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CES Board of Advisors Appointed by Woodson

Dr. Herbert H. Woodson, director of the Center for Energy Studies, has appointed eleven persons to serve on the Advisory Committee of the center, with the approval of Dr. Gerhard J. Fonken, UT vice-president for academic affairs and research.

"This is a broadly representative group of people interested in energy, particularly energy policy," he said. "They represent a diversity of backgrounds and, in my view, are all thoughtful, very responsible people."

Members of the committee include representatives from government, business, consumer organizations, and other universities.

Dr. Woodson said that the CES Advisory Committee has been of great help in the past in the process of evaluating and planning the activities of the center. Their viewpoints on the center provide much valuable insight and challenge, he said.

In the first meeting of the new Advisory Committee, to be held in October, the group will explore CES energy policy research and the relationship between the center and the rest of the university.

Center for Energy Studies Advisory Committee

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Mr. David O. Wood
Senior Research Associate
MIT Energy Laboratory

Energy Policy Studies

A number of energy policy studies are under way within the Center for Energy Studies. The policy studies program is multidisciplinary, carried out by faculty and students from law, business, liberal arts, and engineering of The University of Texas at Austin.

This research has four primary purposes:

- To develop a sound and factual information base that can be used by energy policy analysts and decision makers
- To identify important energy policy conflicts
- To analyze and report on the tradeoffs of selected energy policy issues
- To develop methods and techniques useful to energy policy analysis, particularly techniques of displaying policy alternatives and their tradeoffs

A summary of new energy policy studies:

World Energy Trade—Soviet Energy Exports

The energy needs and plans of the Soviet Union and Eastern Europe will play a key role in future world energy trade. Dr. George Hoffman, chairman of the Department of Geography, has done extensive research on the potential in these countries for energy resource shortages and their impacts on future economic and political development. He is continuing the research to focus next on a situation with inherent conflicts: the Soviets' exporting energy to West European countries while Eastern Europe's energy demands continue to grow.

Electricity—Financing Future Capacity Expansion

The electric utility industry is highly capital intensive: the average ratio of assets to revenues is more than 4 to 1, compared to less than 1 to 1 for manufacturing companies. These high plant and equipment investment requirements, high inflation, and the regulatory practice of setting prices by a historical cost-of-service calculation create great problems. Virtually all privately owned utilities in the United States have been placed in a grave financial and cash flow position.

Unless substantial reform of rate-making practices occurs, most utilities have no alternative to delaying—in some cases indefinitely—their installation of new and replacement capacity. The eventual result will be reduced quality of service and prolonged dependence on oil and gas.

In this project researchers are developing an integrated computer model of the facilities and finances of electric utilities. The model will be used for study of the financing constraints that the industry faces, in terms of their implications for both fuel use and reliability. The project is directed by Dr. Martin Baughman, head of the CES Electric Power Division, and Dr. Leon Lasdon, professor of general business.

Energy Policy—The Political Process

Public policy on energy evolves from a political process. The energy problems of the United States—increasing scarcity of energy supplies, environmental effects of energy production and consumption, and dependence on foreign sources of energy—have continued despite the new energy policies that have been created to solve them.

In this project four political scientists, Drs. Charles Cnudde, R. Harrison Wagner, Nathan Goldman, and Paul Anaejionu of the Department of Government, are seeking to apply political science to the study of energy policy.

The group is integrating three differing but related approaches to the study of public policy: (1) public choice, a tradition related to economics which emphasizes market failure as the basis of government intervention into private decisions; (2) group analysis, which emphasizes the interests involved and represented in policy decisions, and (3) public administration, which emphasizes constraints on decision making.

The specific areas the researchers are addressing are the leasing of public lands for energy production, the synthetic fuels program, and the windfall profits tax.

An Investment Model for Synfuels Plant

A computer simulation of the synthetic fuels industry is being developed by Dr. David Kendrick, professor of economics, Dr. Leon Lasdon, professor of general business, and Mr. Joseph Melton, graduate student in operations research.

