Editors' Introduction

by Helmut J. Frank and Jeremy W. Heist (Department of Economics, University of Arizona, Tucson, Arizona)

This first issue of *The Energy Journal* contains selected papers and addresses from the First Annual Meeting of the International Association of Energy Economists (IAEE), which was held in Washington, D.C., on June 4, 1979. The presentations published here have not been formally refereed, as articles will be for regular issues of the Journal. They represent, rather, a partial record of what was presented at the IAEE meeting, whose form and content was determined as follows: Association officers appointed a general meeting chairman, Michael L. Telson (U.S. House Budget Committee), and three members of a program committee: Terry A. Ferrar (GPU Service Corporation), Michael Rieber (University of Arizona), and Milton Russell (Resources for the Future). This group, in turn, planned the meeting format, appointed chairmen for the concurrent sessions, and selected the main speakers, including Sam H. Schurr (presidential address), William D. Nordhaus (keynote address), and James R. Schlesinger (luncheon address). The concurrent sessions covered alternative energy sources, energy demand, oil and natural gas, and coal and synthetic fuel. Individual topics and speakers were selected by the chairmen of the respective sessions: Richard Rowberg (U.S. Office of Technology Assessment), Irwin M. Stelzer (National Economic Research Associates), Milton Russell, and Harry Perry (Resources for the Future). The present volume does not include all presentations from the meeting. Some participants presented only informal papers or reported only preliminary results.

America's Energy Choices

Presidential Address by Sam H. Schurr (Deputy Director, Energy Study Center, Electric Power Research Institute, Palo Alto, Calif.)

In trying to decide on a topic for this address I found myself wavering between a talk that would review this first, eventful year in the life of our Association as opposed to a subject which would be more substantive in nature. Substance finally won out, partly because of personal preference, and partly because of the advice of others. The remarkable progress of the Association is something we are all proud of, but I believe that it has been-and will
continue to be-well documented in many ways familiar to all of us. The forthcoming appearance in the near future of the Association's own professional journal will be a signal event in the unfolding story of the Association's successful development. A substantive theme, in turn, also offered various possibilities, but it seemed best to stick closely to the research which has dominated my own work for the past few years—a broad study of the future energy supply and demand prospects and problems of the United States. This work was done at Resources for the Future (RFF) and involved several staff members. It covered a wide range of subjects, such as energy-economic growth relationships; natural resources; technological options; environmental health and safety aspects of energy technologies; and policy and institutional issues. In my remarks today I will offer my own interpretations of some of our main findings. I want to begin with two broad conclusions we reached on the long-term outlook for energy supply and demand. I emphasize that these are not predictions, particularly on supply, but instead estimates of results that could be achieved with appropriate policies. (1) That with new or improved technologies, energy in the commercial forms required can be made available from domestic resources at costs (in real terms) no more than about twice today's prices; and that the new energy technologies will, over the long run, substantially dampen cost increases compared to the technologies they replace. (2) That in response to economic, technical, and policy forces already at work, energy consumption will grow at a slower rate in relationship to national output than in the 1950s and 1960s; but we couple this estimate with the proviso that energy consumption in productive activities should not be restricted to levels below those justified on cost-based economic calculations.

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The Energy Crisis and Macroeconomic Policy

Keynote Address by William D. Nordhaus (Professor of Economics, Yale University)

It is hard to find an issue more confusing than energy policy. Is there a shortage of oil? Why? How long will the shortages last? Who's to blame? What will be the supply and demand response to price decontrol? What are the appropriate policy responses today? Can the president or the secretary of energy or the Congress be trusted to find the answers? And so on. I should tell you at the beginning that I do not have the answers. Only a fool would pretend to. Rather, I would like to offer up to you four simple and perhaps obvious points regarding energy policy and economic policy. First, energy policy has graduated from a macroeconomic to a macroeconomic issue; it is hopelessly enmeshed in all of our major economic problems. Second, when this first point is recognized, we see that the overall economic costs of energy consumption—especially oil consumption—far above what buyers face in markets; we are still underpricing energy. Third, I will argue that the whole experiment in politicizing energy policy—prices and consumption—has been a serious failure. We have concentrated too much on substance and too little on process. And, finally, as a result of all these three points, I will make some suggestions about the directions we should follow in energy policy.
Energy Policy: An Economist's Confessions

Address by James R. Schlesinger (Former U.S. Secretary of Energy)

