THE VOICE OF SCIENCE ON CAPITOL HILL

F.A.S. PUBLIC INTEREST REPORT

Formerly the FAS Newsletter

SPECIAL ISSUE WITH
NUCLEAR POLICY BALLOT

Vol. 28, No. 8 October, 1975

THE LAST STAGE OF RAPID ELECTRIFICATION

Nuclear power produces only electricity. But the demand for its product had, until recently, been growing at 7% a year with great regularity for the last half century — hence it was doubling every decade. This extraordinary rate of growth, which has now been interrupted for two years, must decline within the next few decades in any case. This is because 7% so exceeds the historical growth rate in consumption of total energy that the proportion of total energy devoted to producing electricity has been doubling every generation. Today it is approaching 30%. One more such relative doubling would permit the electrification of everything in the economy except that 40% of energy use that goes to transportation and industrial process steam. (The latter is most unlikely to become electrified because industry would then be turning steam into electricity and back into steam — a wasteful process.)

It stands to reason also that this last doubling will occur more slowly as electrification is considered for the least plausible processes. What remains, in fact, is clothes drying (70% electrified already), cooking (40% electrified), water heating (38% electrified) and direct heat and space heating (only 5% electrified).

Moreover, per capita electric energy consumption for residential uses must begin to level off in this century. The following electric appliances exist already in more than 95% of all homes: refrigerators, television, clothes washers, vacuum cleaners. In more than 30% of all homes, these electric appliances exist: water heaters, ranges, disposals, clothes dryers and air conditioners. There is a limit to the devices that affluence might seek.

Finally, with population growth down to .7% a year — and downward revisions being made regularly — we do not need to projcet large increases for population growth.

As the electrification of the economy becomes essentially completed, the rate of growth of electric use would cease to exceed the rate of growth of energy itself. This rate has fluctuated around 3.4% in recent times.

However, the general rate of growth of energy use can be expected to lag behind the rate of growth of GNP as it has, for the most part, since World War II. Higher prices for energy; technical fixes; new technology embodying lower energy costs; and on-going shifts of the GNP composition toward less energy-intensive goods and services should provide at least a 1% and possibly a 2% decline in the energy-GNP

Continued on page 2

THE ENERGY-GNP RATIO

A place to start in considering U.S. use of energy is in graph 1, "Energy and Output in the U.S.". In the upper graph, we see confirmed the first approximation to the problem: energy and output grow in close correlation. More GNP requires more energy.

In the graph below, however, we see that this close correlation hides an important change in the ratio between the two quantities. The energy-GNP ratio has been generally declining since 1947, with the exception of the period 1966-1970, when it moved upwards sharply, only to resume its decline thereafter.

Between 1947 and 1973, it fell, on average, .6% per year. Thus there has been a general trend toward using less energy per unit of gross national product. And this trend has operated during periods when energy prices had been declining relative to other goods; hence, during periods when one might have expected the use of energy to rise as it was substituted for other more expensive ingredients of production (labor, materials, etc.).

Apparently, the less energy intensive industries have been growing at the expense of the more energy intensive ones, an example is the rise of services as an ever larger component of the GNP. And the introduction of new technology often brings with it, as a by-product, energy saving innovations.

What of the period 1966-1970? It was characterized by a slowly growing economy; this seems to characterize other periods in which the ratio did not decline. (Presumably, to the extent that the GNP ceases to grow, it also slows its shift in composition that is forcing down the ratio.) There was a rapid rise in natural gas and petroleum being used as feedstocks in chemicals production; this rise is well correlated with the 1966-70 period although it seems to explain, directly, only about 15% of the rise in energy-GNP ratio. An accelerating use of air conditioning and electric heating is cited also.

In 1970, energy prices rose sharply relative to other prices as shown in graph 1 until, in a short space of time, they were 60% greater. What can we expect to result from this rise in prices if, in fact, energy use tends to fall off relative to GNP even when energy prices are dropping?

There is some evidence that the industrial sector, which uses 40% of the energy, may decrease energy use about 9% for every 10% relative rise in prices — if the period at issue is taken to be a long run of, say, a decade. (This

Continued on page 3

BALLOT, page 6 — SOVIET EAVESDROPPING, page 8

Continued from page 1

ratio each year.

And the GNP growth rate may itself slow as population growth projections are revised downward, as affluence reaches self-saturating limits, and as environmentally conscious life-styles take hold. (The real possibility of economic stagnation for prolonged periods has to be considered as well.)

