

# Energy Studies

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## New Building Planned at Balcones Center

The Center for Energy Studies will be one of several University of Texas programs to be part of a plan to improve and expand the UT Balcones Research Center.

The goal, according to University President Peter T. Flawn, is to make the Balcones Research Center "a highly visible, identifiable research community, . . . an integral part of the University's preeminent energy-related research and educational programs."

A feasibility study proposed by President Flawn and approved by the Board of Regents in July will provide cost estimates for structures to house the Center for Energy Studies, the Center for Electromechanics, the Bureau of Economic Geology, and support facilities, including a commons building. A faculty committee headed by Dr. Grady Rylander, chairman of Mechanical Engineering, will evaluate the plans. Construction may begin as early as summer 1981.

Dr. Herbert Woodson, director of

the Center for Energy Studies, said that the CES building should be an energy-conscious design and, if not a solar building, then one designed to easily accommodate a solar retrofit.

Although not yet finalized, plans for the CES laboratory building are being formulated to accommodate major research activities. Among them are fusion energy technology; solar energy; residential, commercial, and industrial energy conservation; nuclear fission technology; geothermal surface technology; and technologies for the control of environmental impact of energy production and use.

The center's main office will remain in the Engineering-Science Building of the UT-Austin campus.

The Balcones Research Center, a 475-acre tract located in northwest Austin eight miles from the main campus, currently houses about twenty-five research laboratories, mostly in old structures that were part of a magnesium plant in operation during World War II.



Entrance to the UT Balcones Research Center.

# CES Update

## Office of Director

The General Electric Foundation has given the Center for Energy Studies a **one-year grant** of \$15,000. Dr. Herbert H. Woodson, director of the center, said that the grant will be used for energy-related policy studies.

## Electric Power

**A major program for conserving energy** such as the federal Building Energy Performance Standards (BEPS) might have the paradoxical effect of stimulating energy demand, if it significantly lowers the price of energy.

Dr. Martin Baughman, head of the Electric Power Division, and Alicia Torre, graduate student, have completed a study of five computer models that can be used to simulate the financial effects of energy conservation actions on electric utilities.

In the project, funded by Lawrence Berkeley Laboratory, five models are described and compared: Over/Under Capacity Planning Model, Regulatory Analysis Model, Electric Utility Policy and Planning Analysis Model, Regionalized Electricity Model, and the Electric and Gas Utility Financial Simulation Model.

The central recommendation of the study is that the Regulatory Analysis Model be the one incorporated in Lawrence Berkeley's larger modeling effort to assess the impact of energy conservation on utilities.

Large energy conservation programs require careful analysis, Dr. Baughman said. If a conservation program like BEPS reduces the demand for electricity, it may allow utilities to hold down or lower the price of electricity. The lower price may have the effect of encouraging demand and thus reducing the value of the program. In addition, such a program could lead to delays in the construction of more economical generation plants. Such a delay might result in higher prices in the long run. Many other factors also have effects on the price of electricity, among them, escalation of fuel prices, regulatory delays, inflation, high interest rates, and increasing lead times for construction.

In a summary of the study, Ms. Torre pointed out that "Building large generation plants involves a great mismatch of cash outflows and inflows which weakens a utility's financial condition. . . . In contrast, investing in conservation, although more capital intensive, involves shorter lead times and a closer match of expenditures and returns."

**Dr. Martin L. Baughman**, head of the Electric Power Division, has been appointed associate director of the center.

## Environmental Studies

**Acid rainfall and its effects** on air, water, plants, and human health are raising major environmental questions in the United States: What causes rainfall to become acid? Is acid rainfall increasing? How much harm can result from it? How and why does acid rain vary?

CES Environmental Studies researchers are focusing on the last question in this group. In order to provide better raw data for discovering how and why acid rain varies, the researchers have developed a device to sample and analyze rain as it falls.

The device, called the automatic sequential rainfall sampler and analyzer, was developed by Jose A. Lopez-Gonzalez, center researcher and PhD candidate in environmental health engineering, and Frank Hulse, technical staff assistant in the Environmental Health Engineering Program of the UT College of Engineering. The research is funded by the center, the Texas Energy and Natural Resources Advisory Council, and the US Environmental Protection Agency.

In the past a common method of sampling acid rain was to set a clean bucket out during a rainfall. Sample periods ranged from a day, a week, to even a month. None of these long sampling periods reveals how the chemistry of rain changes during the course of a shower, nor how the fresh rain alters chemically after it falls.