The model will contain synthetic fuel plants, market areas, and transportation routes. The submodel for each plant will include inputs and outputs of various commodities, as well as different production activities and capacity constraints. Such a computer simulation is called a dynamic investment model because investment for expansion can occur within it.

The first application of the model will be to study the oil shale resources of Colorado and the size, location, and technology of synthetic fuel plants that might be planned for the area. Given inputs as to the size and quality of the region's resource base, the model will generate a pattern of plants and their technologies that will (1) meet cer-

tain water use and pollution standards, (2) meet production targets, (3) do so at the minimum cost, and (4) show the pattern of development over a 20-year timetable.

The main purpose of the model is to provide a vehicle to study and compare public policies affecting the development of the synthetic fuel industry.

Boomtown Economics

An important impact of the large energy projects appearing in the sparsely populated Rocky Mountain states is the simultaneous appearance of energy boomtowns. The sudden influx of families of workers hired for an energy project often overwhelms the facilities of nearby small towns—particularly social services such as fire protection, law enforcement, schools, and medical care.

In this CES study, the economy of the energy boomtown is the focus. In the past, computer models of boomtowns have been created. In these models, important economic variables (such as prices and relative distributions of income) have necessarily been ignored or held constant. This type of approach is termed a partial equilibrium model. Dr. Michael Kennedy, senior research associate in the Institute for Constructive Capitalism of the UT Graduate School of Business, is developing a general equilibrium analysis of boomtowns. In his model, prices and incomes will not be held static, but will be allowed to change in response to new projects.

The goal of the model will be to identify winners and losers in the boomtown economy and to assist in the design of policies that will ease the impact on the losers.

Environmental Legislation and Leasing of Public Lands

Two goals, the preserving of public lands in their natural state and the exploiting of these lands for their resources (such as energy and timber), are likely to conflict increasingly in the near future. The controversy should come to a head in the formulation of the 1982 Clean Air Act Amendments.

The 1977 Clean Air Act Amendments set high standards for air quality of federal public lands (the prevention of significant deterioration [PSD] standard). Dr. Gundars Rudzitis, assistant professor of geography, is conducting a study of the economic and social tradeoffs involved in the air quality impacts of increased development of federal lands. He will also address the largely unexplored question of the ffect of PSD standards on the economy and on other aspects of the general well-being.

Shale Oil, Water, and the Politics of Ambiguity

Northwestern Colorado is an area rich in oil shale and poor in water. To extract and process fuel from this reserve (which accounts for 80 percent of US oil shale) will require large quantities of water—water for process use, land reclamation, and related service industries. Moreover, the large waste stream of shale processing, the spent shale itself, is a potential major source of water pollution.

These two water-related problems of shale oil development—pollution and supply—are the principal topic of this study, being conducted by Dr. David Prindle, assistant professor of government. He is also examining the technological and economic problems of extraction and the prospective clash between oil shale developers and other users of water.

Because no significant shale oil development has occurred yet in the United States, the problems of shale oil development are unfamiliar and little understood by public policy makers. Thus the research is a case study of how state and federal public policy is made under conditions of uncertainty and of what general styles of decision making emerge.

Future Landscapes of the West

In a related study, the tradeoffs involving the physical landscape of the West is the topic. Dr. Robin Doughty, associate professor of geography, is seeking to determine the temporary and permanent physical effects that are likely to occur from future energy development in the West. The purpose of this study is to construct an integrated view of the environmental character of the West that our great-grandchildren will likely inherit and to clarify the long-range perspective in which current national land-use decisions are being made.

CES Update

Nuclear Studies

The pebble-bed nuclear reactor, a device pioneered in Germany but little known in the United States, is being studied for its potential as an element of a fusion-fission hybrid system of the future.

Dr. Dale Klein, head of the Nuclear Studies Division and assistant mechanical engineering professor, said that instead of containing bundles of fuel rods, the core of a pebble-bed reactor is filled with graphite-covered spheres of fuel the size of tennis balls. A coolant, helium, is blown through the gaps between the spheres, carrying off the heat that the nuclear reaction produces.

