral part of the company's overall operations. How is capital to be raised? What will be the impact on a company's overall debt service, bond ratings, profit margin, and rate structure? How will the requirement to enter an essentially new line of business affect stockholders? These questions must be answered on an individual company basis. To do so, companies must have sufficient flexibility within the Federal and State requirements.

At present, approximately 75 percent of home insulation business is handled by building supply marketers or do-it-yourself retailers. The effect of a massive utility program on such businesses, and—to a lesser extent—on competing installers, could be severe. The "reasonable price" guideline proposed in the Plan will affect the competitive positions of existing installers and suppliers.

[t may be unwise to fix in law the conservation measures that may be taken under a mandatory program. While there is some flexibility built in (the Administrator can add to or subtract from the list by regulation, and there is to be variety in the "suggested measures" for different climates and construction categories), the very existence of a list may discourage development of new technologies. For example, is it wise to offer financing and installation of add-on devices for old furnaces but not to offer the same terms for purchases of new furnaces or heat pumps?

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Issue20

The Research and Development Role of the Electric Utilities

The tax and expense status of electric utility research and development (R&D) expenditures are not adequately addressed by the National Energy Plan.

Summary

The ninth principle of the National Energy Plan calls for large-scale conversion from oil and natural gas to more abundant energy resources, which for the short term to mid-term will be coal. However, the ability to use more coal will depend on the development of new technologies that allow coal to be burned in an environmentally safe and economically efficient manner. Thus, coal research and development in the private as well as the public sector ultimately will determine the degree to which utilities can reduce consumption of oil and natural gas. Consequently, it is important to clarify the tax and expense of the R&D expenditures of electric utilities so that their efforts can be maximized.

Questions

1. What is the appropriate role of the Federal Government in encouraging utility expenditures in R&D?
2. What is the Electric Power Research Institute (EPRI) role in meeting the R&D goals implied in the National Energy Plan?
3. Will the Internal Revenue Service (IRS) and State utility commissions continue to determine the tax and expense status of utility R&D expenditures?
4. Is it possible that under the National Energy Act certain R&D expenses could be construed as "promotional" expenses?

Background

Under the terms of the Administration draft of the National Energy Act, no new electric powerplants would be permitted to use natural gas or petroleum as an energy source. By 1990, no utility would be permitted to burn natural gas. In order for electric utilities to be able to expand their use of coal to meet this schedule for phasing out oil and natural gas, a significant R&D effort will be needed, as the Plan points out.

Until 1973, when the Electric Power Research Institute (EPRI) was established, most R&D involving electric energy, including equipment and facilities, was performed by major equipment manufacturers. As a result, R&D costs were included in the price of equipment purchased. EPRI is currently funded by all major electric utilities, both investor owned and public, with a budget of $179,5 million for 1977. There are two schools of thought as to how R&D by utilities can best be accomplished. On the one hand, legislation could encourage electric utilities to continue, and even to increase, funding of R&D activities in both the energy supply and the energy utilization functions. Such legislation might provide that the Federal Power Commission (FPC) and State regulatory bodies stipulate that

money spent either for funding EPRI or for individual utility R&D could automatically be incorporated into rate base and/or expenses, as appropriate, for determination of electricity rate levels. At present, rate base treatment of R&D expenditures is subject to approval on a case-by-case basis, although approval usually is automatic, at least by the FPC. Such legislation might also provide that R&D expenditures be considered as fully tax deductible and not be construed as "promotional" expenditures. Alternatively, there may be a need for Federal legislation to encourage increased utility expenditures for R&D since present arrangements may be insufficient.

In practically all cases, utility R&D expenditures are considered tax deductible by the Internal Revenue Service (IRS) and classed as operating expenses (rate base items) by the utility commissions, Yet, according to one interpretation of the National Energy Plan, the IRS or a public utility commission could disallow an R&D expenditure as a valid expense for tax or ratemaking purposes. Under the circumstances, consideration should be given to the appropriate role of Federal law in relation to the right of the IRS or the State utility commissions to determine whether certain expenses may properly be included for ratemaking or tax purposes.

Industry

Issue 21

Cogeneration By Industry

The Plan addresses the major problems inhibiting growth of cogeneration, although the proposals promoting cogeneration need to be more closely coordinated with coal conversion policies.

Summary

Considerations of energy conservation, environment, and economics offer strong incentives for the expansion of cogeneration of electricity and process steam by industry and utilities. The provisions in the Plan are both necessary and desirable to remove barriers to development of cogeneration. Some areas of concern remain, however, which could keep the Nation from realizing cogeneration's full potential. Principally, utility interest in cogeneration will probably be very limited for the next several years because planned expansion of generating capacity will meet or exceed demand. A policy promoting a rapid industrial shift away from oil and natural gas could reduce the long-term potential of cogeneration. To this end, there is a need to identify cogeneration opportunities and to monitor their progress in order to gauge the adequacy of the Plan as it addresses cogeneration. More information is also needed for specific site development.

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In addition, enough flexibility in the coal conversion policy should be maintained so that the "cogeneration resource base" is preserved, and research and development should be accelerated on advanced technologies for coal-fired cogeneration.

