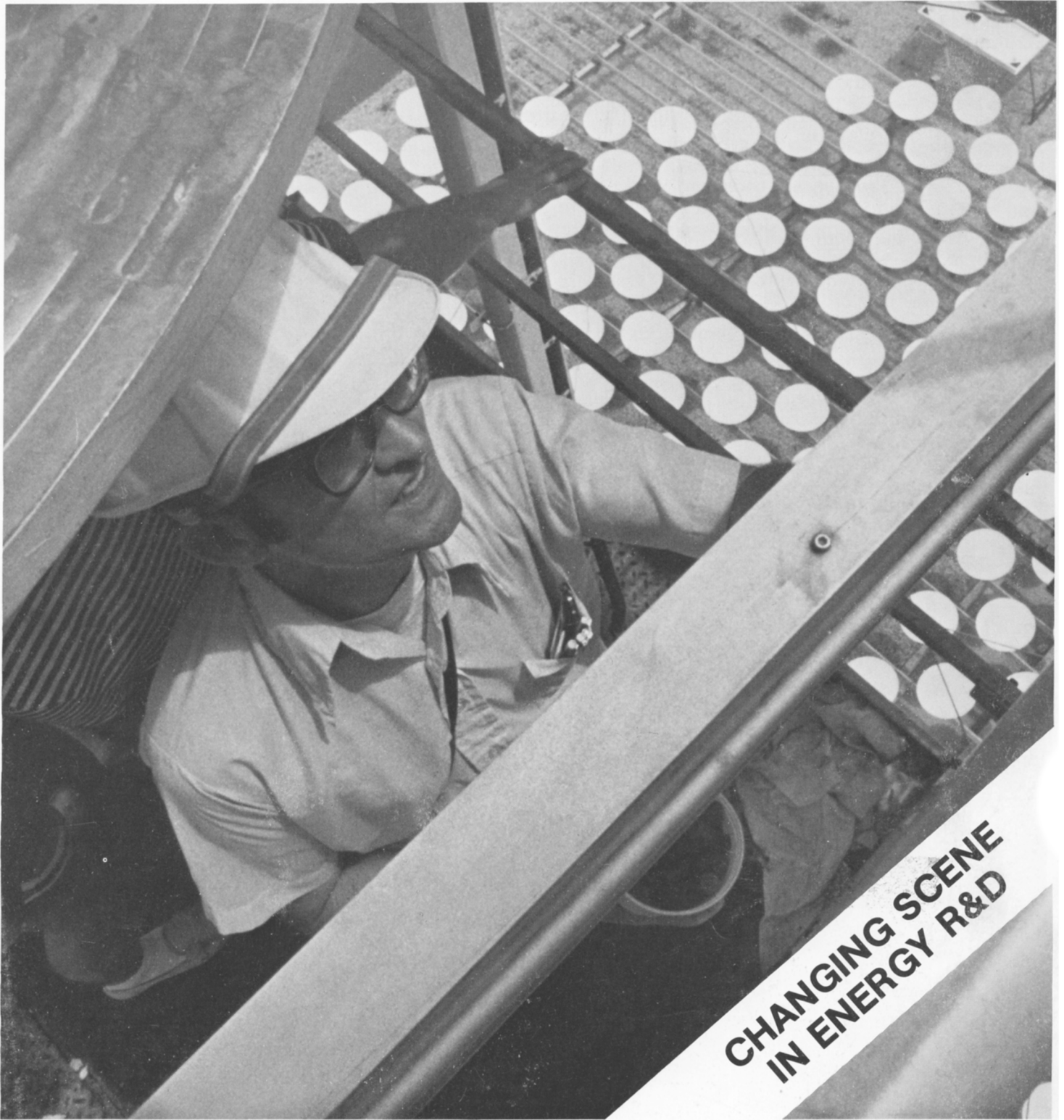


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RESEARCH HORIZONS



CHANGING SCENE
IN ENERGY R&D

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY
A Unit of the University System of Georgia



The Changing Face Of Energy Research

Federal energy research funding priorities have changed, but the Engineering Experiment Station still works actively in this field.

In early 1981, the future of energy research at EES was very much in question. This work enjoyed considerable federal support during the presidency of Jimmy Carter. But with the coming of a new administration more skeptical of the value of these technologies, many in EES and the national research community believed that established energy programs might be lost.

A year and a half later, their worst fears have not been realized. Energy activities at EES have been cut back but a number of projects still have federal sponsorship. However, the kind of research being backed by the Department of Energy (DOE) has

changed. There is no longer much support available for energy conservation assistance programs or pilot projects to demonstrate existing energy technologies. Instead, today's DOE is allocating money for basic research in technologies which have good long range payoff potential but are still too underdeveloped for industry to use economically.

