Why Don't We Have A National Energy Policy?

by JOHN M. TEEM

DURING THE WINTER of 1973-74 the Organization of Petroleum Exporting Countries (OPEC) gave us both an economic and a political shock — a sudden price increase and an embargo on oil exports by its Arab member countries. The embargo was intended to discourage U.S. and other aid to Israel in the conflict then raging, and it ended within a few months, but today imported oil costs about four times as much, and domestic oil costs twice as much, as it did four years ago.

Government policy makers had good reason to worry about the effect of this energy crisis on the national economy. This double jolt disrupted only 4 percent of our total energy supply (plus the price increases), but it produced a reduction of about 5 percent in the real gross national product, unemployment increases of about 1.5 percent, and an increase in the inflationary rate of almost 6 percent — all within about a year.

These events suddenly made energy policy a much-talked-about topic, and many Americans began to recognize that we had some kind of energy problem. Today, we are still talking, and the national debate has, perhaps, become more intense since President Carter proposed his broadly ranging and complex energy policy to the Congress.

At about the time of this first "energy crisis" period I was involved in a task force in Washington, through which the federal government was making its first major effort to pull together a national plan for energy research and development. It brought together people from all the federal agencies involved in any kind of energy research — coal, solar, nuclear, or whatever. That planning exercise had started in July, before the embargo, but one key element seemed to be missing.

It was obvious to most of us that any national energy research plan should evolve in the context of an overall national energy policy. How else could we identify the priorities to be put on different technologies? How else could we identify what was missing? At that time, however, no one apparently could supply us with such a comprehensive description of our national policy for energy. But after the Arab embargo, the answer came quickly from the highest offices in the land: "Energy Independence" was to be our national energy policy.

It was clear to many people at that time — and has become increasingly so in the three years since — that it just wasn't that simple. We couldn't increase our domestic energy supplies fast enough, nor were we apparently willing to pay the costs of reducing our energy demands. I'm talking here not just about the cost of government expenditures. More expensive were the social, economic, and political costs of increasing our fuel prices sufficiently to bring the demand down enough — and help to increase our domestic supplies sufficiently — to make us independent of imported oil within a 10-year period. Today we import more OPEC oil than we did in 1973, and our annual national oil bill for imports has risen from about $4 billion to approximately $35 billion, so the costs of inaction were not negligible either.

A Short Look Backward

This energy problem has been around for a long time. Someone recently gave me a Presidential letter sent to the Congress on February 19, 1939. It served to introduce a report on energy matters.

> To the Congress:
>
> This report . . . suggests policies, investigations, and legislation necessary to carry forward a broad national program for the prudent utilization and conservation of the nation's energy resources. Our energy resources are not inexhaustible, yet we are permitting waste in their use and production. In some instances, to achieve

apparent economies today, future generations will be forced to carry the burden of unnecessarily high costs.

In the past the federal government and the states have undertaken various measures to conserve these resources. In general, however, each of those efforts has been directed toward the problems in a single field. It is time now to take a larger view: to recognize . . . that each of our resources of energy affects the others.

It is difficult in the long run to envision a national coal policy or a national petroleum policy . . . without . . . a national policy directed toward all of these energy producers. . . . Such a broader and more integrated policy cannot be evolved overnight. . . .

Clearly, there must be adequate and continued planning . . . which will reflect the best technical experience available, as well as give full consideration to both regional and group interests.

The widening interest and responsibility on the part of the federal government for the . . . wise use of the nation's energy resources raise many perplexing questions of policy. . . . This report sets forth a useful frame of reference for legislative programs . . . (and advances) specific recommendations for solution of the most pressing problems.

(Signed) Franklin D. Roosevelt

This message could have served as an introduction to President Carter's energy message to the Congress on April 20, 1977! It has been almost 40 years since President Roosevelt pointed out that later generations — and that was *us* he was speaking about — would have to pay the price in energy costs and shortages for the lack of integrated, carefully designed policies that take a long-range view of the problems. To an even greater extent, perhaps, it is the present younger generation, and the generations to follow, who are really being "ripped off" by our current policies.

The "pressing problems" that President Roosevelt mentioned are even more pressing today. The natural gas shortages back east this winter put between one and two million people out of work, and showed even those of us from Missouri that the coupling between energy and our economy is very strong.

Why is it, if energy is so very important to each of us, we haven't yet been able to agree on a comprehensive national energy policy?

A Long Look Forward

The difficult part of energy policy formation has been in trying to make sense out of the whole — as President Roosevelt pointed out. In seeking to understand this dilemma during my brief time as a Fairchild Scholar on the Caltech campus, I have discovered that energy policy is, indeed, a complex subject. Hoping to provide some perspective for understanding President Carter's energy proposals, and the process by which these will be considered, adopted, or modified, I have tried to answer three basic questions:

- What is involved in formulating and adopting a comprehensive national energy policy?
- What are the principal dimensions of the energy dilemma and some of the issues involved?
- What are the key objectives that national energy policies try to achieve and what are some of the conflicts between them?