Other proposals in the Plan will affect the cogeneration potential. The investment tax credit may be too small to encourage industry to invest because industrial firms generally pay higher financing costs than electric utilities. Taxes on oil and gas used in industry cogeneration will be about twice those for electric utilities, thus encouraging industry to buy power rather than to develop cogeneration. The Plan does not consider the problems of potential reductions in reliability that may result from adding several industrial generators to electric utility systems over which the utilities do not have complete control. In addition, the Plan does not answer the question of what constitutes a fair rate of return to the utilities on purchasing and wheeling cogenerated electric energy. Finally, strategies are needed for retrofit of cogeneration facilities. Although these are not insurmountable difficulties, they will slow up progress on cogeneration until they are resolved.

Questions

1. What is an appropriate level of electricity generated by cogeneration ?
2. Will the provisions of the Plan result in achieving that level?
3. How will progress in expanding cogeneration be measured?
4. Are the Plan's coal policies compatible with its cogeneration proposals?

Background

While it is reasonable to expect that an expansion of cogeneration will be in the public interest, the low rate of construction of new cogeneration facilities indicates that the practice is not always in the private interest.

There are a number of ways in which the existing energy system discriminates against cogeneration. Strongest of the barriers to cogeneration by industry, perhaps, are financial practices that favor supply of electricity by conventional utility systems. A utility has access to capital at lower rates than does a cogenerating industry. Industry must determine the cost of power from a new facility on marginal considerations. The price of utility power with which cogeneration must compete is determined from the average cost. Even the energy program contains subtle disincentives to cogeneration. The oil and gas consumption taxes of Sec. 1501 are about twice as high for industrial cogenerators as they are for electric utilities.

There are many considerations that make electric utilities wary of industry cogeneration. They are concerned that they may have to pay too high a price for cogenerated power, and that it will not always be available when needed. Further, utilities may be required either to make major additions to transmission grids to accommodate small blocks of cogenerated power or to sacrifice transmission capacity in serving this power. Unless a utility makes an investment in cogeneration equipment, it is not permitted under most State regulations to make any

profit on the purchase and resale of cogenerated power,

Another concern is the effect cogeneration facilities will have on utility system reliability. The addition of many relatively small generating systems over which the utilities do not have complete control may magnify the problems of load flow and economic dispatch (mix of generators online). In this context, it may be appropriate to establish standards that the cogeneration supplier must meet when selling to a utility.

The proposed legislation contains a number of features which either remove obstacles to or provide incentives for the practice of cogeneration by industry. Sec. 521 enables any qualifying cogenerator to intertie with utility transmission facilities in order to sell surplus power and buy backup power at fair prices. In Sec. 522, qualifying cogenerators are assured fair rates in the above transactions; they receive exemptions from Federal and State public utility regulations. In Sec. 109, qualifying cogenerators could be exempted from oil and gas conversion in cases where exemption is necessary to stimulate construction of generators. Finally, it is proposed that cogeneration property purchases should be entitled to an additional 10-percent tax credit.

These provisions are felt to be necessary and desirable for the extension of cogeneration. They are not perceived to have significant adverse impacts on any sector of the economy or the society. The principal concern with the proposals, in fact, is that a credit considerably higher than 10 percent probably would be needed to motivate potential industrial cogenerators to construct such facilities. Consideration should also be given to determining new criteria for rates utilities can charge for resale of cogenerated power.

There are other aspects of the energy plan which motivate cogeneration. Preeminent is the increased cost of energy to the industrial user as a result of price increases and taxation, which should make the price of cogenerated electricity attractive. In an indirect fashion, the conversion to coal also offers an incentive. The technical complexity of burning coal as compared with gas or oil makes a shift to more complex cogeneration relatively less formidable. The proposals to promote industrial conversion to coal, however, also create a potential impediment to the long-term development of cogeneration. This can be seen in the following context:

Demand for new cogeneration capacity will probably not develop on a large scale before 1985 because there is a possibility of excess central station generating capacity. In 1975, the average utility reserve margin was 35 percent. Excess reserve margin will not drop to the 15 to 20 percent range, which utilities prefer, before the mid-1980's if electricity demand grows at the average rate of 5.8 percent per year in this period and present plant construction schedules are maintained. The Plan envisions growth at 4 percent per year, however, leading to the possibility of an even longer period of excess reserve capacity unless many plants presently under construction are cancelled or deferred or demand grows more rapidly than expected. Therefore utility interest in cogeneration projects will be minimal for some time. Also, if a shift of industrial boilers to coal is made too rapidly, a con-

siderable fraction of the long-term potential savings from cogeneration may be lost. If they are forced to shift to coal before advanced coal technologies are commercially available and while there is a national excess of generating capacity, many firms will be unable to work out satisfactory agreements with utilities for the sale of excess power generated onsite or for the purchase of backup power. In that case, they may either install low-pressure, coal-fired boilers (that cannot be converted for cogeneration) or they may install steam turbine cogeneration systems (which can produce only a fraction of the electricity for a given steam load that a combustion-turbine system could). In either case the maximum cogeneration potential would not be achieved for many years. If industry should convert steam functions to electricity (e.g., steam drives to electric motors) rather than install coal-fired boilers-as now seems likely in cases where this is an option—the cogeneration potential also could be reduced because the excess capacity might then be used to meet the added industrial electricity demand. If industrial conversion to electricity were great enough to use up the excess capacity rapidly, cogeneration could become very attractive to utilities because additional capacity could be put online relatively fast. This would most likely occur if industrial energy growth equal led the Plan's projected rate of 4.6 percent.