Thus we can see an end to rapid electrification. What to do, however, during this last final stage? Unfortunately, the energy burden is not likely to be easily shifted from electricity to gas or oil. The same specters of shortage that encouraged higher fuel prices, also discourage industrial, commercial, and residential users from relying upon these substitutes for electricity. Energy costs are still not high enough to make their minimization a priority that exceeds concern for availability. Industrial and commercial firms can pass the costs along in any case; home buyers pay the costs only over time, and looking for the lowest mortgage is their main preoccupation.

To the extent that solar or geothermal do not materialize in this century there will therefore be only two substantial alternatives to nuclear fission: coal-fired electric plants and conservation.

After whatever conservation has occurred, there will be the necessity for building a reduced number of plants to produce electricity. Thought of in terms of 1,000 megawatt plants, America has now the equivalent of about 450 plants of which 60 are driven by water, about 40 are nuclear, and 350 are conventional steam plants (60% of which are coal-fired and the rest fired by oil or gas).

Electric energy use may grow at a rate as low as 2% for reasons described within. If, however, it grew at the more commonly quoted rates of between 4% and 6% until the year 2000, it would be necessary to build between 800 and 1400 more. If 600 to 900 of these were nuclear, then AEC-ERDA predictions that about half our electricity in the year 2000 would be nuclear would be vindicated. If, on the other hand, we built only between 300 and 450 more nuclear plants, nuclear would represent only 25% of our electric generating capacity and our dependence would be limited.

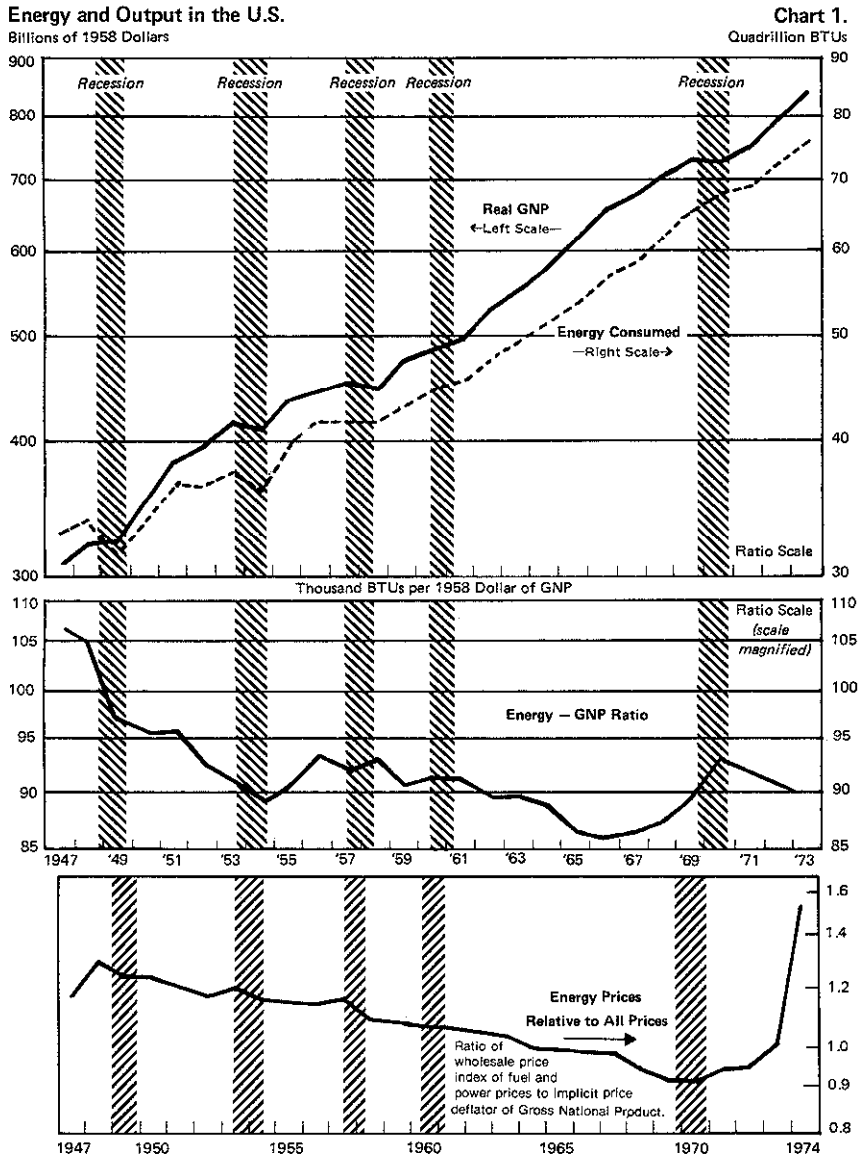
What looks likely in nuclear plant construction? In February, 1974, AEC's lowest of four estimates was still 231 by 1985 and 850 by the year 2000 but the industry now projects only 193 by 1985. (All four estimates were below the "most likely case" of 1972.) It is evident that the rate of growth of the nuclear industry is slipping. Its doubling time seems to have slipped from every five years (16% rate of growth) to every six years (12% rate of growth), and to be dropping off still more.