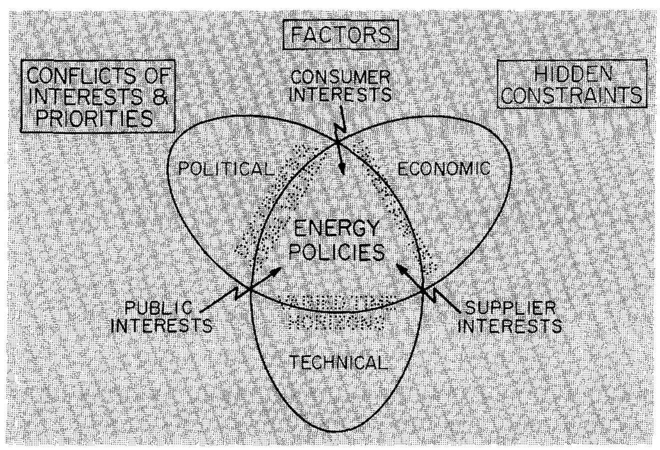
The diagram below shows some of the factors involved in formulating a national energy policy. It also helps identify the kinds of interactions that are involved in establishing (that is, getting agreement on) the "best" national energy policy.

All comprehensive energy policies, I think, have component elements or *factors,* which are political, economic, and technical in nature. Any national energy policy must include some aspects of each of these elements, and the energy policy domain thus falls where such factors overlap.

The process of evolving an energy policy requires resolution of many *conflicts of interests and priorities.*

It is also important to recognize that such conflict resolution takes place, and that energy policies are formulated within the context of a number of often hidden *constraints.*

There are, for example, differing political viewpoints on the worth of various social values — such as environmental conservation, or preventing the poor from suffering disproportionately from the economic



impacts of energy pricing policies, and even differing basic attitudes toward big or little business. There are also quite different doctrines within the political spectrum on what are the best national economic policies and on what is an appropriate role for government in energy affairs. Such doctrines can color the approach used to formulate energy policies. There is another, often unrecognized, doctrine that pervades many attitudes toward energy policy — that science and technology can accomplish *anything*, if we but unleash a "Manhattan Project" or "Apollo" type of effort.

Energy policy formulation and establishment may also be constrained by various uncertainties, both economic and technical. History has shown that it is often difficult, for example, to anticipate fully the total impact a particular energy regulatory or tax policy may have on the whole energy economy. The Federal Energy Administration's oil price and the Federal Power Commission's gas price regulations may be good examples. Other uncertainties concern what will happen outside our own country. What will be the effect on energy policy if OPEC suddenly lowers oil prices?

Poorly Meshed Time-Horizons

Finally, and I think most important in understanding why we don't have a coherent energy policy, is recognition that the energy policy domain is characterized by widely differing time-horizons among its economic, political, and technical components. The focus in the political sector, for instance, is often on the immediate or near-term. Congressmen and presidents are responsive to voters — at least every two, four, or six years — and their vision is often distorted when they try to look too far ahead.

The time scale or lead time for making any significant change in energy technologies is much longer. Fifteen to 20 years is not unusual in order to progress from a new technical concept through the research, development, and demonstration process to first commercialization. It is often 15 to 20 years after that before a new technology can become a significant (say, 10 to 20 percent) factor in the nation's total energy supply.

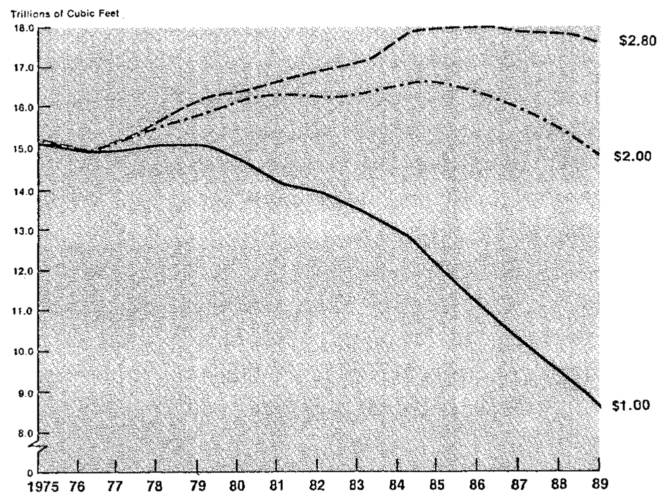
In the economic domain, time-horizons can be either intermediate or rather short. There is a longer time-horizon associated with economic return on investments; perhaps 6 to 10 years is a characteristic pay-back time used as a criterion for product-development decisions by equipment manufacturers. Investment time-horizons are somewhat longer for utility plant decisions; the associated discount rate is lower.

