Science & Technology

New lobbying push for MHD program

by Marsha Freeman

This spring, a potential users group of more than a dozen electric utility companies launched its first lobbying effort to save the U.S. program for developing magnetohydrodynamics (MHD), an advanced energy conversion process that promises to double the efficiency of all forms of energy production.

As a result of the pressure, Congress restored $29 million to the fiscal 1982 MHD budget that had been cut by the Reagan administration. (This compares with a fiscal 1981 budget of $66 million.)

Now, industrial contractors involved in the program are preparing to form a complementary lobbying organization to promote MHD development, as this reporter learned at the 19th symposium on Engineering Aspects of Magnetohydrodynamics held at the University of Tennessee June 15-17.

The importance of this joint lobbying effort and of obtaining full support for the U.S. MHD development effort cannot be overstressed. MHD is an energy-conversion process that converts the heat of combustion from fossil fuels, or from nuclear or fusion reactions, directly into electric power, with no moving parts. Under development since the mid-1960s, the MHD process could potentially double the amount of electric power extracted from each pound of fuel.

In conventional electric energy production, the heat from combustion is used to produce steam from water. The steam operates a turbine made up of copper wires that generate electricity when rotated through a magnetic field. In this conversion from thermal, to mechanical, to electric energy, using large rotating turbine generators, more than two-thirds of the original heat is lost.

The MHD process, by contrast, is a direct conversion process that can use any electrically conducting working fluid to produce electric power through the interaction of an ionized fluid and an external magnetic field. The hot, ionized gas produced in burning coal, for example, is accelerated through a magnetic field producing an electric current, bypassing the turbine stage and the loss of energy.

Why so long?

MHD is a relatively simple concept, yet it has required a long development process—15 years so far. First, the relationship between the speed of the moving, hot gas, the strength of the magnetic field, and the temperature of the gas have to be delicately balanced to get the most efficient conversion. Second, a hot, coal gas is a very corrosive environment, because coal is a dirty fuel with ash, sulfur, and other impurities. Therefore, new materials with an ability to withstand the MHD environment have had to be developed for the electrodes inside the channel. Results reported at the 19th symposium indicate progress in this area, using very expensive platinum on parts of the electrodes to extend their useful life.

The high magnetic fields needed for MHD devices require superconducting magnets, which do not lose power as conventional electromagnets do. These superconducting magnets are kept super-cold, near absolute zero, and are very delicate systems. They are also being developed for magnetic fusion devices.

One of the problems discussed by the electrical engineers at the conference was the electric current that is captured and collected on the electrodes. There will be dozens of pairs of electrodes in commercial MHD generators, each with varying voltages. These separate voltages have to be "conditioned" into a coherent flow of current which can then be converted from direct to alternating current to be put into the utility power grid. Reports at the conference also indicated progress in designing electrical systems that can handle such a complicated configuration.

Preliminary designs were also discussed for a first engineering test facility for MHD that would burn coal and produce a significant amount of electrical power—at least 50 megawatts. At the present time, the largest coal-burning MHD experimental facilities in the United States are designed to produce 50 megawatts *thermal* energy, which will only be a few megawatts electric after MHD conversion.

The conference hosts gave the participants a tour of the University of Tennessee Space Institute Coal Fired Flow Facility; when finished this facility will be a complete MHD coal plant on a small scale. Also toured was the High Performance Demonstration Experiment at the Arnold Engineering Development Center nearby, a facility designed not for long-duration experiments but for short experiments on scaled-up components,

such as coal combustors, magnets, and channels.

In testimony before the Senate Committee on Energy and Natural Resources April 30, Dr. George Seikel, the manager of MHD Systems at the Lewis Research Center run by NASA, stated: "It is in the nation's long-range economic interest to retain our international coal-fired MHD leadership by maintaining a critical core of MHD support and participation of the utility industry, suppliers of equipment to that industry, research and development organizations specializing in energy R&D, and universities. . . . Reassembly of such a team and the necessary facility investment by industry and government would be difficult and costly," if the program were temporarily halted due to budget constraints, he warned.