The sequential sampler-analyzer remedies these problems, Mr. Lopez-Gonzalez said. When rain starts, a large funnel on top of the device automatically flips open. Rain falling in the funnel runs to a container where its pH level at that moment is recorded. After the desired volume of

water is obtained, the sample is discharged into one of a series of sample bottles, and the cycle repeats. The intensity of the rainfall can be calculated from the samples and a time record.

The end result of other monitoring techniques is at most one sample per rainfall. In contrast, the sequential sampler-analyzer automatically gathers as many as forty samples of uniform volume (200 to 500 milliliters) per rainfall.

The value of obtaining numerous small samples is that they can be used to create a profile of a rain shower, Mr. Lopez-Gonzalez said. When the samples are correlated with meteorological data, such as wind direction and acid source data, even more can be learned.

One way the sequential sampler-analyzer can be used is to study the differences between "rain-out" and "wash-out." Rain-out is the process by which a contaminant particle becomes the original nucleus for a raindrop that carries it to the ground; wash-out is the process by which the hurtling raindrops pick up other contaminants as they fall. Rain-out is thought to pick up contaminants from more distant sources; wash-out is thought to pick up local contaminants.

The sequential sampler-analyzer was tested in November in a rainfall in Austin and performed well, Mr. Lopez-Gonzalez said. Initial data will be gathered with the machine at sites near weather stations throughout the lignite belt of Texas (principally north-east Texas) and perhaps Arkansas.

Because of the concern and the



The rainfall analyzer developed by Jose Lopez-Gonzalez is housed in a van. The sampling apparatus on top automatically flips open when rain falls.

questions being raised about acid rain, more careful measurement of its occurrence and composition is needed. Mr. Lopez-Gonzalez thinks his sequential sampler-analyzer will contribute to the fuller understanding of acid rain.

## Solar Studies

An innovative **textbook for teaching solar engineering** through computer programs has been written by two Solar Division researchers and a University of Houston professor.

The book, *Solar Thermal Systems: Analysis and Design*, is written by Dr. John Howell, UT mechanical engineering professor; Dr. Gary Vliet, UT mechanical engineering professor and head of the Solar Studies Divi-

sion; and Dr. Richard Bannerot, associate mechanical engineering professor at the University of Houston. The text is due to be published in early 1982 by McGraw-Hill.

The book is based on the concept of computer-aided design. In the first chapters the student is introduced to the simplest configuration of a solar thermal system: solar radiation source, collector storage, and load.

In each succeeding chapter, a basic element is made more detailed and realistic. Size and demands upon the system are varied. Different components with varying performance characteristics are introduced. Weather patterns are altered in various ways.

After each chapter the students perform a computer exercise in which they run the system, see how it behaves, and alter variables to meet the

specifications of the exercise. Programming instructions are given at the end of the book in FORTRAN and BASIC languages. Dr. Howell said instructors with a moderate computer knowledge can set up the program for their students. The text can be used at university, junior college, and community college levels, he said.

Dr. Howell said *Solar Thermal Systems: Analysis and Design* was developed to give engineering classes direct experience in designing solar systems. "It is good because it gives a grasp of overall system behavior and because it lets the student understand what's really important: what the overall system provides," he said.

The text and the programs can be used later on the job by students as a reference manual and design tool, Dr. Howell said.

## UT Austin Energy

### Energy Degree Programs Planned in Architecture, Mineral Resources

Two new graduate-level academic programs in energy—one in architecture and the other in energy and mineral resources—are planned to be offered at The University of Texas at Austin.

Both programs are among the first of their kind to be created in the United States and are planned to start up in fall 1981.

The proposed architecture program is called Energy in Architecture and is a degree concentration for the existing master's degree in architecture, said Dr. Francisco Arumi, architecture professor and coordinator of the program.

"Over the past five years we have seen a whole new breed of architects develop, architects interested in energy-conscious design," he said.

The thirty-hour program is the most engineering-oriented concentration offered by the UT School of Architecture. It requires courses in heat transfer, numerical experiments in building design, applied solar energy, passive solar design analysis, and others. A thesis is also required.

Graduate students who enroll in the concentration must have completed the professional bachelor of architecture degree, Prof. Arumi said.

The second new program is a multidisciplinary master of arts degree in

energy and mineral resources. The initial graduate advisor of the program is the director of the UT Mining and Mineral Resources Research Institute, Dr. Willem C. J. van Rensburg.