Another economic time-horizon constraining energy policies is the relatively long time — at least in comparison with some other basic commodity markets such as those for food or steel products — that it takes to see any significant expansion of fossil fuel supplies in response to energy price movements. This is well illustrated in the chart below. Here are plotted the FEA's projections of natural gas production under three assumed levels of controlled prices, assuming such prices were fixed in 1976 and maintained in constant dollars over a 15-year period. Note that there is relatively little increase in gas supply forecast (nationwide, under 5 percent) for 3 years after the price rise, and that the major impact on supply (roughly, a 50-100 percent increase) comes only after 10-15 years. Economists say that energy supply, as this illustrates, is relatively *inelastic* to short-term price movements, but that it becomes more *elastic* to longer term ones.

The same observation can probably be made about the demand for many energy sources — that it is inelastic in the short term, but grows more elastic over time. Gasoline is possibly a relevant example; its usage fell only slightly in response to the 1974 price increases. Over a longer period of time many analysts believe that gasoline demand will decrease in response to higher prices.

In summary, many of these time scales — political, economic, and technological — do not mesh well. This mismatch of time-horizons has, I believe, been an inhibiting factor in our establishing any coherent, overall national energy policy.

PROJECTED NATURAL GAS PRODUCTION



NOTE: These quantities include gas used for repressurization of wells; excludes tight gas.

The FEA's projections of natural gas production under three assumed levels of controlled prices. They presuppose that the prices were fixed in 1976 and are maintained in constant dollars over a 15-year period. (The quantities include gas used for repressurization of wells, but exclude tight gas.)

Credibility — Who and What Should We Believe?

I also sense that public attitudes toward our energy problems may be inhibiting our reaching agreement on an overall policy. Rather than apathy, our hang-up may be the problem of credibility — or rather, the lack of it. Many of us just don't know who or what to believe.

I suspect that a significant body of the American people tend to think that all this energy hassle is just a plot by the energy suppliers to get prices up — to gouge the consumers. The actions of OPEC may have lent some credence to such a view. In the minds of some of the public there lurks the suspicion that our energy dilemma is, at least in part, the result of a conspiracy on the part of our domestic energy industry and/or a gullible government. This credibility issue probably underlies the proposal to establish an Energy Information Administration within the new Cabinet-level Department of Energy to make independent assessments of oil and gas reserves, among other things. It may also stimulate, in part, the policy debate on whether or not there should be vertical or horizontal divestiture of portions of the energy companies.

In my judgment, there is no such conspiracy, and we desperately need to achieve better public understanding of the chronic nature of our energy dilemma. Only then can we hope to achieve some broad consensus on a national policy that will provide us some future relief.

Contrasting Approaches to Policy Formation

There are two different approaches to formulating energy policy. The first focuses on the technological means of filling expected gaps between energy supply and demand in the future, and says what the government will do to prevent or remove them. It tries to define how much and what kinds of energy will be available in the future.

The second approach looks at the market and the regulatory processes that maximize or impede the efficient economic use of energy, and focuses more on the impact of governmental policies that affect the operation of markets between suppliers and consumers of energy.

Any comprehensive national energy policy has to take both viewpoints into account, to some degree, and attempt to resolve any conflicts between them.

The first, or "gap-filling," approach is based on the doctrine that central planning can anticipate potential energy problems and solve them. It can do this through coordinated efforts directed either at developing new resources or at methods that will reduce the demand. *The first thing one does when using this approach is to* attempt to forecast what future energy supply and demands are likely to be, nationwide, and thus identify the potential gaps between them. An energy policy is then formulated in terms of a set of priorities among supply technologies — for coal, oil, nuclear, solar, and so on — and among methods of using energy more efficiently. Because of the close relationship between energy and the environment, public safety, and national security, such a policy must also consider what the allowable constraints or trade-offs among such factors will be and adjust these priorities accordingly. Finally, to complete the policy formulation, the role that government should play in encouraging development and commercialization of new supplies or for demand-reducing energy conservation should be identified, in order to meet the schedule implied by the supply-demand gap that the policy aims to fill.

The second, market-oriented approach, is based upon a different doctrine. Many economists feel that we will never have the *wisdom* necessary to allocate resources among the many diverse elements of the energy economy from a centralized, governmental perspective — at least not in the most economically efficient way. They believe that the free marketplace provides the best means for making such resource allocations efficiently.

So this approach focuses on identifying the constraints, incentives and dis-incentives that affect the efficient operation of energy markets, and then asks how governmental actions potentially affect these. The basic approach here is to minimize any constraints on market operation. However, this approach also tries to identify all the public interests affected by the energy economy and then seeks to determine to what degree governmental regulation of energy-related activities may be required to insure them.