Most of the electric plants may be coal-fired in any case for financial and economic reasons. As the electric demand slips, the nuclear plants tend to get canceled first. They require more capital, which is in desperately short supply for utilities. And since they also take longer to build, they are always planned for that further future which is most vulnerable to downward revisions of demand. (A host of nuclear related problems also encourage their deferral just as a host of coal-related problems discourage coal plants.)

In the January 1975 Report, we discussed many of the underlying nuclear issues and followed this up in the March Report with reader comments and a delineation of four strategies: speed-up, slow-down, moratorium, and phase out. In June, we presented an ecological point of view and surveyed the APS reactor study.

We would now like to present our members with some further information on the nature of the issue and some questions that would guide us in setting FAS policy in future on a host of matters upon which we cannot consult all members in detail. See page 6. Do let us know your views. □

The FAS Public Interest Report is published monthly except July and August at 307 Mass. Ave., NE, Washington, D.C. 20002. Annual subscription $20/year. Second class postage paid at Washington, D.C.



Graph 1

Continued from page 1

was a conclusion of Project Independence.) Thus one could expect a 50% decrease over a decade from that sector alone.

Writing for the Conference Board Record, John G. Myers concludes the above analysis by suggesting that price rises, coupled with the historical record of downward movement in the energy-price ratio, might produce a 2% decline in the energy-GNP ratio.

If, then, GNP rose at 3.5% as projected in Project Independence, energy use would grow only 1.5% a year. This compares with the Energy Policy Project projections to 1985 of 1.7% (technical fix) and 1.4% (zero energy growth). Project Independence also suggested 2% as a goal for energy rate of growth. In short, at least one analysis suggests that the FEA and the Ford study aspirations for limiting energy growth to 1985 may well be achieved simply by on-going changes in GNP composition and recent relative price increases of energy.

GNP Growth

Furthermore, it is entirely possible that the estimated rate of economic growth in these projections may be more difficult to achieve in future. While the efficiency improvements in energy-GNP are less likely over periods of slow growth, the savings in energy that result from slower GNP growth more than compensate for them. Obviously, there are severe and undesirable costs to an unplanned and abrupt failure of growth. Obviously, also, most projections that are normative wish to allow for whatever growth is considered plausible. Nevertheless, a best estimate of future energy use would have to consider the possibility of low rates of GNP growth. □

MANDATORY CONTROLS

Mr. Sant: ". . . . the fact is, the one mandated program we have had out there is a 55-mile-an-hour speed limit, and I find in our surveys 90 percent of such people support it, and about 30 percent are actually adhering to it."

—pg. 380, Hearings before House Science and Technology Committee, February 18, 1975 □

ELECTRIC GENERATING CAPACITY: BROWN-OUTS?

Some conservationists tend to fear that America will use all of the electric energy that can be produced; that utilities have a strong urge to build more plants than America needs; that greater investment in plant construction will lead to price decreases as the surplus of "supply" affects prices; and that demand will rise.

The truth is more complicated and, in some respects, the opposite. The utilities do have an urge to build into their plans a reasonable margin because they are legally liable for failures to supply the anticipated demand. But construction of plants that are not fully used reduces their margin of profit by adding capital costs that are not bringing in customer payments. Thus, in the short and medium run, building too great capacity can cut their profits, and hence force them to apply for still higher rates.

If the utility is able to generate 20% more than its peak load, then it will rarely have insufficient capacity (much less than once a year). But with only ten percent reserves, six or eight occasions a year may arise. (Graph 2).

Graph 3 shows the reserve ratios that result if one combines projections of January 1975 plant construction with projected demand; it shows also the same plant construction plotted against earlier demand projections (April, 1974). If the earlier projections turned out to be true, the graph shows that reserve ratios would drop from about 22% to about 10%. While the earlier projections are unlikely to emerge, considering the many kinds of delays that the power industry is experiencing (siting, regulatory requirements, environmental litigation, jurisdictional conflicts of government agencies, equipment deliveries, etc.), it is possible that planned growth might sharply underestimate the real growth. (One reason for this dramatic shift in the implications of April, 1974 and January, 1975 is that the National Electric Reliability Council revised its projections in those nine months sharply downward — the equivalent of nearly two years' load growth over the ten year period!) But NERC sees a shift to electrification of the economy in view of the crisis of supply in oil and gas and wonders if this could result in a return to the earlier forecast of electricity demand. NERC concludes:

> "Overall reserve levels may well prove to be inadequate in future years to meet even current forecasts of peak loads."