Under these circumstances, consideration should be given to scheduling coal conversion with enough flexibility to permit the introduction of coal-fired combustion turbines when fluidized-bed combusters are perfected and commercialized. This would need to be coupled with a research and development policy, as suggested by the plan, to accelerate the development of advanced coal-combustion techniques. The important point is to not lock out technologies that would have a much greater potential for long-term energy savings.

To facilitate this, provisions for identifying and monitoring cogeneration opportunities, as long as they exist, should be made. This would also greatly enhance the energy program by providing the most valid test of the adequacy of cogeneration provisions. This record could provide information long before the actual plants went into service, Since the information is site specific it would probably be best compiled at the State or local level. California electric utilities are implementing such a program for the State government.

The requirements of cogeneration in new facilities compared with those in a retrofit situation are not explicitly treated in the energy program. Incentives which are adequate to induce cogeneration in the first situation will fall far short of those required for retrofit. It is safe to say that the energy program will produce no retrofit cogeneration except where existing facilities are being scrapped and replaced for reasons other than cogeneration.

Issue 22
Industrial Conversion From Oil and Gas

The Plan does not propose methods to remove the principal constraints on conversion of industrial processes to direct use of coal.

Summary

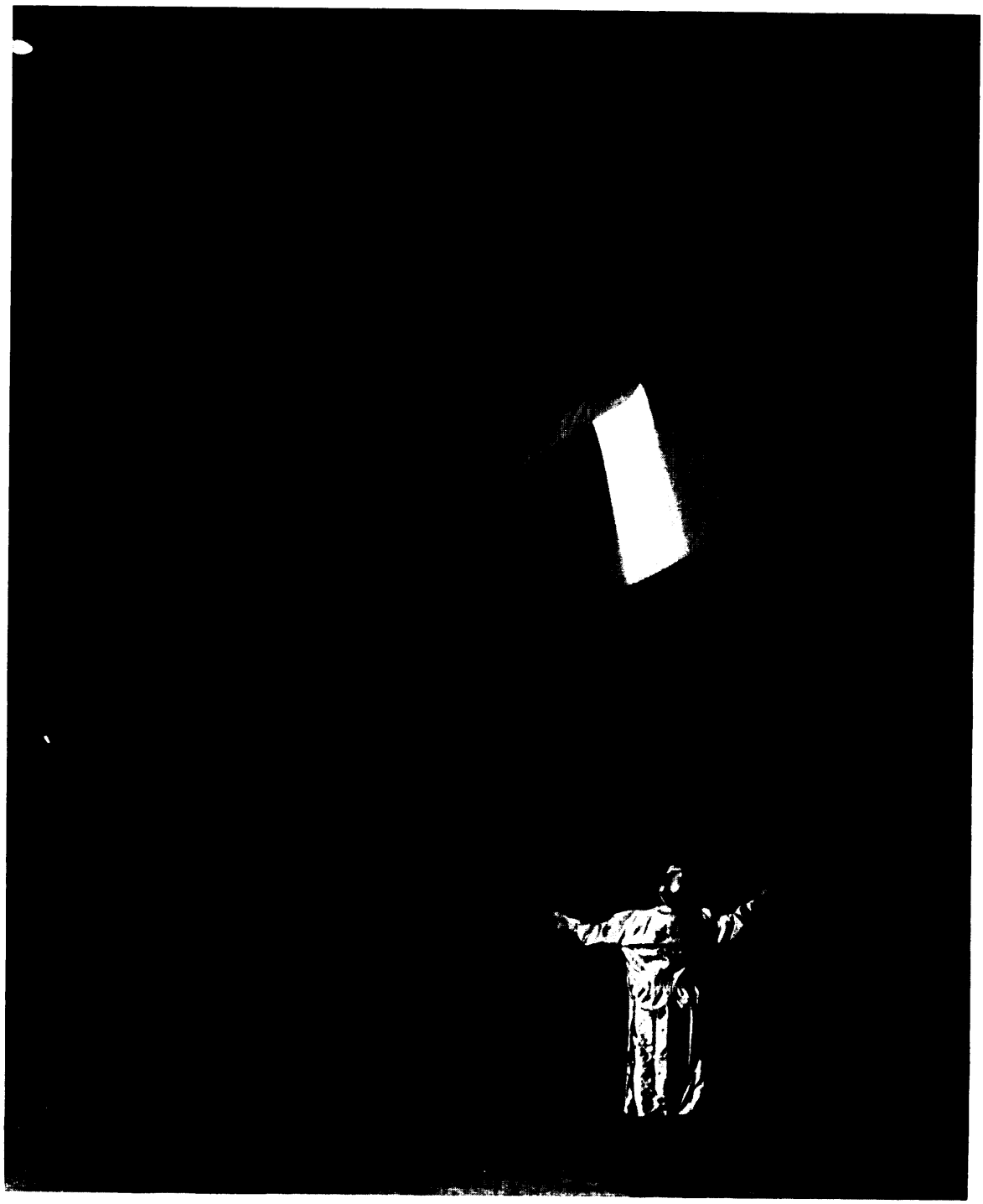
The Plan does not recognize that increased industrial demand for coal is incompatible with presently available means of distributing and marketing coal. As a consequence, industry may well convert to electrified processes where possible, and export the coal-handling problems to the electric utilities. This will be particularly true when direct heat equipment must be converted but it also could involve replacing some steam functions with electricity (e.g., steam drives with electric motors). Although apparently not the objective of the Plan, the direct use of electricity in this manner could be desirable because of the relatively low efficiency of direct combustion of coal in many process applications. In this context the plan should emphasize support by the Federal Government for scientific and technological innovation leading to the development of effective electrified processes. The Plan does not appear to adequately take into consideration the consequences of failing to meet the planned conversion goals, and it should contain specified programs for midcourse corrections. Finally, the Plan touches only lightly on the feasibility of the industrial use of solar energy, fuel wood, and burning of refuse to reduce industry's dependence on oil and natural gas.