The proposal for the new degree (which is awaiting College Coordinating Board approval) states, "The Master of Arts degree in Energy and Mineral Resources would be a comprehensive, interdisciplinary degree designed to prepare students for professional positions in industry, government, or education where they can help address important problems faced by the United States in providing adequate sources of energy and nonfuel minerals for the future."

The course areas include geological sciences, petroleum engineering, electrical engineering, economics, government, public affairs, business, and geography. Thirty hours of courses and a thesis are the main degree requirements. Funding for scholarships exists within the Mining and Mineral Resources Research Institute.

"There is already a substantial demand in industry and in the public sector for persons having [multidisciplinary energy and mineral resources] training, and the demand will increase in the future," the proposal states. "Texas has a greater need for the development of an integrated training and research program in energy and mineral resources than any

other state" because of its intensive energy and minerals industries, vulnerability to supply disruption, and need for new sources of energy and revenue.

### DOE Awards UT-Austin \$178,500 for Energy Conservation Retrofits

The University of Texas at Austin has received a grant of \$178,500 from the US Department of Energy (DOE) for energy conservation measures in three campus buildings.

The grant is being used primarily to modify the air-conditioning control systems in the Art and Education Buildings and in Sid Richardson Hall. The DOE grant provides 50 percent of the total project cost, with the university providing the remainder in matching funds.

### PETEX Signs Agreement with Mexican Institute to Produce Manuals, Films

The University of Texas Petroleum Extension Service has signed an agreement with the Instituto Mexicano del Petroleo to jointly produce and distribute training materials to the petroleum industry in Mexico and the rest of Latin America.

Twenty-three training manuals and three audiovisual programs are being considered for joint development. The

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Petroleum Extension Service already has released or is preparing four publications, five films, and eleven audio-visual programs in Spanish.

The materials will deal with topics such as well drilling, petroleum production, work-over (enhanced recov-

ery), and well servicing. The items developed will be used by the Instituto Mexicano to train personnel in the national petroleum workforce.

In addition to Spanish materials, the Petroleum Extension Service has prepared its first Chinese-language

petroleum manual.

Established in 1944, the Petroleum Extension Service conducts in-house training programs and technology schools and distributes petroleum training manuals, slides, tape programs, and films.

## **CES Publications**

### **The Banking of Lignite Leases in Bastrop County, Texas: 1954-1979**

by Christopher S. Davies and R. Wyatt Dietrich, August 1980, 56 pages, Policy Study No. 12 (UT/CES-PS-12).

Coal and lignite are becoming increasingly attractive resources in Texas: lignite's share of the electric power generated in the state was 1 percent in 1971—projected to grow to 27 percent by 1985.

In one area of Texas, Bastrop County, the leasing of lignite-bearing lands is booming, although no surface mining has yet occurred. The report analyzes this leasing activity and its patterns—geographic, financial, and attitudinal.

The authors conclude that for the lignite leases investigated the profits are disproportionately divided: 90 to 92 percent to the leasing companies, 6 percent to the landowners, and 2 percent to land reclamation. Public resistance to strip mining was found

to center on a perception that it would cause despoilation of the land and that, aside from certain landowners, the general community would incur losses with no compensation.

The interim before mining begins in Bastrop County is an opportunity for landowners and the rest of the community to better understand the situation.

(Dr. Davies is a UT associate professor of geography; Mr. Dietrich received a master's degree in geography in December 1980.)

### **Offshore Oil: an Overview**

by Ian R. Manners, June 1980, 103 pages, Policy Study No. 11 (UT/CES-PS-11)

This report provides an assessment of the current status of the worldwide offshore search for oil and gas. Particular attention is given to trends in offshore production (such as shifts in producing regions) and the geographic patterns of exploration drilling. Profiles are drawn of those

non-OPEC nations where the chances of new offshore oil discoveries appear highest—the new “offshore frontier” (Argentina, Australia, Brazil, Chile, India, Indonesia, and Mexico).

The principal policy issues associated with future offshore oil development include: (1) developing appropriate, risk-free technologies and (2) balancing demands that conflict and compete for coastal land (recreation, energy-related facilities and infrastructure, and wetland preservation). These issues will have to be faced and decided by the nations of the offshore frontier.

(Dr. Manners is a UT associate professor of geography currently on leave of absence in New Zealand.)

**To order Center for Energy Studies publications, contact Information Index, P.O. Box 866, Oak Ridge, Tennessee 37830 (615/576-1335) or the National Technical Information Service, P.O. Box 1552, Springfield, Virginia 22151 (202/487-4600).**