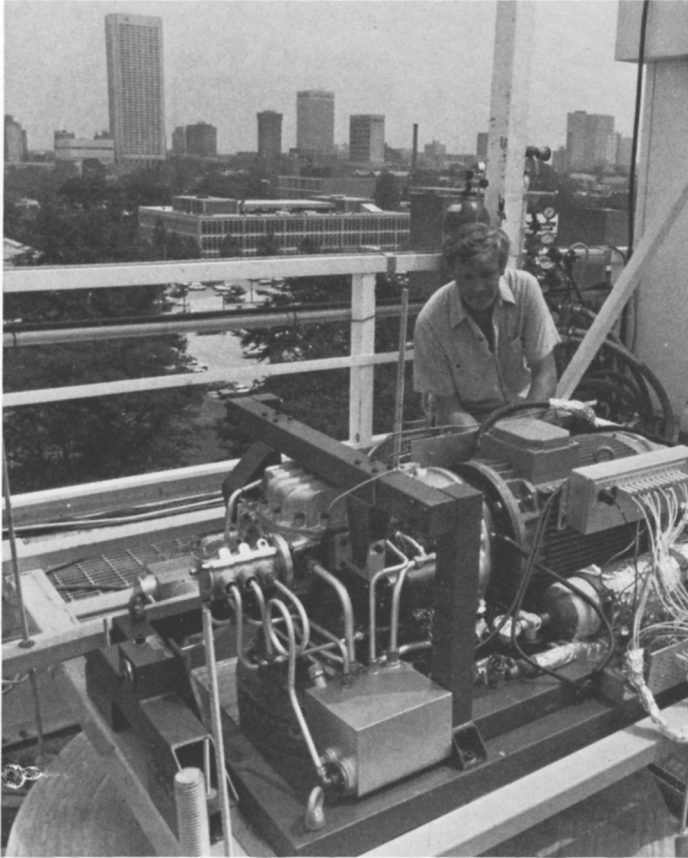
EES' solar energy program has benefitted from this change of emphasis, securing a contract to operate one of two DOE centers in the country for basic research in solar thermal applications. The Station will do most of this R&D in-house at the 325 kW Advanced Components Test Facility

(ACTF), a solar concentrating device owned by DOE and maintained by EES on the Georgia Tech campus. First year funding for the center was \$616,000.

Researchers working through this R&D center will conduct projects aimed at:

- Developing materials for solar equipment with improved characteristics and performance at the high temperatures encountered in some solar energy systems.
- Producing synthetic fuels and valuable industrial chemicals through solar thermal processes.
- Developing solar systems as eco-





DOE's funding priority shift, but not as much as their colleagues in biomass R&D. Federal support for only one large program of basic research in the biomass area at EES was reinstated after last year's budget cuts. This year, DOE provided \$418,000 to develop an EES technology known as "entrained flow pyrolysis." The process is the outgrowth of many years of Station research in pyrolysis and its unique feature is its method of thermal conversion of biomass into synthetic fuels. Ground wood is pyrolyzed in a moving, hot stream of inert gas rather than a traditional fixed bed—thus the name "entrained flow pyrolysis."

The entrained approach is considered by DOE to have excellent economic potential for industries looking to produce synthetic fuels from wood on a large scale. After several years of research, Station engineers have built a prototype unit which is nearly ready for a trial run and testing. If EES projections are correct, the entrained flow pyrolysis system will optimize conversion ratios of hard wood to pyrolytic oil and syngas. These by-products are valuable for heating or as feedstocks in other manufacturing processes.

Another R&D program recently funded by DOE calls for the Station to spend two and a half years developing a novel method of cleaning up effluents produced by wood gasification. First year funding is in place at \$150,000. Wood has proved itself to be economically feasible in an era of skyrocketing petroleum prices. However, toxic materials produced by combustion can create environmental hazards or mar the purity of the manufacturing processes which use these fuels. EES has invented a cleanup method which does not rely on wastewater treatment systems, as most previous research efforts have. The Station's approach promises to be more efficient and less costly than traditional cleanup technologies. It recycles the waste materials as feedstocks for the gasification process.

The Station's biomass and solar energy research groups are seeking support outside DOE, but private industry and other governmental agencies are having difficulty filling the void left by these research funding cutbacks. Biomass



onomically viable sources of industrial electricity and high temperature heat for certain manufacturing processes.

EES also is teaming up with the Florida Solar Energy Center to make a similar type of investigation of photovoltaic solar technology. The two institutions will form a Southeastern Residential Experiment Station with a \$2 million grant from DOE. They will collaborate for two years to pave the way for wider use of photovoltaics as a supplemental source of residential electricity.

Photovoltaic cells are a product of space technology which can convert sunlight directly into electric power. They can be made from silicon and are generally clustered in flat plate arrays. The Southeastern Residential Experiment Station will focus on the practical problems of feeding electricity generated by solar cells into electric power grids. EES will gather data for this research from photovoltaic arrays at sites at Georgia Tech and Roswell, Georgia, and in Tennessee, Florida and Alabama. This program is aimed at solving problems related to lineman safety, power quality, reliability and power management in systems using solar cells.

Solar researchers at EES have lost some momentum with

Left, the federal government is sponsoring a basic research study to improve effluent cleanup in wood gasifiers. Top center, in a solar testing program conducted by EES, directly usable electricity was generated for the first time with a small external combustion Stirling engine and a large solar concentrator. Right, the Station continues to offer industrial energy conservation surveys free of charge to Georgia industries.

researchers are working on several small contracts, some of them spinoffs of programs done for the Department of Energy in recent years.