In this event it sees some form of rationing or curtailment.** Would the brownouts constitute a referendum on nuclear power that would lead to its being freed from existing restraints?

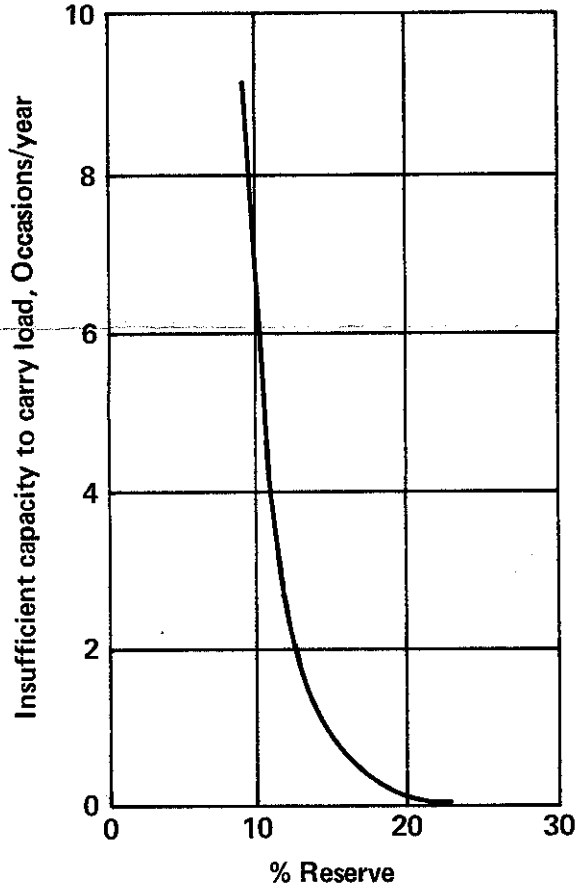
A report by Murray L. Weidenbaum, "Financing the Electric Utility Industry", has documented the sorry shape of the industry. This single most capital-intensive industry needs to raise about $140 billion for 1974-1980. Stock offers are hard to market since existing utility shares are being sold below their book value. Because their earnings are low, and because the interest rates are high, bonds are hard to sell. And, traditionally, utilities have had a low level of retained earnings to finance major capital programs from internal sources.

New technology seems to hold no immediate promise; a national grid, for example, runs afoul of the fact that peak periods tend to coincide.

However, the industry no longer has such a direct financial interest in expanding demand since it costs more to service new than old demand. There is rising interest in using the rate structure to slow down demand and to shift demand off of peak load periods through differential rates and time-of-day charges.

From Weidenbaum's point of view, the political process discriminates against utilities by taxing them more heavily than other forms of business. It seems to be easier to substitute utility rate increases for property taxes or other direct taxes. He advocates shifting the burden and warns that there is a "very real possibility" that the United States has entered a period in which high interest rates reflect the shortage of savings available to supply the capital desired. In this case, the utilities will be in trouble. In his view, higher utility rates *now* would produce relatively lower ones *later* by leaving the utilities in better shape to supply their own capital or secure it from the market. □

