EES Report
ENGINEERING EXPERIMENT STATION • GEORGIA TECH
Serving Georgia and the Nation

President's Gasohol Plan Needs Time, Says Economist

It is doubtful that the president's proposed gasohol program could be met in even two or three years, says an economist with the EES Economic Development Laboratory.

Nick Gibson, an economist specializing in energy-related topics, says that the president's gasohol plan, based on the grain denied the Soviets, needs time. The biggest problem, says Gibson, is that the United States does not have adequate production facilities for converting large amounts of corn into ethanol, the alcohol component of gasohol.

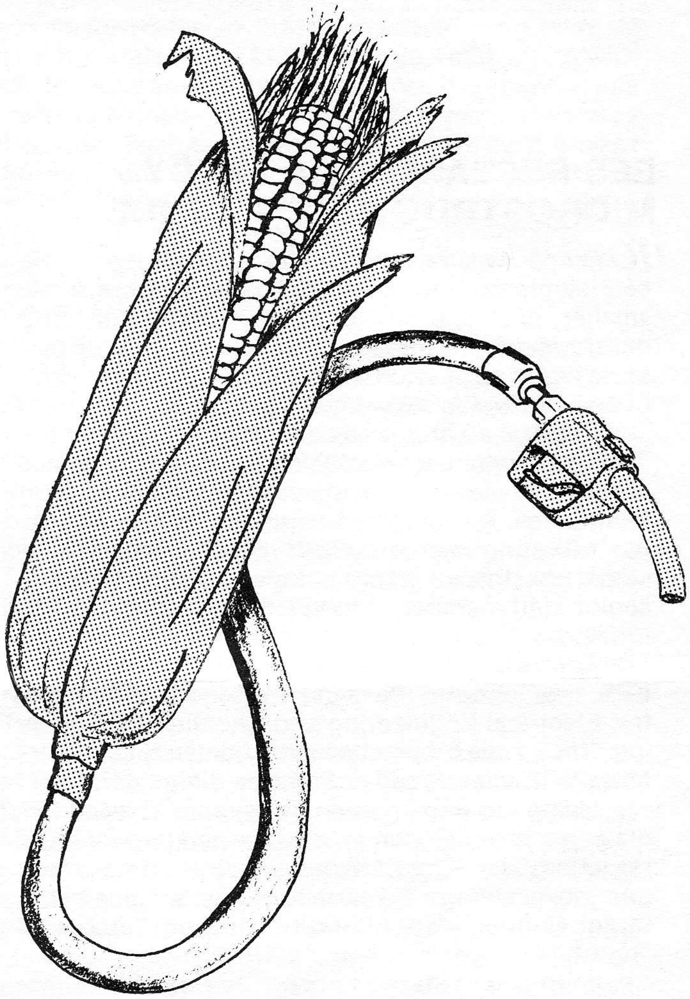
Approximately 14 million metric tons of grain will be diverted from shipment to the Soviets. Of this amount, the equivalent of five million metric tons, or 200 million bushels, of corn has been earmarked by the president for gasohol production.

The economist says that the United States' present capacity for producing ethanol is approximately 50 million gallons per year. This is primarily from two large industrial alcohol plants, one in Illinois and one in Pennsylvania.

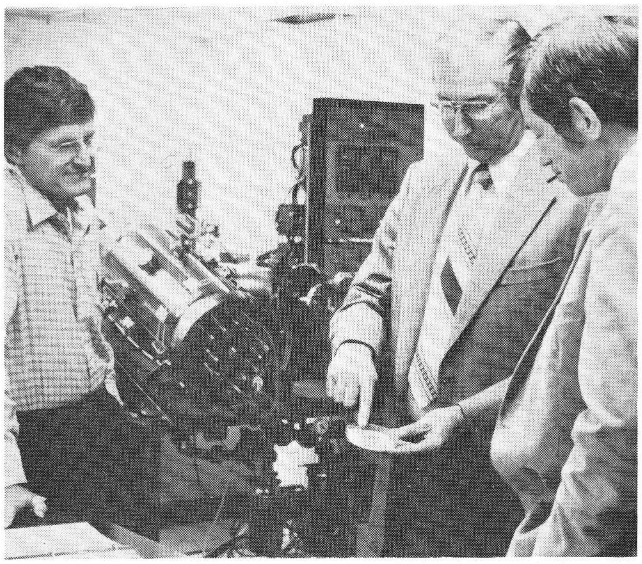
The embargoed corn could produce as much as 500 million gallons of ethanol, says Gibson. This is ten times the amount of ethanol we can now produce.