Background

The Energy Plan relies heavily upon an increase in demand for coal among present industrial consumers of oil and gas. However, the plan omits specific incentives for production of coal and for development of systems for coal transportation and marketing to industrial users. At present, the most effective means for transporting and marketing of coal is in large-volume shipments of more than 100,000 tons per year in unit trains or on barges. Coal slurry pipelines may offer another effective means of transporting coal in volume. However, the large-scale systems for coal slurry transport have not yet been built, and it is questionable whether a large coal pipeline network can be built within the next 7 years.

By contrast, the market for coal that would be created by industrial users switching from oil and gas consists of a large number of widely dispersed installations, each of which can consume only relatively small amounts of coal. Therefore, the market would be incompatible with the present system of distributing coal.

The disparity is important. For example, unit-train and other volume shipments of coal become justifiable at about 600,000 tons per year and become economically attractive at about one million tons per year, but a typical large-scale industrial facility can consume only about 80,000 tons per



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year; a very large industrial boiler plant may be able to consume as much as 130,000 tons per year. The Administration draft of the National Energy Act defines major fuel-burning facilities as those using 100 million Btu's or more per hour and places the oil- and gas-user tax on facilities using 500 million Btu or more per year. These lower limits correspond to about 25,000 tons of coal per year. By comparison, a 500 megawatt coal-fired powerplant operating at 10,000 Btu per kilowatt hour would use about 1.7 million tons of coal per year. Coal transportation and marketing systems on the smaller scale envisioned by the Plan once existed but were abandoned when industry switched to oil and natural gas, and the present system has been developed primarily for utility markets. To accommodate the Plan, industries might be relocated so as to concentrate the demand for coal to utilize present transportation and marketing systems. This is not possible within the period covered by the Plan. A system of coal transportation and marketing might be developed to serve the industrial market as it is presently constituted, but this would require new coal retailing facilities to handle vastly increased volumes of coal shipments in urban areas where most of the industrial market exists. It is rather unlikely that this could be done before 1985. Even if either course of action were possible, they might increase the costs of using coal to the point at which using electricity would be less expensive. Coal costs would also increase because conversion would require coal combustion equipment not now commercially available and pollution-control equipment to meet environmental standards.

A third alternative is to use existing distribution systems to deliver coal to central facilities where it could be converted to forms of energy suitable for the industrial market. One possibility is to convert coal to high-Btu gas and distribute it by pipeline. But the present costs of high-Btu gasification of coal are so high that industry probably would not help finance gasification -plant construction and it is therefore very doubtful that high-Btu gas can play any significant role in reducing industrial consumption of oil and gas by 1985.

Low-Btu gasification has limited applicability because low-Btu gas cannot be piped more than 30 miles and still be competitive in price. Thus the same storage, coal handling and delivery, and environmental constraints that exist for direct burning of coal by industry apply as well to low-Btu gas.

One final alternative is to convert coal to electricity in large utility plants and to use the electricity for industrial processes that now depend on direct combustion of oil and gas. Because of the barriers to direct use of coal, industries that abandon use of oil and natural gas will probably turn to electricity. Because such a decision would require a substantial investment in facilities to replace existing oil and gas combustion equipment, a conversion to electricity would mean that industrial processes would not be changed again for many years. It is important to note, however, that the use of electricity rather than direct-coal firing would not necessarily be wasteful. First, electricity would not be used to produce steam in large boilers but to replace the functions of the steam, such as using electric motors rather than mechanical steam drives. For direct-heat applications,

most coal-fired processes operate with end-use efficiencies of around 33 percent. Since the end-use efficiency of electricity when used for direct heat is nearly 100 percent, the difference is sufficient to compensate for the conversion losses at the powerplant. Further, it may be possible to develop electrochemical processes that would use even less total energy.

If the goals of conversion in the Plan are to be met without compromising conservation goals, a major research effort is required on the science and technology of industrial processes, with a strong emphasis on electrified processes to replace those which now rely on direct combustion of oil and gas. This would be most effective if the Plan were to include support of basic scientific research, support of critical demonstration programs, and Government leadership through its own research programs and purchases of effective electrified processes.

Furthermore, the plans for conversion depend on the feasibility of modifying industrial processes so that they may use the energy from coal as indicated above. If for any number of economic, technical, or environmental reasons the modifications cannot proceed within the time frame of the Plan, then the national energy policy should contain specific programs for midcourse correct ions.