The issues involved in this approach are often questions of regulation versus deregulation and how to achieve fairness among the money transfers between consumers (of various income levels) and suppliers. But the basic approach used in this method of policy formulation is to leave the balance between supply and demand to the marketplace and pricing mechanisms.

The Multiple Dimensions of Our Energy Dilemma

Certain aspects of these two approaches to energy policy formulation can be illustrated while considering the principal dimensions of our national energy dilemma and some of the issues involved:

1. Are we really running out of oil and gas — and if so, when?
2. What can we expect from other energy sources and new technologies?
3. How will future energy usage be related to economic growth?
4. What can we expect from conservation?
5. Can we keep energy costs low by regulating prices — and what is the relative impact of increasing energy costs on families of different income levels?

1. **When will we run out of oil and gas?** Domestic natural gas supplies are falling. Gas production peaked during 1970-72, at about 22 trillion cubic feet annually. Even with the increased discoveries and production that might follow a price increase, the best we can probably hope for is that domestic gas supplies might rise again to near the historical peak rate for the next 15 years or so before falling again. In part this supply will come from the Alaskan North Slope, providing new pipelines can be built to bring it down to the lower 48 states.

Domestic oil production also peaked in 1970 and has been falling ever since. The outlook for increasing domestic oil production in the future is similar to the situation for natural gas. Some new production, including that due to enhanced recovery from existing fields, can be expected under the stimulus of increased prices. But even with the arrival of Alaskan North Slope oil this summer and possible future discoveries located off the continental shelves, it is unlikely that domestic oil production can be maintained much above current, or perhaps historical, peak rates (about 3.6-4.0 billion barrels per year) for more than 15-20 years. Proven domestic oil reserves are now about 35 billion barrels, and the total estimated remaining U.S. recoverable resources — including undiscovered oil — amounts to about 135 billion barrels. Included in this latter estimate is about 40 billion barrels of potential oil production using advanced, so-called tertiary, recovery techniques. However, the FEA has recently estimated that, for such recovery techniques to become economic, domestic oil prices will probably have to increase by as much as a factor of two over current prices — i.e., to higher than we now pay for imported oil.

Domestic supplies of oil and gas are thus rapidly declining and, at most, can be expected to remain constant at levels less than our current consumption. So where are our petro-fuels coming from? Obviously, we are making up the gap now through imports from around the world. The world's resources amount to about 2,000 billion barrels of petroleum that is economically recoverable, and over half of that is located in Asia. Natural gas and condensable liquids increase our total petro-fuels bank to the equivalent of 5000 billion barrels of oil. Even this large supply of petro-fuels will be used up some day. What we do not know is exactly when this will happen. One possible answer to this question is shown for oil in the diagram below. Most analyses of this sort show that as early as 1990 — only a little over a decade from now — we will begin to find it very difficult to get oil from overseas.

Thus we can recognize the first dimension of our energy dilemma:

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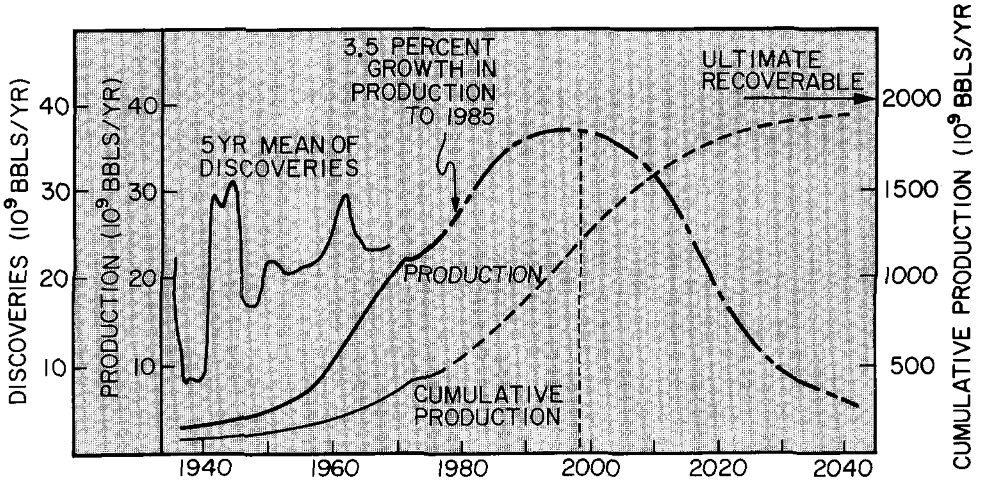
Source: C. Wilson, MIT



WORLD OIL:

Production,

Cumulative Production,

Discoveries

By 2000, or earlier, we may have difficulty obtaining either domestic or imported petroleum and natural gas, except at very high prices. What we get then may well come from the Soviet Union or China – if they will sell it to us.