TYPICAL RELATIONSHIP OF GENERATION RESERVE LEVELS TO POWER SUPPLY DEFICIENCIES

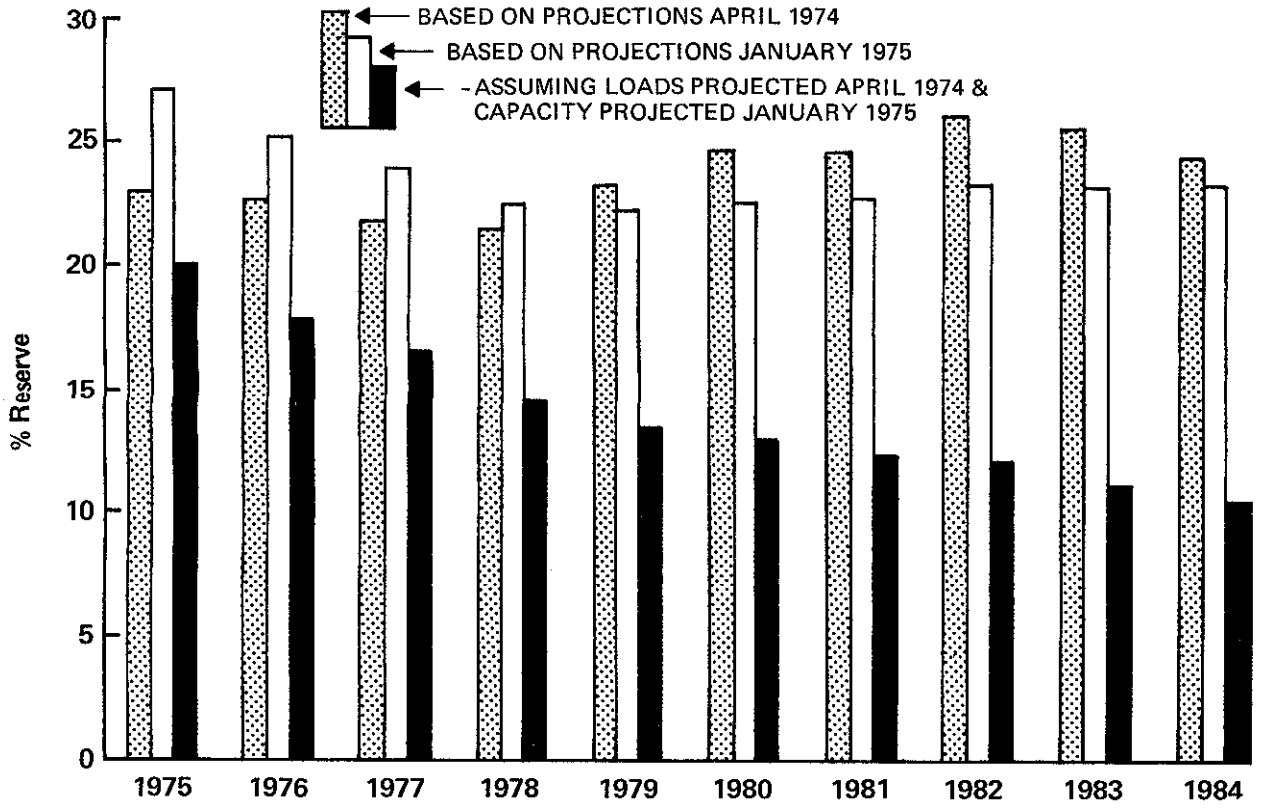


Graph 2

**By July, 1975, a subcommittee of its Technical Advisory Committee warned that economic recovery was likely to raise low load forecasts and that "the specter is raised that the power supply will be inadequate in some regions by 1978 and in other regions by the early 1980's." It noted that past practices in meeting peak load deficiencies with gas or oil were increasingly uneconomic and that the lead time on the turbines having been increased to three years, this was no longer a fast option.

NATIONAL ELECTRIC RELIABILITY COUNCIL

Percent Reserve Generating Capacity (Installed)
at Time of Summer Peak



Graph 3

CONSERVATION: MANY THINGS TO MANY PROFESSIONS

Everyone seems to see conservation in a somewhat different light. The physicists see enormous *potential* for conservation.

> "At present our energy resources are being consumed with an overall second-law efficiency of only 10 to 15%. This is not only wasteful, but inelegant."
> (APS Summer Study)

Politicians tend to accept the fact that there is enormous "potential" for conservation — they believe the physicists without understanding them. But they doubt that they will be able to reach a consensus on a conservation program. Knowing themselves only too well, they predict a form of business as usual.

Federal Energy Administration sees conservation as being achieved by "cost effective savings efforts in lieu of short lived curtailment steps" and by effecting "as rapidly as possible, the removal of Government constraints on the free market and allow supply and demand to seek their own levels".

There seem to be three coherent conservation strategies.

The Economist

Embed all possible social costs of energy production or use in their prices. De-regulate with all deliberate speed. Let the invisible hand of the price mechanism produce the conservation. It is sometimes alleged, but probably not true, that these higher prices for energy would represent a regressive tax; newer data suggest that when indirect uses of energy, such as flying, are considered, everyone is using about the same fraction of his income for energy.

Problem: No one knows how much conservation this will produce. Will market flaws be repairable? Will the price rises spur inflation?

The Environmentalist

Add to the strategy of the economist, legal restraints upon certain kinds of production: off-shore oil, strip-mining, nuclear plant construction. Advise public to curtail use, and indirectly force changes in life style by limiting availability of energy.