Finally, a more aggressive approach toward other means of conversion away from the use of oil and gas such as solar energy, burning of refuse, industrial wastes, and fuel wood, and other energy sources should be embodied in the Plan. Greater incentives than those presently proposed would most likely substantially speedup industry's use of solar energy.

Issue 23

The Industrial Conservation Investment Tax Credit

The investment tax credit designed to provide incentives for industrial conservation technology may be too small and too restricted in scope to do an effective job.

Summary

The National Energy Plan recognizes the legitimate need to stimulate industrial investment in energy efficiency and to reduce the disparity between the regulated rate of return on an electric utility's investment in new energy supply and the rate of return on industrial capital investment.

The latter, along with the difference in returns on investment that an industry requires on cost-reduction measures compared to those it expects from plant expansion measures, are significantly greater than 10 percent. The proposed tax credit, even in conjunction with the existing 10-percent tax credit, appears to be too small to have a significant impact on industry investment decisions. Designating specific items that qualify for the credit, as the Plan does, might discourage innovation which could increase efficiency or even eliminate the use of energy for a particular process. A more general qualification for the credit would be more appropriate. No distinction is made in the Plan between investments that produce

large efficiency gains and those that yield small gains, and consideration should be given to developing a performance indicator on which to base a sliding scale of credits.

Background

The disparity between rates of return for various energy-related investments are such as to discriminate against energy conservation investments. Industry generally expects a higher rate of return on investments in cost-savings measures (such as energy conservation) than on investments in plant expansion or in other measures to increase productivity. In addition, regulated rates of return for utilities that invest in energy-supply facilities are at least so percent below rates available to industry for measures to reduce demand.

The investment tax credit proposal attempts to address differences in these rates. In its investment decisions, industry generally requires a 1 5-percent or larger rate of return after tax, while a utility is regulated at roughly 10 percent. Thus, decisions to build new powerplants, for example, are made with something closer to a 33-percent advantage over industrial investments, such as conversion and cogeneration, than a 10-percent advantage. The investment disparity is less for oil and gas, but those fuels are not considered as replacements, whereas electricity is.

Industry also appears to require a higher rate of return on investments that increase energy efficiency and reduce costs than for those that increase product output. The latter is perceived as most crucial for a company in order to maintain its competitive position. At least a 25-percent rate of return is generally required for conservation investments compared to about 15 percent for "production" investments. These large differentials are not reduced significantly by the 10-percent tax credit, even though it is added to the present 10-percent investment tax credit. At most, it appears that the proposed conservation credit will accelerate decisions to invest in conservation by only a few months.

it is likely that designating a specific list of qualifying investments, such as those listed in part C of the Administration draft of the National Energy Act, would foreclose many options for conservation. Innovation for increasing efficiency or outright elimination of energy use is discouraged because true breakthroughs in the future are not likely to be considered in a specific list drawn up today. At a minimum, procedures should be included in the Plan that allow new items to be added without delay, It is also important that investment in new processes or systems be included in the tax-credit provision, since the potential for energy savings is very substantial. If a general performance indicator could be developed on which to base the tax credit, many of these concerns could be eliminated. The tax credit also could be graduated to match absolute levels of efficiency achieved by investments in conservation measures.

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Issue 24

Oil and Natural Gas Price and User Tax Provisions

price and tax provisions designed to promote industry energy conservation and the use of coal probably will succeed in the long run, although industry decisions will not be uniformly affected by the Plan's pricing proposals.

Summary

The Plan establishes a number of price and tax provisions which would increase the price industrial users pay for oil, natural gas, and electricity. The prime purpose is to achieve a substantial reduction in use of oil and natural gas by encouraging more efficient use of energy and an expanded use of more abundant energy sources. These measures will serve this purpose over the long run. However, distortions will appear along the way because the proposals do not uniformly achieve replacement costs for all energy sources. The Plan is likely to achieve its goal with oil, but to be only partially successful with natural gas and less so with electricity. As a result, economic waste of energy may well continue, although on a smaller scale than at present.

There will be adverse impacts on industry as production costs rise with increasing energy costs. These impacts will vary regionally and by size and type of the industry. In addition, severe problems for gas utilities could arise, depending on the rate at which industry reduces its demand for natural gas. The application of oil and gas taxes to industry 4 years before they are applied to electric utilities could result in an inefficient allocation of resources to boiler conversion or the selling of such facilities to utilities to avoid the tax. Finally, the tax and price provisions should provide a strong stimulus to innovation in developing more energy-efficient industrial processes and equipment.

Questions

1. What portion of the Plan's goal of a 6 million to 7 million barrel a day reduction in imports can be traced to the oil pricing provisions? Is the provision a cost-effective means of achieving the goal?
2. What are the impacts of the oil pricing provisions on competition in the industrial sector (especially with regard to smaller companies)?
3. Have the regional effects of the gas pricing provisions on industry been considered?
4. Has switching to No. 2 oil as an alternative to industrial gas use been considered as a transition phase in the conversion to coal?
5. In general, do the industrial oil and gas user tax provisions contradict the Plan's stated principle of equity?