2. **What can we expect from other energy sources and new technology?** Obviously, if oil and gas are being used up, we must shift to coal or some other alternative. What about coal resources? The total world's supply of oil and gas is less than half of the total U.S. coal supply. The problem is to get the coal out of the ground safely and use it without fouling our environment. We also have relatively large quantities of oil shale, but there is some question about the environmental and economic viability of oil-shale production, at least at current world oil prices.

Geothermal energy, using currently developing hydrothermal technology, is a new resource. Liquid-dominated hydrothermal resources could provide an amount of energy equivalent to about a quarter of our current oil and gas supply. Getting access to the geopressurized fluids of the Gulf Coast and the western hot rock resources would give us a supply of energy larger by 50 percent than the potential for all our oil and gas. The question is whether these geothermal resources can be made technically exploitable.

If our current supplies of uranium are burned in light-water reactors like those operating today, they would provide us with a total amount of energy about equal to that of all of our oil and gas. If breeder reactors were used, the potential from this uranium is larger than the sum of all other non-renewable resources. But breeder reactors involve plutonium, with all its potential for proliferation of nuclear weapons.

The energy available from solar energy or nuclear fusion — if it becomes practical — is essentially infinite and inexhaustible.

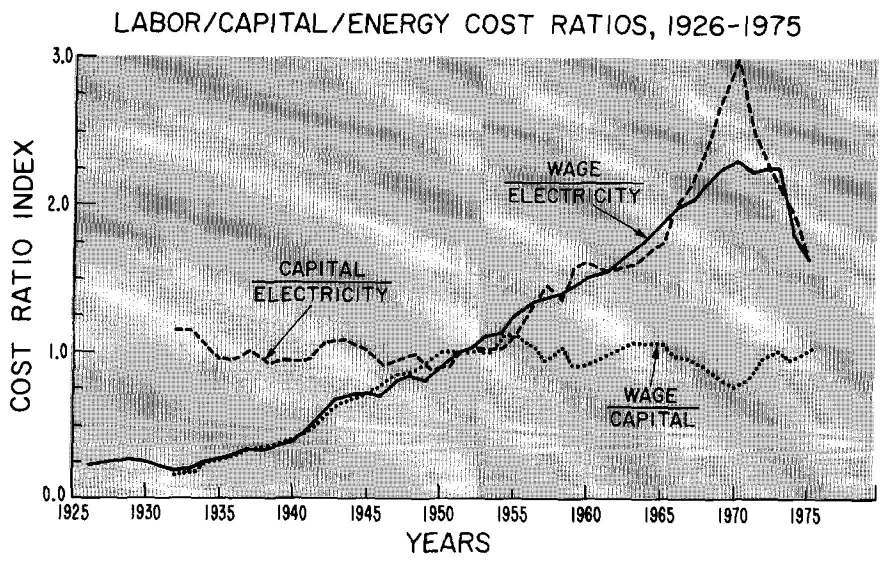
So there appear to be a lot of alternatives, but can they be developed quickly enough — and at what price?

A recent ERDA analysis tries to answer the question of what is the maximum impact on the energy supply that can be hoped for from these new technologies. This analysis indicates that by 1985 the maximum impact from improvements to existing coal-related technologies might add about 4 percent to the supply that is expected to be needed then. Improvements in light-water reactors could perhaps add an additional 5 percent, and enhanced oil and gas recovery might add 2 percent to our supply. Synthetic fuels, solar, and geothermal resources would provide less than 1 percent of our energy supplies by 1985.

By the year 2000 the situation could be somewhat more hopeful. The maximum impact from improving our currently existing technologies, primarily coal and nuclear, might be as much as 30 percent of our expected supply and needs by that date. Advances in coal combustion and for light-water reactors would each account for about 10 percent. Synthetic fuels would provide maybe as much as 6 percentage points in this estimate.

Other new energy sources might supply as much as 18 percent by 2000. In order of relative contribution, this increment would come from solar, geothermal, oil shale, and the nuclear breeder reactor. However, energy from new technologies would not necessarily be additional to that from improvements in existing coal and nuclear technologies, because there will be trade-offs among these various technologies. Hence, we must conclude that no one technology can fill the gap, and even with all of them at their maximum impact, we may *not* have enough. Thus is revealed the second dimension of our energy dilemma:

It will be difficult to achieve the potential benefits of new energy source technologies — perhaps somewhat lower energy costs than those extrapolated for petroleum-based technologies



In the American economy there has long been a substitution of energy for labor in order to increase productivity. The economic basis for this is shown in this diagram, which plots the ratio of the relative costs of labor, capital, and energy (in the form of electricity) over the past 50 years. The solid curve — which plots the cost ratio of labor to energy — and the dashed curve — which plots the ratio of capital costs to those for energy — have been rising. With energy becoming progressively less costly than either capital or labor, it has been substituted for them. Note, however, that since 1972 energy costs have been rising relative to capital and labor, and so these curves are falling.