Problem: The restraints may overdo it; even the uncertainty over future legislation may cloud energy investment.

Engineering Approach

This is the "technical fix" approach of the Ford Energy Study, advocating various methods of getting more out of less energy.

Problem: Insulating your home may pay for itself in due course but motivating the consumer to lay out the cash raises a host of questions. Such schemes as having the utility advance the capital and receive its payment in reduced fuel bills are ingenious. But can the institutional problems be solved? Are energy prices just too low to motivate the new devices and techniques the engineer wants? □

NUCLEAR POLICY BALLOT

☐ **I. RAPID ADVANCE:** A growth rate for nuclear power plants of 10% or more per year.

☐ **II. GO SLOW:** A growth rate for nuclear plants of 3% to 7% per year.

☐ **III. MORATORIUM:** A zero growth rate for a number of years while maintaining plants now under construction.

☐ **IV. PHASE OUT:** A halt to construction of nuclear plants and the phasing out of existing commercial nuclear reactors.

SAMPLE ARGUMENTS FOR THESE POLICIES, EACH LIMITED TO 100 WORDS, FOLLOW:

I RAPID ADVANCE

Domestic production of oil and gas are in decline and it is desirable to reduce dependence upon imported oil. Even with *no* growth in energy demand, and maximum deployment of solar systems, it will be necessary in this generation to compensate for the deficit with coal and/or nuclear fuel. Analyses done thus far to compare the environmental costs and social costs of coal versus those of nuclear seem to indicate that such costs of nuclear might be a hundred-fold less. It would therefore appear wise to permit nuclear to significantly increase its 3% share of U.S. energy which this policy would do.

II GO SLOW

Go Slow cuts the current 12% rate of growth by a factor of 2 to 4, providing more time to observe performance of existing plants before investing further capital, while maintaining industrial momentum. It could keep the percentage of nuclear-generated electricity below 25% to limit national dependence. Since the total nuclear plants would be only double or triple the 200 plants now under construction, this policy: does not increase substantially existing risks of sabotage or waste disposal; increases the risk of accident and plant related dangers by only a small factor; and has little or no increased effect on world proliferation.

III MORATORIUM

The nuclear program has been growing much faster than is prudent on the dubious assumption that various technological and institutional problems will be solved in timely fashion: waste disposal, emergency core cooling, sabotage, diversion, leaks of actinides throughout the fuel cycle, plant decommissioning, and fuel-reprocessing; and on the assumption that current reactors would function economically. Only a flat moratorium will persuade the reactor industry and government to reconsider and resolve these problems — if they can be solved — before the nuclear commitment becomes irreversible. Lower expectations for energy growth rates make this policy especially timely now.

IV PHASE OUT

Even if nuclear plants grow only slowly, conservation and energy alternatives are undermined. Indeed, so long as any commercial nuclear plants are permitted, unsolved problems of sabotage, waste disposal, and diversion remain, and an inherently dangerous new technology exists. Why absorb these risks? To the extent necessary, coal, in abundant supply, coupled with efficient use of energy, can replace nuclear plants until benign and renewable sources suffice. Clearly, the social-environmental costs of coal are far more amenable to control than those of nuclear, and much shorter term. Above all, having first built the bomb, America owes the world leadership in an effort to leapfrog fission.

Tear out this page, fold in thirds, and mail to FAS.

FIRST CLASS STAMP

Signature of FAS Member _____

Printed Name _____

Federation of American Scientists
307 Mass. Ave., N.E.
Washington, D.C. 20002

ECONOMICS OF ENERGY

There are a variety of methods for securing energy in general, and electric energy in particular. The result ought to be greatly increased availability of energy with each substantial price rise. Whether it is solar energy, synthetic oil, nuclear fusion, or whatever, higher prices of energy justify technologies that were not economically feasible before.

Once the methods begin to establish themselves, moreover, their prices ought to decline thereafter as they yield economies of scale. According to John Fisher's "Energy Crises in Perspective" (Wiley Interscience, 1974), one finds, in plotting cumulative production of energy of various kinds on log-log paper, that costs drop a certain fraction for each doubling of cumulative production. (Of course, at some point, when depletion of the resource is in sight, costs will begin to rise — Mr. Fisher believes this will occur in inverse proportion to the fraction of the resource left in the ground.)