It is a particular pleasure to be addressing an association of professional colleagues. I must concede it is the first time that I have done so since I was on the faculty at the University of Virginia. The atmosphere here is a little bit chilly; you can rest assured that when our rulemaking on temperature control takes effect on July 1, you will not have this experience. I want to talk briefly about how we think about energy and economics. Energy turns out to be the essential economic problem of this era. It will determine not only the performance of the industrial economies, it will determine the survivability of the political institutions in these Western democracies. Unless we effectively deal with the energy problem, we shall be in grave difficulties. Even though it is the quintessential economic problem, I must state that it lends itself only in part to traditional economic analysis. I recollect that when my Harvard tutor John Williams, president of the American Economic Association, spoke, his address was entitled "An Economist's Confessions," and that will be the burden of my comments.

Residential Electricity Revisited

by Hendrik S. Houthakker (Professor of Economics, Harvard University)

The following is a report on various attempts to update and improve an earlier analysis of residential electricity demand (Houthakker, Verleger, and Sheehan, 1974 - hereafter referred to as HVS). To understand what is new the reader should first know what has been maintained, namely: (1) the logarithmic flow-adjustment model which estimates this year's consumption from last year's consumption, this year's price and income, and possibly (though not in HVS) from other variables, (2) the pooling of annual time series for 48 states using the error component approach of Balestra & Nerlove, (3) the use of a "marginal price" for electricity. The present paper may be regarded as a verification of the first of these hypotheses, and to some extent of the other two.

The Clumsy Cartel

by M.A. Adelman (Professor of Economics, Massachusetts Institute of Technology)

The recent price explosions in the world oil market result from the tardy recognition of the post-1973 consumption slowdown. Such odd results could not happen in a competitive market, but are not at all strange in the world of the cartel. An analogy may explain. A diver
in the sea cannot go lower than the sea floor, nor higher than the water’s surface. He is nearly weightless, and can float at any depth between these extremes, but the slightest impact effort sends him up or down. Similarly, in any market, the price cannot drop below incremental cost, since such a drop would choke off supply, nor can it rise above the level that would maximize profit a monopoly, since the monopoly would gain by putting the price back down. But in a once-competitive market, where the price has been rising toward some unknown monopoly optimum, the price can hold steady or can move drastically up or down in response to very slight impulses. In this range the price may show no response, or even a perverse response, to changes in demand. Since 1973, price response has been perverse. This was clearly the case in 1974, as the world headed into recession. It is so again in 1979.

Pages 55-61

The World Oil Market: An Exporter’s View

by Alirio A. Parra (Director, Petroleos de Venezuela, S.A.)

I am deeply honored to be part of this distinguished panel and to address my professional colleagues on the occasion of the first annual meeting of the International Association of Energy Economists. I have been asked to speak about the world oil market from the point of view of an oil exporter. Before I begin addressing myself to matters on which there are some differences between exporters and importers, however, I wish to point out an important area of agreement between us, namely, the need for better information about the oil situation. To an extent that the general public probably could not comprehend, the main actors on the world oil scene today make decisions on the basis of very sketchy and inadequate information. A public conscious of the explosion of facts and information would probably find that difficult to believe. But conditions change far faster than our means of gathering information, analyzing it, and acting on it. As economists, we struggle constantly with the time lags and other problems that make it hard to get usable data. Those of us engaged in shaping industry policy day by day are always conscious of the shortcomings of the information we have. We are underinformed about developments on both the supply side and the demand side of the international oil industry.

Pages 63-75

The U.S. Outlook for Supplemental Gas

by Arlon R. Tussing (President of Arlon R. Tussing & Associates, Inc., Seattle, and Adjunct Professor of Economics at the University of Alaska, Anchorage, Institute of Social and Economic Research)

Current forecasts of natural gas demand in the United States through the turn of the century are lower than projections made only a few years ago, and fall far short of the volumes the economy is technically capable of absorbing even with its existing stock of energy-using
equipment. The first two columns of Table 1 compare medians of demand forecasts published in the last three years with the medians of similar forecasts published between 1961 and 1972. The third column lists the amounts that would be consumed if gas accounted for the same proportion of total U.S. energy consumption (32 percent) as in its peak year, 1971. The final column shows the amount of gas that would be consumed if gas accounted for 32 percent of total energy in 1980, and supplied in addition all energy requirements above those of 1980, except for transportation fuels, over the following decade. A priori, one would expect a fourfold increase in the real price of crude oil to have induced a substantial rise in gas consumption through its effect on both supply and demand, but actual experience has been just the opposite.