Source: B. M. Hannon, U. of Illinois

and a substantial level of ''gap filling'' new energy supply — within the time horizon of the anticipated oil shortage.

3. **How will future energy usage be related to energy growth?** Energy has not only become a pervasive factor in our economy, it may even be the weakest leg of a three-legged stool on which our economy rests. The other two legs are capital and the labor force. In recent years this three-legged stool has been tilted.

Between 1950 and the early 1970's, energy became progressively less costly relative to either capital or labor. The consequence of this was a persistent and continuous substitution of energy for both capital and labor, with the result that the growth in our energy consumption per person has increasingly outrun the growth in our total gross national product per person. However, in the last few years, the relative costs of energy have been increasing, which suggests the third dimension of our energy dilemma:

The cheap energy that has fueled our economic growth of the past 30 years, and that of the other developed nations, is coming to an end. We do not know whether we can turn down, significantly, our historic non-linear growth in per capita energy usage (with respect to per capita GNP growth) without producing economic chaos or requiring significant changes in our style of life.

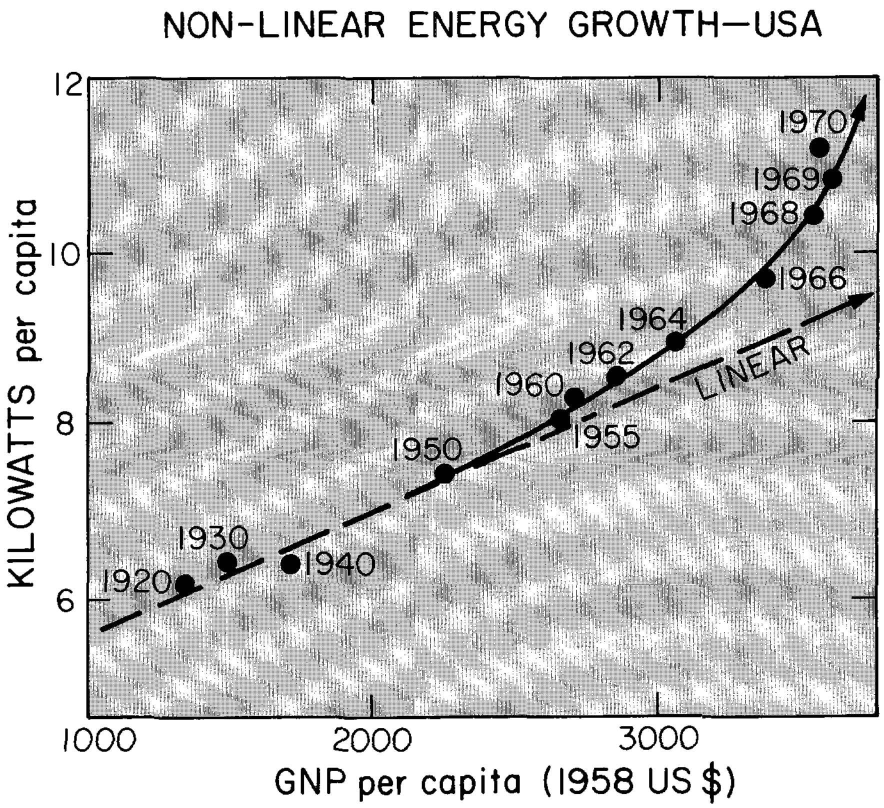
4. **What can we expect from conservation?** Can we use our energy more efficiently? Can we achieve significant energy conservation without sacrificing either our standard of living or our industrial output? These are related questions.

In the industrial area there is probably some chance for improvement, as comparisons with the experience of other countries indicate. But industrial usage of energy may be so closely related to economic growth and expansion of our labor force that too much ''conservation'' could be costly. Nevertheless, perhaps we can reduce our industrial demand by 25-30 percent.

In the residential sector the situation for substituting capital for energy is even more hopeful. We can add some *insulation to existing buildings; better* yet, we can replace old buildings with new ones and use insulation even more effectively in the construction. We can make more innovative design improvements, including perhaps designing to keep the sun's energy out in the summer but allowing it to come in in the winter. These progressively larger capital investments lead to progressively smaller energy usage, and total costs over the life of a building of providing a given level of comfort can usually be minimized in this way. Perhaps even lower fuel consumption can also be achieved, at the expense of somewhat higher total life-cycle costs, by adding active solar energy heating and cooling to the building. Generally, we can identify an optimum relative use of energy and capital (or labor) in providing building comfort, and this is usually at an energy-usage level below current practice. Furthermore, as fossil fuel *costs for building heating and cooling* increase, the optimum life-cycle cost will occur at even lower energy consumption. Thus, detailed studies have shown that levels of energy conservation in buildings may reach 30-35 percent and be cost-efficient without sacrificing comfort.