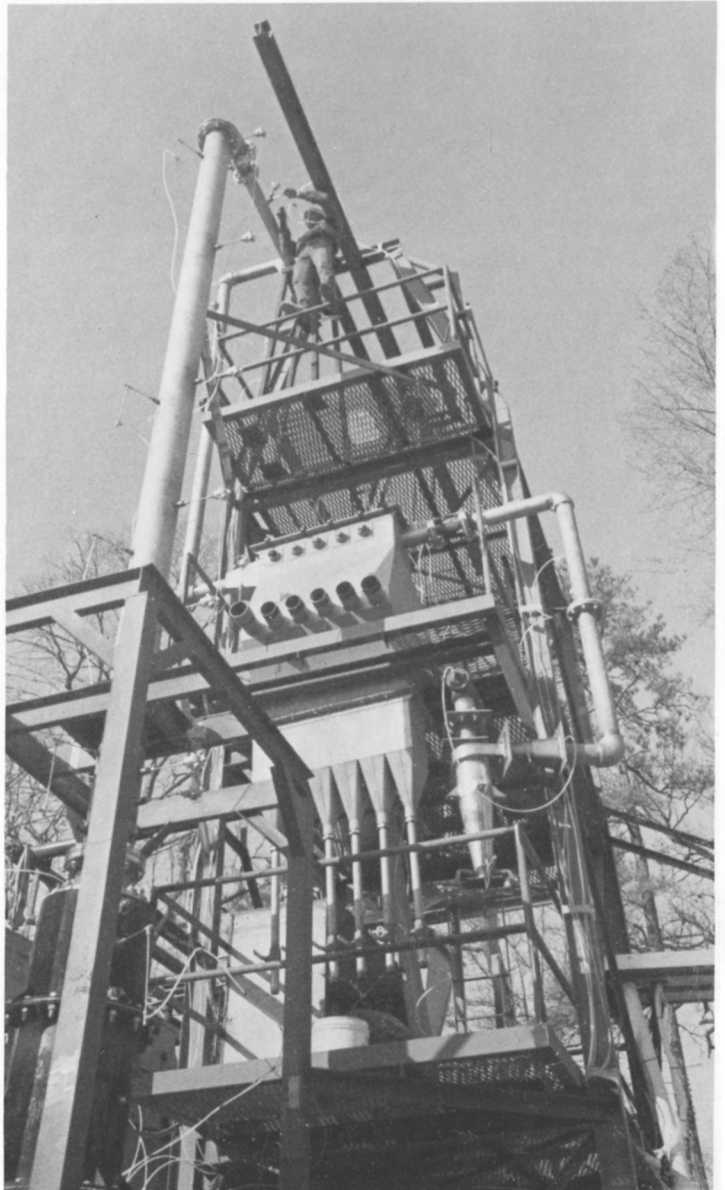
EES' solar energy program continues to get outside support from private industries and other research labs who wish to use the ACTF for testing programs. Last year, the Station helped United Stirling of Sweden generate directly usable electricity for the first time by mating the 325 kW solar concentrator at Tech with a small Stirling external combustion engine. EES researchers have scored preliminary successes testing a small particle heat exchanger developed by Lawrence Berkeley Laboratory. This direct flux receiver uses small carbon particles to absorb solar thermal energy and produce process heat. Another important experiment at the Station will test the feasibility of using a solar reactor to produce hydrogen through a thermal chemical cycle developed by General Atomics.

DOE funds for energy technology demonstrations and energy conservation assistance have largely disappeared, but programs in these areas at EES have survived in scaled down operations with money from other sources. One surviving DOE-sponsored demonstration project in biomass R&D is an effort to create an "energy integrated farm." Funding for this activity was saved because money was allocated by Congress before last year's federal budget cuts began. This project aims to demonstrate how anaerobic digestion can recycle animal wastes on a Georgia dairy farm and provide economical process heat for the operation.

DOE continues to support EES' largest energy conservation program, the Industrial Energy Extension Services (IEES), but federal funds for this center have diminished. However, The Georgia Office of Energy Resources, which administers IEES for DOE, continued to fund the program at essentially the same level this year, thanks to a grant received from Chevron as a result of an overcharging judgment.

Increasingly, the Station is looking to markets overseas for sponsorship of energy technology demonstrations and energy conservation assistance. Ironically, some of the funds available in foreign countries come indirectly from United States-backed organizations. However, there are indications that some industrialized nations are interested in supporting programs of this kind. Recently, the Station signed a \$929,000 agreement with the Agency for International Development (AID) to help the government of Sudan develop and disseminate renewable energy technologies which are appropriate to rural needs.

EES will conduct a similar demonstration program in Egypt over the next four to five years for the National Aeronautics and Space Administration (NASA). Funding for the Station's work will run close to \$1 million, and EES researchers will direct 11 renewable energy projects utilizing technologies more sophisticated than those employed in Sudan. □



Above, solar photovoltaics technology is being developed at EES for use in international energy programs. Below, this prototype developed at the Station is almost ready for tests of the entrained flow pyrolysis concept of wood gasification.