**Pages 77-86**

**Coal Policy and Energy Economics**

by Richard L. Gordon (Professor of Mineral Economics, Pennsylvania State University)

With the flurry of legislation in 1977 further inhibiting coal consumption and production, it became apparent to many observers coal had joined oil, gas, and nuclear energy as a tightly regulated industry. Since by now this observation has been widely disseminated, it seems most appropriate here only to summarize the nature of the barriers and their obvious implications. Then emphasis can be placed on the perspectives that economic analyses can provide for evaluating the issues. Coal consumption is most severely limited by the increasingly complex set of air pollution control regulations. Coal supply was first reduced by the Coal Mine Health and Safety Act of 1969. More barriers were added under the Surface Mining Act of 1977. Finally, an incredibly convoluted set of pressures, involving administrative actions inspired by various acts of Congress and fears of an emerging energy monopoly, have produced eight years without federal coal leasing and complex procedures for leasing and employing federally owned coal (see Gordon, 1978b, 1978c). To be sure, sound economic arguments can be provided for the principle of government intervention, at least in the cases of air pollution and surface mining. The question raised here is whether the actions have been excessive.

**Pages 87-104**

**Coal Liquefaction**

by George R. Hill (Envirotech Professor, University of Utah)

The relative quantities of coal, petroleum (plus natural gas liquids), and natural gas proved and currently available in the United States are $18 \times 10^{15}$ British thermal units (Btu), $3.7 \times 10^{15}$ Btu, and $2.5 \times 10^{15}$ Btu, respectively. The relative total recoverable resources are $134 \times 10^{15}$ Btu for coal, $11.2 \times 10^{15}$ Btu for petroleum, and $9.5 \times 10^{15}$ Btu for natural gas (Parent, 1979). Since coal represents roughly 86 percent of the total U.S. resource, one
would expect its use to approximate that percentage of the energy input in the United States. But actually, the percentage of coal in the fossil energy input is only 21 percent. Petroleum and natural gas consumption accounts for nearly 75 percent. Almost half (48 percent) of the fossil energy used in the United States consists of petroleum and its products. Since some 45 percent of this petroleum must now be imported, it is essential that our primary resource, coal, be used in increasing amounts. This paper presents information on the various liquefaction processes that can utilize coal. Where possible, comparative economic data are also presented.

**Pages 105-106**

**Comments on "Coal Liquefaction"**

by L.E. Swabb, Jr. (Exxon Research and Engineering Co., Florham Park, N.J.)

Dr. Hill has given an excellent, comprehensive review of the coal liquefaction development programs that are now in progress. In view of the limited time, I would like to comment on just one subject - the economics of coal liquefaction and the impact the economic basis on product cost. This would appear appropriate to the interests of this audience, as well as an important consideration when evaluating costs quoted by various sources. My comments are based on a commercial plant study design for Exxon Donor Solvent (EDS) process made in 1975-1976 and published in an EDS project report in January 1978. This study design is now being updated, and the new coal liquids costs are probably going to change. However, the old data will serve to illustrate the point I wish to make.

**Pages 107-131**

**Biomass Energy Economics**

by John R. Benemann (President, Ecoenergetics, Inc., Richmond, California)

"...an economy based only on solar energy would have to rely on the natural costless way of harnessing that energy, which means an intensive on of wood ... and possibly, but at this moment, debatably, of algae." (N. Georgescu-Roegen, 1976).

**Introduction**

The energy crisis has become a permanent fixture in our lives. It is apparent that the brief era, roughly 1920-1970, of relatively low and declining fuel costs is over for good. The world economic system must adjust to a new era of high-cost fuels, dislocations, and transition to new energy sources. Large uncertainties exist about the future availability, production costs, market prices of the conventional fuels - oil, gas, and coal. Even greater uncertainties exist about the costs of the alternative sources - nuclear power and renewable resources, principally solar. As more information becomes available, nuclear power is constantly required to increase its safety level, becoming ever more expensive.
The high-risk, very large, very long-term capital investments required for fusion research and development (R&D) make those options unattractive economically, even should they ultimately prove technically feasible. Renewable energy resources are not yet technically well developed and must still undergo a process of evolution and selection whose outcome is unpredictable for specific cases. It will require a very significant research effort and investment to reduce the number of competing concepts, processes, prototypes, and products to those that can meet the requirements of the future marketplace.