Per capita usage of energy for transportation is also relatively high in this country. Such usage can probably be reduced eventually by 30 percent or more, but this will require a significant replacement of our motor fleet with more fuel-efficient vehicles and perhaps greater investment in mass transit systems. The losses we now incur in the generation of electricity and in its transmission can also be reduced, perhaps by 5 percent.

ERDA has estimated that the total



The growth in our energy consumption per person has increasingly outrun the growth in our total gross national product per person from 1950 until the early 1970's, as is shown in this chart of the actual growth (solid curve) in relation to what would have constituted linear growth (dashed line).

Energy Policy
. . . *continued*

reduction in the demand for primary fuels by 1985 could be as much as 14 percent from such technological improvements in the efficiency of energy usage. This is about what we expect to be able to add to the supply through improved source technologies. By the year 2000, however, the energy demand reduction through more efficient technologies may be as much as 24 percent of the then expected demand, without such conservation measures. This is somewhat less than the percentage improvement in energy supply from new technologies.

What will motivate consumers to change their current patterns to make these savings possible? What will motivate them to make the necessary capital investments required to reduce energy usage by such amounts? Well, the market or process-oriented energy policy analysts tell us that the best motivation we can give for conserving energy is a price increase, although some longer term cost benefits of energy-use reduction may exist even at current energy prices. However, our national experience to date is that relatively little conservation has yet occurred voluntarily. That raises the fourth dimension of our energy dilemma:

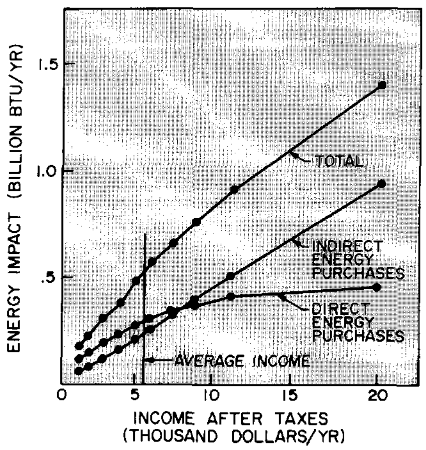
Any significant level of energy conservation probably requires comparably significant increases in the price we must pay for energy.

This observation also raises the other related energy policy issues:

5. **Can we keep energy costs low by regulating prices, and what is the relative impact of increased energy prices on families of different income levels?**

Keeping energy costs low through regulating the price of energy might appear to be an appropriate action, but it is a simplistic one that is not easy to apply equitably. If the price of natural gas, for example, is regulated to be significantly lower than that for other roughly equivalent forms of energy, an artificial demand for it is created, along with a concomitant disincentive to develop new supplies. This has occurred.

Source: B. M. Hannon, U. of Illinois



This chart plots the per-family consumption of energy versus family income in the period 1961-63. It shows in billions of Btu's both direct energy purchases, such as for heating, cooking, and gasoline (i.e. the curve that flattens out), and also the indirect purchases of energy included in the production of other consumer goods and services. Since 1963 family consumption of energy has gone up, perhaps by 35-40 percent. Income has also increased, due to both real gains and inflation. Thus, a recent average family income had gone from $5,500 shown here to about $10,500 per year.

On the other hand, if energy prices rise higher, there is a disproportionate impact on lower income members of society. Adjusting the data in the figure above to current levels of income and energy consumption, we find that a median income family (now about $10,500 per year) spends about 22 percent of its total income on energy — 16 percent of it for direct energy purchases. Such a family today uses about 750 million Btu's per year. but a low-income family, with an income of, say, $5,000 per year, must spend 28 percent of its total income for energy, although it uses only 420 MBtu. Of this, 22 percent is used for direct energy purchases. A high-income family now making about $38,000 per year uses about 1960 MBtu, and spends only 14 percent of its income for energy, roughly equally divided between direct and indirect costs.

If both direct and indirect energy costs were to increase by $1 per MBtu, such families' energy costs would change as follows:

The low-income family would pay an additional $420 per year, so that its total energy costs would now represent 36 percent of its income, 27 percent of it for direct energy purchases. The median income family would pay an additional $750 per year, which would mean that its total energy purchases would represent about 30 percent of its income, with 20 percent of that being for direct energy costs. The high-income family would pay an additional $1960 for energy annually, and its total energy budget would now be about 19 percent of its income, with only 8 percent of this being for direct energy purchases.

Thus we see that the poor bear, disproportionately, the costs of any price increase for energy — particularly those involved in direct energy purchases. This fact provides a rationale for some sort of income redistribution policy to equalize the relative costs of energy price increases among different income groups. There are several possible solutions, among which are a negative income tax associated with energy use, or a tax on gasoline. These could be the source of income transfers to make the costs of energy price increases more equitable. This brings us to the fifth dimension of the energy dilemma:

Formulation of an energy policy that involves regulating or increasing the price of energy also requires assessing the true costs – who will bear them, what social costs will be associated, and how to share the costs more equitably.