Background

Oil Pricing Provisions.—The National Energy Plan retains price controls on oil as long as world oil prices remain "subject to arbitrary control, and domestic supplies are

insufficient to meet domestic needs. " Thus, as established under the Energy Policy and Conservation Act of 1975, current lower- and upper-tier price ceilings of $5.25 and $11.28/bbl. are retained for producers selling previously discovered oil. The producer's selling price of newly discovered oil would rise over a 3-year period to the 1977 world price, adjusted for inflation, and would increase each year after 1980 to keep pace with general domestic inflation rates.

The results of these provisions would be to raise the price of oil products by the same absolute amount as the rise in crude price (i.e., a $1 per barrel rise in crude price would increase the price of each product by $1 a barrel). Demand elasticity would presumably result in reduced consumption in industry at a rate determined by the ability of a particular industry to pass on the oil cost increase in the price of its product or products, the ability to convert from oil, the ability to institute conservation and the degree of that conservation, and the degree of competitive advantage that would be gained through conversion and/or conservation. The latter, in turn, depends on the relative prices of alternative energy sources, the cost of conversion and conservation, and energy costs in that industry as a percent of total costs.

The effectiveness of these provisions can be measured against the goal of reducing oil imports, It should be kept in mind that industry is not a particularly large user of oil products. In 1975, for example, it consumed only 7.4 percent of No. 2 oil and 18,2 percent of No. 6 oil. Moreover, the relationship of the increase in the oil price, and its effect on industrial use, to the goal of a 6 million to 7 million barrel daily reduction in imports is not clear. There will be some positive response, however, because demand will be reduced through increased use of conservation technologies and conversion to less expensive, more abundant energy sources.

These provisions could have adverse impacts on industry. Competition could be lessened in some industries if smaller, marginal firms who do not have the financial resources to conserve energy or pay the higher prices were forced to close. The proposals would also have different effects in different regions, with consequent disruptions, owing to regional differences in industrial fuel mix. By raising energy costs to industry, the Plan would make imported goods from areas where producers have access to cheaper energy relatively cheaper than domestic goods.

Although a tradeoff of these impacts normally would occur in determining the cost effectiveness of an oil price increase, it should be noted that fuel prices are likely to climb sharply with or without the Plan. Therefore, the real question is whether or not the strategies proposed in the Plan will reduce the potential disruption as the United States makes a transition to more abundant energy sources and more efficient use of all energy.

The effect of the oil price increase on technological innovation should be positive. By forcing industry to conserve and switch to more abundant fuels, the Plan

would improve opportunities for the introduction and adoption of new technologies.

Natural Gas Pricing Provisions.—The proposed natural gas policy would remove the interstate-intrastate distinction from "new" gas. All new gas would be subject to a "price limitation at the Btu equivalent of the average refiner acquisition price (without tax) of all domestic crude oil. " A price limitation of about $1.75 per thousand. cubic feet (Mcf) is established at the beginning of 1978.

Initially, new gas would cost $1.75 per Mcf, which is equivalent to crude oil at $9.43 per barrel. Flowing natural gas would be guaranteed at its present price and be allowed to move up to $1.42 per Mcf upon expiration of existing contracts. The highest-priced gas in this mixture would be dedicated to industries and electric utilities. The results of these provisions would be to raise the price of gas to industry by an amount determined by the mix of new gas, old gas, and gas from high-cost supplemental sources, The natural gas pricing proposals, however, do not move as far toward meeting the "replacement cost" principle as do the proposals for oil. Although "replacement price" to industry is not defined as precisely for natural gas as it is for oil, it would seem to be at least as much as the Btu equivalent for oil.

The goal of the natural gas proposals is to reduce industrial use of gas through increased conservation and conversion to other energy sources, a change that already is taking place because of curtailments in industrial natural gas supply. The price and tax provisions in the Plan will undoubtedly accelerate the trend. However, certain uses of gas cannot be replaced by alternative fuels as easily as others. Although technically there are no irreplaceable uses of gas, there are those which would be far more costly to replace than others. A consequence of this would be to increase the attractiveness of No. 2 fuel oil, even though it may be a higher-cost fuel, because it is the principal substitute fuel for natural gas. In addition, industry would be affected by the pricing proposals in much the same way as described above for oil. Regional effects would tend to be greater because of a greater disparity in regional use of gas by industry relative to regional disparity in oil use.

The effect on technological innovation would be positive, for the same reasons that are true for oil.

Oil- and Gas-User Tax Provisions.—Under Sec. 1501 of the Administration draft of the National Energy Act, a consumption tax would be imposed on industrial use of petroleum and natural gas beginning in 1979. The tax on electric utility use of the fuels does not begin until calendar year 1983. **Ultimately, the tax rate to industry will be twice that** for electric utilities. The user tax attempts to pull oil and natural gas prices into equivalence for industrial users, but this will not take place immediately and is limited to the largest industrial users.

The tax on oil and gas use in addition to oil equalization taxes would mean large total increases in prices for industry. As noted, this should accelerate the shift in industry from gas to electricity, coal, or No. **2** fuel oil, depending on the process undergoing conversion and the availability of coal and fuel oil.

There are several possible consequences of the differing rates and time schedules for taxing electric utilities and industry. The principal reason given for these differences is that utility boilers, being larger, are more difficult to replace than industrial boilers. Limited resources for boiler and stack-gas scrubber fabrication may be used to convert smaller industrial facilities, rather than large utility boilers, thereby adding to the constraints on expanding the Nation's use of coal. This problem would be reduced to the extent that industry converts steam functions to electricity. Industry might also sell some of its steam-generating facilities to electric utilities to avoid the tax. These two possibilities alone suggest that the way the tax provisions are applied differently to industry and electric utilities should be reexamined.