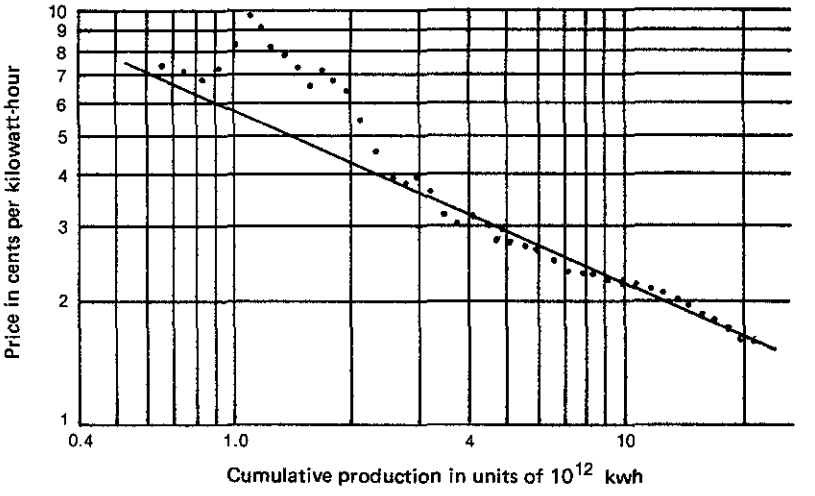
For electric energy, the trend line shows a 25% decline in price for each doubling. See graph 4. For electric utility coal, the same conclusion was reached until enactment of the Clean Air Act started prices rising. For crude oil, the trend line shows a 5% decline with each doubling of cumulative production. For retail gasoline processing, a 20% decline is found in processing costs.

Mr. Fisher concludes that other energy sources, such as synthetic oil, will follow this same course. Higher prices for energy induced by external forces will force older energy sources off the trend line temporarily but a trend toward constantly declining costs per doubling of cumulative production will recur. Moreover, the higher prices will bring in new sources, which will then follow these same trends.

In a widely reported article, "The Coming Glut of Energy", of January 5, 1974, The London Economist predicted that the higher prices of OPEC would precede a surplus for these general reasons — and also because the higher products would induce conservation, curtailment, and general limitation of demand. Others have predicted that OPEC might break up if its prices were set high enough. It might be necessary to so curtail the supply of OPEC countries to preserve demand that the cartel became unwilling and competition resumed. Indeed, in the last year, the real price of oil has apparently dropped 20% as supply pressures exceeded demand.

Capital Versus Fuel

The other trend that is inescapable to any observer is the trend toward higher and higher capital investment costs, coupled with lower and lower fuel costs, coupled with ever more inexhaustible resources. Fuel costs for nuclear power represent only about 25% of its cost where 40% is the rule for coal. For synthetic fuels made of coal or shale, the capital costs will obviously be higher than before, but the supply of shale is enormous. Fusion and solar will both use inexhaustible resources but neither will be cheap because of the enormous capital investment. In the limit, as with solar, the capital costs will become everything. But the fear of ecologists that energy will eventually be both inexhaustible *and* cheap seems not to have any present basis. □



Graph 4

ERDA PLAN OBSCURANTIST

FAS was asked by the President's Council on Environmental Quality to testify on the ERDA "National Plan for Energy Research, Development & Demonstration" in hearings to be held jointly with ERDA. Inasmuch as Volume II of the Plan was only made available three days before the hearings, FAS supplied a letter on Volume I.

Volume I contained five energy scenarios. The first reference scenario called scenario zero was followed by this sentence which seemed to impeach its significance:

> "Increasing energy prices and concerns about increasing national and economic vulnerability would force major modifications in services and outputs based on energy if the trends of this scenario were to continue for very long."

This sentence, virtually the only infusion of economics in the volume, called into question the significance of the scenario — which was, nevertheless, used as a reference point thereafter.

In scenario IV, ERDA projected a course of events involving limits on reactors to about 200 now under construction. But, in a failure of nerve, it so designed the scenarios and the data released, that it is impossible to determine whether this scenario is really viable. Hints abound that electric supply is in excess in all scenarios. Elsewhere it is hinted that the real problem is a liquid fuel problem. But because the scenarios each vary supply and demand constraints independently, the analysis does not provide the outside analyst with building blocks with which to draw his own conclusions.