Gibson does feel, however, that with proper government incentives such as tax reductions and subsidy plans, the rate of ethanol production could double or triple within a year or two.

If this happens, the economist says that the five billion gallons of gasohol that could be made from the 500 million gallons of ethanol could provide about five percent of the nation's annual gasoline requirements.



The economist also feels that emphasis should be placed on constructing smaller, localized production facilities which would service communities. He says that building large production facilities like the ones in Illinois and Pennsylvania would mean additional transportation costs, and the facilities would be unresponsive to local needs.



EES scientists examine a sample of a semi-conductor layer less than a micron thick which was grown in the Solid State Sciences Division laboratory.

EES RESEARCHERS STUDY MICROSTRUCTURE SCIENCE

Someday scientists may be able to study the life of a single cell by using probes a hundred times smaller than the width of a human hair. The development of microstructure science—the understanding of structures with dimensions of a micron or less—is well underway at Tech.

There is an enormous amount of interest in the Tech research community and in the electronics industry in developing microstructure fabrication techniques. A new interdisciplinary program could push existing microstructure research into dimensions less than a micron, says Gordon Harrison, senior staff member of the EES electronics laboratories.

Tech's microstructure research programs are in EES, the School of Physics, the School of Chemistry, Electrical Engineering and Chemical Engineering. They have focused primarily on studies of surfaces with micron and submicron dimensions.

Using ion implantation, for example, researchers can aim and fire tiny supercharged particles at a target surface. The particles penetrate the surface and totally change the surface characteristics of the target. Soft metals can become hard and metals with "rough" surfaces can become frictionless.

In the Solid State Sciences Division of the Electromagnetics Laboratory of EES, the development of semiconductor layers has been controlled down to a thickness of 200 angstroms using a molecular beam epitaxy system. It is difficult to see objects less than 200 angstroms in size such as biological cells in living tissue, which vary in size from five to 10 angstroms. But with advanced electron beam lithography techniques and equipment, researchers might be able to design and build circuitry 100 times smaller than that on the market now.

ELECTRONIC DEFENSE

Electronic defense, the silent, secretive war of electromagnetic detection, disruption and deception, is much in the news today. Unfortunately, information is seldom given to the public on the nature and specific activities of this vital area of national defense.

Today's military makes extensive use of sophisticated electromagnetic equipment such as radar and radio. These tools serve as the eyes and ears which are so necessary to the military's mission. For example, in the context of SALT II, the so-called "technical means of verification" involves highly sensitive electronic and optical devices which provide much of the information necessary to police the terms of the treaty.

Even more specifically, aircraft and ships depend very highly on the timely functioning of many electronic sensors and devices, both on-board and at control centers on land. Anything which serves to disrupt or introduce deception into any of these systems constitutes a serious threat to the safety of those people who are depending on the proper functioning of a given electronic system, whether it be radio, radar or navigational aid.

Electronic defense is generally divided into two main areas—Electronic Countermeasures (ECM) and Electronic Support Measures (ESM). The term ECM is usually applied to those activities specifically directed at disruption or deception and can involve either active or passive techniques.

The term ESM is generally applied to all of those activities associated with reconnaissance, detection and threat assessment. In addition, ESM is sometimes used to mean anything of an electronic defense nature which is not specifically directed as a countermeasure.