The pebble-bed reactor has three possible advantages. Depleted fuel pebbles can be extracted from the core and fresh ones added without requiring that the unit shut down operation. The pebble-bed reactor can operate at higher temperatures than conventional reactors, perhaps as high as 1000° F, and thus can be used for process heat applications. The use of graphite instead of metal to cover the fuel elements means that, if a loss-of-coolant accident were to occur, the pebble-bed core would not be in danger of melting down.

Dr. Klein and graduate student Brian Gantt are studying the feasibility of breeding nuclear fuel by placing the pebble-bed fuel elements into a blanket zone surrounding a hybrid fusion reactor. Exposed to the neutrons released from the fusion reaction, the fertile material could be converted into usable fissile material (a process known as enrichment) or the deplet-

CENTER FOR ENERGY STUDIES
The University of Texas at Austin
Engineering Science Building 143
Austin, Texas 78712

ed spheres could be regenerated into fissile material.

Dr. Klein said that fusion reactor engineering is still in its infancy, and various types of blankets have been envisioned. In this project the researchers will use computer codes to do detailed neutronic analysis for the various blanket concepts. They will also look at how a pebble-bed blanket could be integrated into currently envisioned fusion reactor designs and at how the altered pebbles could best be recirculated when returned to the pebble-bed reactor.

The project is supported by a grant from the Texas Atomic Energy Research Foundation.

Social Systems Analysis

When it comes to environmental effects, **not all petrochemical plants are alike.** In fact, the opposite is true, according to a study recently completed by center researcher Keith Chapman, a geographer, at The University of Texas at Austin while on leave from the University of Aberdeen in Scotland.

Dr. Chapman studied the petrochemical complexes of the Texas and Louisiana Gulf Coast and summarized his results in a report published recently by the University of Aberdeen, *Petrochemicals and Pollution in Texas and Louisiana.*

The Texas-Louisiana Gulf Coast is the most important petrochemical production region in the United States. About two-thirds of the US capacity to produce petrochemicals exists in Texas and Louisiana. The primary environmental impact of petrochemical facilities is the residual byproducts they generate. Dr. Chapman found that residuals vary substantially from plant to plant and that the specific manufacturing process being carried on in the plant is the best determinant of what residuals are produced. Thus, generalized guidelines for the petrochemical industry are often not as appropriate as process-specific ones, according to Dr. Chapman.

Which pollutes more per unit of production, a large plant or a small plant? Dr. Chapman found that, for atmospheric emissions, large and small plants were about the same. For effluents (residuals discharged into the water), however, the type of cooling system and the company's attitude toward pollution control investment appeared to be stronger factors than plant size.

"Despite the existence of such economic factors promoting corporate interest in reducing the discharge of residuals, there is little doubt that investment in pollution control facilities is usually a response to external pressure [i.e., regulation]. Where such differences exist between establishments of similar size and product-mix, they may reasonably be regarded as indicative of differences in the prevailing environmental policy climates," Dr. Chapman wrote in his report.

"Differences in pollution control performance cannot be explained exclusively in terms of such external factors. . . . Certain companies tend to view environmental legislation as a form of unwelcome government interference to be challenged and resisted. . . Others take a more positive view and frequently anticipate state and federal requirements."

Two types of approaches to environmental regulation exist. One focuses on the region, the other on the sources. In the first, the pollution control plan is devised to achieve a certain standard of environmental quality in the region; in the second, the aim is simply to limit each pollution source to a certain level.

Dr. Chapman said that which standard is best is a question currently being debated in Europe. Great Britain favors the regional quality standard, and the European Commission sees point source standards as more practical.

The United States has used both approaches. Since 1970 the point source standard has become predominant, particularly in water pollution control. "The effectiveness, if not the efficiency, of the policy [of point standards] is apparent in the improvement of water quality in such industrialized waterways as the Houston Ship Channel," he said.