ERDA's high projections of energy use are the medium projections of AEC (and its medium projections, the low projections of AEC, etc.); this, coupled with a more serious effort of analysis, makes the ERDA plan a step forward over those of AEC. Nevertheless, the entire analysis was of surprisingly little value and FAS called it a waste of the tax-payers' money. □

SOVIET EAVESDROPPING & ADMINISTRATION UNCERTAINTY

In June, 1975, the Rockefeller Commission on CIA Activities sounded an alarm about Soviet eavesdropping on Americans by saying:

> "While making large-scale use of human intelligence sources, the communist countries also appear to have developed electronic collection of intelligence to an extraordinary degree of technology and sophistication for use in the United States and elsewhere throughout the world, and we believe that these countries can monitor and record thousands of private telephone conversations. Americans have a right to be uneasy if not seriously disturbed at the real possibility that their personal and business activities which they discuss freely over the telephone could be recorded and analyzed by agents of foreign powers."

Reports then began to circulate from unnamed sources that there was "nothing that we could do about it".

FAS wrote the Attorney General on June 27 asking why microwave interceptions could not be prevented by electronic means; was there any technical or legal impediment? Was the Department subordinating its interest in preventing espionage to an interest in avoiding a jamming war that might undermine our own intelligence collection in the Soviet Union? FAS also expressed concern about the financial and political implications of permitting, or acquiescing in, Soviet eavesdropping.

When no answer had been received for some weeks, FAS gave a front-page interview to the Washington Evening Star expressing these concerns. U.S. News and World Report made light of the problem but subsequently Newsweek gave new indications of the possible scope of the danger. It seems to be possible for computers to collect selectively only the calls from specified telephone numbers and, furthermore, rumors are everywhere that the National Security Agency — and presumably its Soviet counterpart — can delegate to computers listening for "key words"; if some machine-analyzed approximation to the key word is heard, the entire conversation is taped for human transcription. In this event, the enormous volume of calls might be digested to provide useful information.

On September 4, Assistant Attorney General Thornburgh replied to FAS's letter saying that Justice could not make a "final determination as to any specific course of action in a matter this complex. . . . Essentially, this Government's course of action must be determined on a national policy level."

This seemed to confirm the view that the Justice Department did not consider this a matter of simple espionage to be resisted with whatever means were legal. ☐

FAS PROFESSIONAL BULLETIN SUSPENDED

During the last two years, the Federation of American Scientists Fund, FAS's tax-deductible subsidiary, had been complementing the FAS Public Interest Report with a second monthly publication, the Professional Bulletin. Drafted by Ms. Mary Fillmore, this publication had received considerable praise from memers for dealing objectively and lucidly with such subjects as:

Psychosurgery	Toxic Substances Control Act
Peer Review	Scientific & Political Control of NIH
Freedom of Information Act	Human Experimentation Regulations
Data Suppression	

Besides her reportorial and analytical talents, Ms. Fillmore had shown considerable ability as an administrator and entrepreneur in ironing out and managing various FAS problems. Early this summer the Environmental Policy Center, in desperate financial straits, approached FAS for advice on launching a direct mail program and publishing a newsletter. In order to assist EPC in these ways and to help Ms. Fillmore broaden her career experience, FAS acquiesced in her transfer.

Although the Federation itself is solvent, based upon projected membership dues collections, the tax-deductible Fund is broke. In view of Ms. Fillmore's departure, it was decided not to try to continue the Professional Bulletin with infusions of Federation dues — which ought to be earmarked, in principle, for that more activist role it is permitted by the tax laws to play.

For the moment, therefore, we have suspended publication of the Professional Bulletin and will simply continue the monthly Public Interest Report, supplemented possibly with occasional special comments.

A number of members, while not questioning the value of the Professional Bulletin, had wondered whether FAS should be publishing two monthly periodicals in a world in which members had so much to read in any case. Comments are invited on how hard the FAS Fund should try to resurrect the Professional Bulletin. ☐

FAS PUBLIC INTEREST REPORT (202) 546-3300
307 Mass. Ave., N.E., Washington, D.C. 20002
October 1975, Vol 28, No. 8

☐ I wish to renew membership for calendar year 1976.

☐ I wish to join FAS and receive both newsletters as a full member. Enclosed is my check for 1976 calendar year dues. (☐ I am not a natural or social scientist, lawyer, doctor or engineer, but wish to become a non-voting associate member.)

☐ $20 Member ☐ $50 Supporting ☐ $100 Patron ☐ $500 Life ☐ $10 Under $10,000

☐ Subscription only: I do not wish to become a member but would like a subscription to:

☐ FAS Public Interest Report — $20 for calendar year

☐ Enclosed is my tax deductible contribution of _____ to the FAS Fund.

NAME AND TITLE _____
Please Print

ADDRESS _____

CITY AND STATE _____
Zip

PRIMARY PROFESSIONAL DISCIPLINE: _____

Second Class Postage Paid at Washington, D. C.

Return Postage Guaranteed