Finally, the oil- and gas-user tax would increase incentives for technological innovation since it would stimulate investigation of ways to reduce or eliminate the use of natural gas and oil.

Utility Rates.—The combination of flatter rates and peak-load pricing as outlined in the National Energy Act (Sees. 512-51 7), would raise electric rates to industry. The effect on demand would be mixed. In the short term, the response would be small because the present pattern of industrial use of electricity shows a high load factor and rather low elasticity. In the long term, however, there would be greater response through improved efficiency in new furnaces and electrolytic processes. New design could allow a peak-load response with furnaces that could be turned on and off daily. This would have an adverse impact on utility load factor because industrial loads would become more cyclical. The efficiency of electricity use would increase, however, because furnaces could be shut down when not in use, which is not now common practice. The impact on industry in terms of higher energy prices would be the same as for oil and natural gas. With the exception of centers of aluminum production, however, these would be fewer regional differences.

It should be noted that while these proposals may permit electric rates to approach replacement costs, the differences between replacement cost of electricity and embedded costs are substantial, not because of fuel costs, but because new plant costs have escalated in recent years. This should be recognized in the Plan since it may inhibit industrial investments in more efficient electric processes and equipment in the short run and encourage the uneconomical use of electricity. The proposed user tax on oil and gas may aggravate this problem since there is no comparable tax on electricity no matter how it is generated. Somehow, the replacement costs of electricity must be apparent to the consumer if the utility rate proposals are to be most effective.

With regard to natural gas, the proposal for cost-based gas utility rates is in keeping with the replacement cost principle. Regardless of wellhead prices, if the costs of new gas are not somehow reflected in the rates to consumers, rather than as an average of

all gas prices, decisionmaking will differ between consumers and producers. In this proposal, the Plan seems to recognize the need to maintain State and regional cost differences in rates.

The influence on technological innovation would be especially strong as there are large opportunities for efficiency improvement through the development of electrochemical processes to replace many thermal-chemical processes now in use. These considerations apply in a similar manner with regard to natural gas rate measures,

Issue 25

The Effect of the Oil and Gas Use Tax on Petrochemical Feedstocks

The tax on oil and natural gas for industries that use those fuels as feedstocks for petrochemicals other than ammonia and fertilizer could put these industries at a competitive disadvantage in the world market.

Summary

The National Energy Plan recognizes a need to maintain a healthy economy and high levels of employment. Moreover, one of the policy principles set forth is for an equitable solution to energy problems in all sectors of the economy. However, by taxing oil and gas used as raw materials as well as for fuels, a selected few industries are disproportionately burdened. The objective of the tax, to stimulate conversion to coal, cannot be practically achieved by the petrochemical industry with available technology. The affected industries will be put at a competitive disadvantage in world markets, and their domestic growth rate will be slowed.

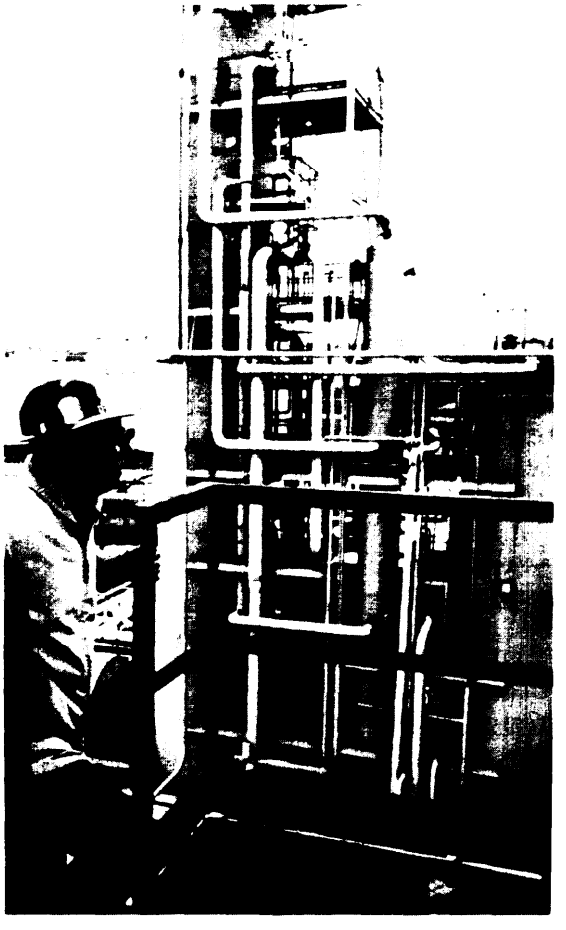
Questions

1. What is the justification for a tax on oil and gas that are used as raw materials?

2. If conversion to coal as a raw material for industries using oil and gas as feedstocks is not technically feasible, what will be accomplished through these taxes with regard to feedstocks?

Background

A consequence of oil and gas consumption tax for industry s that all industry must share the burden of increased costs for oil and gas used as fuel . In addition, many industries will experience a small incremental increase in raw material costs due to the increased costs of oil and gas used in the production of their raw materials. A selected few industries, however, will be disproportionately burdened because they will have to pay the full tax on their raw materials (oil and gas).