On the other side is the development of improved electromagnetic components which are referred to as Electronic Counter-Counter Measures (ECCM). As can readily be seen, the level of complexity grows extremely rapidly as the game is played to a higher and higher level.

Unfortunately, the stakes are extremely high today, especially when one considers not only the billions of dollars spent on such systems but also the very grave consequences of losing. Literally, to lose the battle for control of the electromagnetic spectrum might mean a loss to the United States of early warning time and the ability to respond.

EES has long recognized a need to assist the nation in defense preparedness. It has provided technical assistance to that end by supporting the

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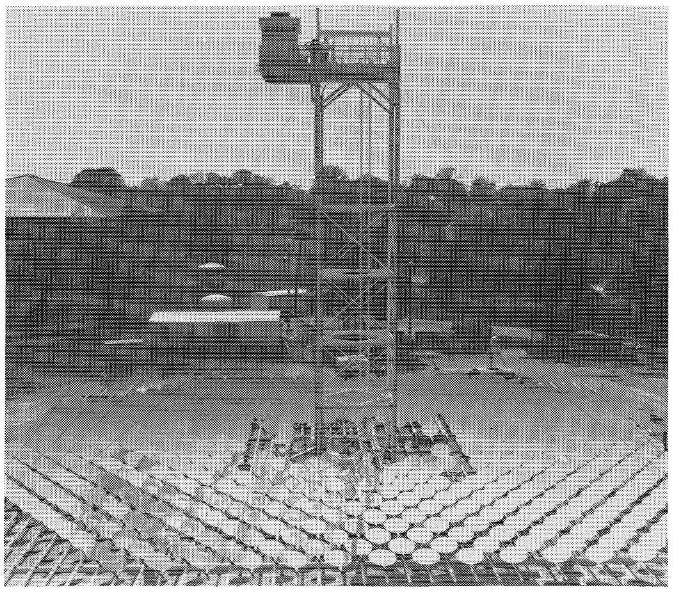

The Advanced Components Test Facility on the Georgia Tech campus.

SOLAR TEST FACILITY GETS NEW PROJECTS

The Georgia Tech Advanced Components Test Facility will be kept fairly busy over the next few months.

Beginning in March, a high-temperature steam loop receiver (steam generator) capable of generating steam at 1500 F will be tested by Solar Turbines International. Traditional systems operate at 1000 F or lower.

In April, the tower will test for Dynatherm Corp. a heat pipe receiver which was designed to provide heat transfer between concentrated solar flux and compressed air steam.

A solar receiver, consisting of a fluidized bed of particles, will be tested by the Westinghouse R & D Center in May. The receiver has possibilities for use as a gas or particle heater or as a chemical reactor.

This summer, Princeton University will test a solar pyrolysis biomass gasifier for the thermochemical conversion of wood and other biomass materials into fuel gases and other chemicals.

Owned by DOE, the Test Facility is run by a team of researchers in the EES Energy Research Laboratory. Its purpose is to test advanced high temperature solar components.

All of the projects listed above are being funded by the Solar Energy Research Institute, a branch of DOE.

EES REPORT

Peggy Simcic Brönn — Editor

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TECH STUDIES MINERALS CRISIS

A potential shortage in metals production could affect our lifestyles more dramatically and more quickly than the energy crisis.

The U.S. must import so many key metals and minerals that foreign embargoes would be devastating. Here are some examples:

—A handful of countries could conceivably cripple the steel industry simply by withholding manganese, an important component of steel.

—The U.S. must import 90 percent of its aluminum.

—Titanium, an important mineral used to make lightweight aircraft, comes mostly from overseas sources.

And the unsettling fact is that virtually every key mineral the U.S. imports in large quantities is in abundance in the Soviet Union.