"Although high in payoff potential," Seikel continued, "the long term and high risk of MHD R&D are such that government involvement will be required through 'proof-of-concept.' MHD thus directly meets the OMB criteria for energy R&D support. An MHD Users Group has been formed and interest has been expressed in supporting MHD demonstration plants if an adequate technology base is first established."

At the 19th engineering symposium, Dr. Heinz Pfeiffer, the keynote speaker, addressed directly this question of broader-based support for the MHD program. Pfeiffer is the head of the utility users group formed after the threatened elimination of the MHD program, and he represents Pennsylvania Power and Light. He reported that more than a dozen electric utilities were involved in the potential users group that lobbied for the MHD program, but he chastised the MHD researchers present for not taking "the information and potential value of MHD to decision-makers."

"At Pennsylvania Power and Light we are using the results from MHD coal-slagging studies now in our coal-burning plants," he said. "This can be used by other utilities. Coal combustor development work in MHD can be applied in the electrical industry which already burns coal, and in the synthetic fuels, steel, and chemical industries. The applications today for MHD technology should be brought out, in general.

"If the transition team had known about these technical accomplishments in the program, the budget wouldn't have been zero," Pfeiffer concluded.

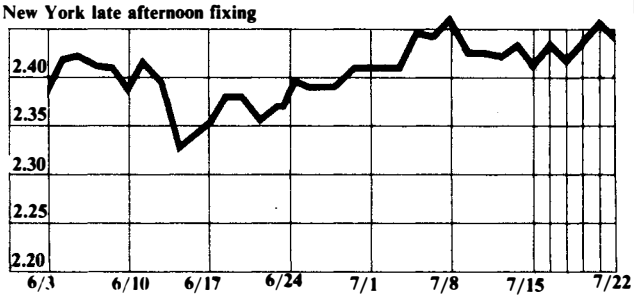
One utility, Montana Power Company, has offered to donate land and a new conventional coal plant to be hooked up to an experimental MHD unit if the Department of Energy comes up with the financing for the MHD generator.

How soon the U.S. MHD program completes the research and development phase and goes on to build commercial power plants now depends largely on the amount of financial support that can be mobilized for the program.

Currency Rates

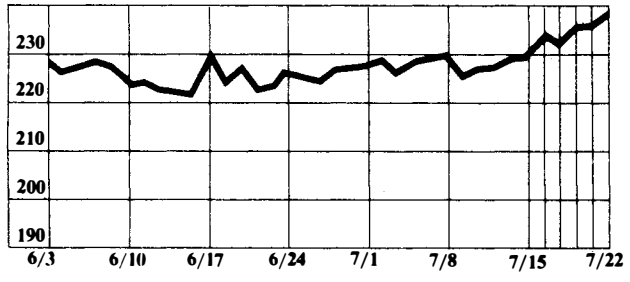
The dollar in deutschemarks

New York late afternoon fixing



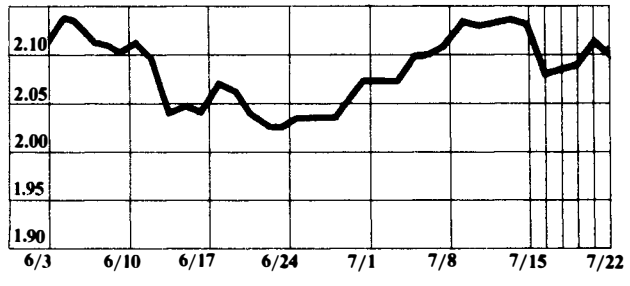
The dollar in yen

New York late afternoon fixing



The dollar in Swiss francs

New York late afternoon fixing



The British pound in dollars

New York late afternoon fixing