Federal Energy Administration Photo

The tax may encourage the use of coal rather than oil or natural gas in many large boilers and some reduction in the use of oil and gas may be possible for process heat or steam. However, no technology is available that will permit industries which use oil and gas for feedstocks to use coal as a raw material, nor is such technology likely to be developed before 1985-90.

in effect, these industries not only will be doubly taxed-once for their industrial fuels and once for their raw materials-but they cannot escape the double tax because they must continue to use oil and gas to manufacture their products.

Prior to the introduction of the National Energy Plan, projections were for a petrochemical growth rate that would double the demand for oil and gas feedstock over the 1975-85 decade. If the cost of feedstocks rises, the growth rate of the industry is likely to decline. Because the tax is to be imposed on top of a world price for oil and gas, the affected industries will be at a competitive disadvantage in the world market.

The Plan recognizes these problems and provides exemptions for oil and gas used as feedstock in the manufacture of ammonia and fertilizer. There does not appear to be any good reason why the same exemption should not apply to all users of energy materials for feedstock.

Issue 26

Federal Leadership in Industrial Energy Conservation

The Plan should place greater emphasis on the leadership role the Federal Government can play in encouraging industrial energy conservation and innovation by the private sector in developing conservation technologies.

Summary

There are four areas where Federal encouragement and action could provide significant incentives to more efficient use of energy in industry. Federal leadership could:

- take advantage of industry's unique capacity for innovation to adapt to new circumstances, if it led to an attractive investment climate for industry in new conservation ideas;
- emphasize long-range research and development efforts in the basic technology and science of industrial processes;
- demonstrate, through equipment purchase, production contracts, and research grants, that energy efficiency is a prime consideration;
- provide Federal grants' and/or loans to the Nation's universities and technical schools to train engineers in conservation techniques.

Background

The Plan calls for fundamental alterations in energy use, which generally emphasize conservation. The alterations entail both changes in the form and quantity of energy to be used. These alterations probably will be accompanied by intense activity to exploit opportunities to optimize them. This will take place, in large measure, through the efforts of individual inventors, innovative firms, entrepreneurs, research and development organizations, and others in the private sector. The effort will probably concentrate on total systems and processes rather than individual items of equipment, process steps, or unit processes.

The capacity of industry to adapt to new circumstances through innovation, scientific progress, and other measures is not adequately recognized by the National Energy Plan. In fact, the only explicit mention of innovation in the Plan is in connection with development of nonconventional sources of energy. The Plan should recognize that industrial innovation in the use of energy can be at least as important as innovation in development of nonconventional sources. For example, the Plan's listing of conservation devices that would quality for special tax credits may well direct industrial efforts toward installing these devices or improving the performance of existing equipment when the most effective step might be to adopt new processes that offer much greater overall improvements in performance.

In dealing with innovation, the Government should recognize that despite the many formal computer-assisted techniques for risk analysis in use today, risk-taking and progress generally result from sharp con-

flicts of opinion. The existence of such conflict is healthy and should be maintained. It is the process through which basic assumptions are tested. Government must draw upon private initiative and private commitment of resources if it is to foster progress toward solving energy problems.

The Plan also should recognize the need for long-range R&D in the basic technology and science of industrial processes instead of just focusing on demonstrations of nearly marketable technology. The tests of "relevance" and economic justification presently employed for R&D projects do not recognize that the most important results of research often are related only indirectly to the original expectations, and motives, of investigators. Those projects that can pass rigorous tests of justification or "relevance" do not represent the really venturesome investigations from which progress comes, or that reflect the popular expectations of research. In related efforts, the Plan should incorporate specific measures to elicit wide-ranging innovative contributions toward improved energy use and improved processes through direct Government financing of R&D and its use of its powers to affect the climate for private investment in R&D.

Through direct purchase of industrial-process equipment, the purchase of manufactured products, and the sponsorship of research and development programs, the Federal Government can influence the extent to which energy efficiency is taken into account in developing and using industrial equipment. Similar actions have occurred in the past. For example, numerically controlled machinery processes, which are used extensively in U.S. manufacturing, were brought into being by early efforts of the Defense Department to fabricate advanced defense systems. In another example, a large part of the capital stock of the aircraft and shipbuilding industries is owned by the Federal Government. Opportunity exists here to influence the development of more efficient process equipment.

Finally, there is a need for engineers with special capabilities in various aspects of industrial energy conservation. This does not necessarily mean that more engineers are needed, but that those who are trained in the plant and process areas should be taught to identify and implement conservation opportunities. The problem is essentially one of disseminating information bringing practicing engineers up to date in the current methods available to design improved processes, to instrument production lines, and to use computer simulation.

Although the National Energy Plan does not take note of this possibility, a series of short courses could be developed by universities or not-for-profit organizations, handbooks could be written to bring together the best current design techniques, and numeric data could be published in convenient forms for practical use at relatively small cost to the Government, Some significant efforts have already been made in this direction by the Federal Energy Administration, the Energy Research and Development Administration, and the Department of Commerce, but an expanded effort could help the industrial sector, particularly in small businesses which have limited technical staff to help improve existing practices.