In response to the uncertain future of metals and minerals in the U.S., Georgia Tech, along with 36 colleges and universities across the country, has been designated a Mining and Mineral Resource Institute. Tech is due to be funded by the Office of Surface Mining (part of the Interior Department) with $110,000 in operational funds and $160,000 for three years for fellowships and scholarships. The operational funds have to be matched by non-federal funds. Part of the fellowship money will be shared with the University of Georgia.

The establishment of Tech as a Mining and Mineral Resource Institute (MMRI) comes about as part of the 1977 Surface Mining and Reclamation Act.

"Because of our dependence on key components of steel and aluminum, it was felt necessary to train people to discover and use these resources and to provide a permanent base for education and research," says Professor John Husted of Tech's School of Chemical Engineering. Husted is the director of the MMRI.

"This problem is just as bad as the oil problem and in a sense it is worse because it is not even recognized as a problem by most people," says the Tech scientist.

Tech's program, among other things, will explore using kaolin as a source for aluminum. Three to five billion tons of kaolin can be found between Macon and Augusta, Ga. The program will also explore using phosphates for fertilizers and using chromite as a source for chromium. Chromium gives steel resistance to high temperatures, strong chemicals and corrosive materials. The Interior Department says more than 80 percent of chromium production is controlled by Rhodesia, South Africa and Russia.

The Tech program will also investigate new sources of titanium. Titanium is abundant in the U.S., but the capacity to produce the metal is extremely low.

The Engineering Experiment Station will work with the MMRI in various areas of coal research. Specific attention will be directed at coal characterization.

Sheppard Named Acting VP

DR. THOMAS STELSON SWORN IN

Dr. Thomas Stelson, Tech vice president for research, took office Jan. 17 as Assistant Secretary for Conservation and Solar Energy in the U.S. Department of Energy. Stelson will be taking a one-year leave of absence from his post at Tech.

Dr. Albert P. Sheppard has been named acting vice president for research by Tech President Dr. Joseph Pettit. Sheppard has been at Tech since 1965, and for the past five years has served as associate vice president for research.

SHORT COURSES OFFERED

Several Continuing Education short courses on electronic countermeasures and on the electronic spectrum will be held on the Georgia Tech campus.

The courses, their dates and fees are listed below. Continuing Education Units are shown to the left of the course name.

(1.6)	Laser Technology & Systems Applications	March 3-4	$200
(2.4)	Infrared Technology & Applications	March 5-7	$295
(2.4)	Submillimeter Wave Technology & Applications	March 10-12	$295
(2.8)	Radar Reflectivity of Land & Sea	March 24-27	$400
(2.1)	Millimeter-Wave Systems & Technology	March 31, April 1-2	$295
(3.8)	Principles of Modern Radar	May 5-9	$425

The courses will be taught primarily by Georgia Tech academic and Engineering Experiment Station faculty members. For further information, or to register for any of these courses, contact Director, Department of Continuing Education, Georgia Institute of Technology, Atlanta, Ga. 30332, phone (404) 894-2400.

***Rep. Herb Jones of Savannah, Ga.,** raises his hand to ask a question during a meeting held at Georgia Tech on Feb. 7 to brief members of the Georgia General Assembly on energy research at Tech. During the gathering, members of the House and Senate were presented with an overview of major Tech energy research projects including solar and biomass activities. Most of this research is being done in the Engineering Experiment Station. The meeting was hosted by the Joint Energy Committee of the House and Senate, and the Georgia Poultry Federation.*

Electronic Defense *cont'd*

various branches of the government which are responsible for national security.

The Station has maintained a continuing program of research and development in radar, communications and electromagnetic propagation since 1946, and activities in all areas of electronic systems, especially in electronic defense, have increased greatly in recent years.

In recognition of EES's role in electronic defense, a number of separate electronic defense oriented activities were recently brought together in one laboratory, the Systems Engineering Laboratory. While the work in SEL is not exclusively directed to electronic defense activities (nor does it do all of the defense-related electronics work within EES) the Laboratory has been designated the lead research unit for electronic defense related work at Georgia Tech.

—Frederick B. Dyer
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