Resolving Conflicting Policy Goals

These multiple dimensions of our energy dilemma suggest or imply a number of broad national objectives that we might hope to achieve through any overall national energy policy:

- Ensure security of supply against foreign disruption.
- Ensure efficient economic use of alternative resources and adequate future supplies.

- Constrain environmental impact to conserve our natural environment.
- Keep energy costs low to minimize economic disruption.

The first emphasizes our need to be protected against any sudden, externally produced disruption to our fossil energy supply in the near term. One way to minimize the impact of potential future oil embargoes is to develop a substantial oil stockpile.

The second highlights our need to ensure that we will have the energy that is necessary for our economic survival over the longer run. But to do this we need to help by reducing our energy appetites somewhat through using our energy supplies more efficiently. We also want to diversify our sources of energy as soon as possible, reducing the relative dependence on oil and gas. We probably have at most only about 25 years before we are going to be unable to get — at any price — anywhere near the amount of petro-fuels we now use.

The third objective emphasizes our intent to conserve our natural environment, but at what cost? We clearly have no desire to return to the "smoky 1920's" nor to let technology lead us into more profound long-term environmental problems, such as those that could arise from improper attention to storing nuclear wastes. So far, our national policy seems to allow little compromise with this objective.

Finally, we must recognize that our economy runs on energy and that there are significant social costs for energy price inflation, particularly if such inflation occurs rapidly. We want to avoid these, or at least to make adjustments equitably and as slowly as possible, considering the needs of our citizens at all economic levels.

Perhaps we can all agree that these form an attractive set of national energy policy objectives, but the critical question is: Can we achieve them all simultaneously? It seems to me that the main reason why we are having so much trouble in agreeing on an energy policy is that, in trying to focus our priorities on one or possibly two of these four objectives, we often find ourselves in trouble with one or more of the others.

Too often we have tried to substitute energy slogans for carefully thought out energy policies. Remember "Energy Independence"? Perhaps throughout the past 20 or 30 years the energy slogan that has most nearly characterized our policy has been "Low Cost Energy, Adequate for All!" "Zero Energy Growth" is another slogan that has surfaced in recent years. And we all remember the various technological "fixes" that have been promised us. There was "Atoms for Peace" when we believed, naively, that nuclear energy would be our panacea. Now it's "Coal and Conservation" or, maybe, "The Solar Solution — Inexhaustible Energy Plus a Clean Environment!" Perhaps you have your own favorite energy slogan.

Each of these slogans may have been intended to focus our attention on one or another of the four objectives listed above. They sound good and simple. But such slogans, taken one at a time, *don't make a viable energy policy*. The real issue of energy policy is — can we achieve all of these goals together? We must face the probability that we cannot afford to give them all equal priority, because there are some fundamental conflicts among these worthy objectives. Hence, I believe my answer to this fundamental question is — Probably not.

I doubt that we will ever have a simple but coherent overall policy statement that will summarize everything beautifully. It will take a concerned and informed public and perceptive national leadership to work out all of these conflicts. Our energy policy must evolve over the next few years through a series of interrelated and thoughtful changes in the way we currently do business in this arena.

Two "Laws" of Energy Policy

I want to summarize with a slightly tongue-in-cheek suggestion of two "fundamental policy laws" or guidelines which I suggest for putting energy policy suggestions in perspective and for evaluating future proposals. It seems to me that President Carter's proposals are, at least, consistent with them. These are my "laws" of energy policy, perhaps not so profound as the laws of thermodynamics, but at least as easy to remember.

First in energy matters—
THE SIMPLE SOLUTION
IS NEVER THAT SIMPLE

Second—
WHATEVER THE SOLUTION,
IT'S GOING TO BE (TOO) COSTLY
AND SLOW

Perhaps a word or two needs to be said in defense of the second law. Most energy systems, whether they are intended to provide new sources of energy or to utilize energy supplies more effectively, demand large amounts of capital. This means that even if we resolve our energy policy debate soon and establish an effective and coherent national policy, it is going to take a long time before we complete the adjustment to our changing energy situation. It also may forecast, I'm afraid, a capital crunch as we try to find the capital resources to make the major new investments required, along with our energy crunch.

It is also true, I forecast, that our energy is going to cost us more in the future. One source of this rise is the costly trade-offs that must be made between energy and environment, or among energy, capital, and labor within our economy. Not the least inexpensive will be the social costs of income redistributions between energy consumers and suppliers that the rising monetary costs of energy imply — but which are politically difficult to swallow. (President Carter's proposed use of energy taxes and rebates seems aimed at minimizing such social costs.)

Whether our energy solution will be *too* costly or not, will depend upon the wisdom we bring to making these energy policy trade-offs and upon whether or not we, as a nation of special interests, can agree on a policy solution before it is too late to implement it. □