ERDA Awards a $350,000 Laser Fusion Contract to KMS

Making what appears to be a U-turn in policy, the government awarded a sizable research contract to a small Michigan company which does extensive study of laser fusion but was previously excluded from the national research program.

The new Energy Research and Development Administration (ERDA), which took over the federal laser fusion program after the Atomic Energy Commission (AEC) expired, has granted a $350,000 contract to KMS Fusion, Inc. for a series of 42 laser shots at different sized targets. Laser radiation hitting a tiny spherical shell filled with reactive isotopes of hydrogen can produce a small fusion reaction, and the enthusiasts of laser fusion hope that one day it will be used to generate power. The new contract will provide ERDA scientists with detailed data for 14 different sets of conditions. After completion of the initial work, ERDA expects to arrange for further experiments, probably in June, for an additional $150,000.

KMS has recently shown that it has unusual expertise for producing and studying microexplosions induced by a laser (*Science*, 24 December 1974), and undoubtedly researchers in the ERDA laboratories wanted data from the KMS experiments to check their computer predictions. The contract is effectively a recognition that KMS has a unique facility at the present time. In fact, ERDA administrators accelerated the normal contracting procedure so that experiments could begin before the end of February, when KMS intended to shut down its laser for improvements. In announcing the contract, ERDA had words of praise for the company that the AEC had often fought, some would say bitterly. "In its laboratories at Ann Arbor, Michigan, the company has an advanced laser system, together with facilities for producing fuel pellets in a wide variety of dimensions," said the ERDA statement. "KMS Fusion has reached an important milestone—generation of neutrons by using laser beams to compress fuel pellets."

The announcement appears to be a vindication for KMS Industries, the parent company to KMS Fusion, which was founded by and named after Keeve M. (Kip) Siegel, an ex-professor of electrical engineering at the University of Michigan who turned entrepreneur and made at least $4 million from his first venture, which was Conductron Corporation. Many companies have been spun off of government research efforts, but usually they concentrate on some specialized line of technololgy. In late 1969, Siegel proposed nothing short of competing head-on with the government's entire laser fusion effort, and furthermore had the brashness to promise that KMS would produce net energy from its experiments within 2½ years, which is only an eye blink in the history of fusion efforts. Such audacity by a small modestly funded midwestern company might have gone unnoticed by the multibillion dollar Atomic Energy Commission except for two factors: the chief scientist of KMS, Keith A. Brueckner, had for many years been an AEC consultant, and beginning in 1969 he filed applications for no less than 24 patents on laser fusion processes. Many factors have contributed to the strained relations between KMS and the AEC, including accusations of scientific incompetence on both sides, but according to one veteran who has followed the story closely, nothing angered several members of the Joint Committee on Atomic Energy so much as the fact that KMS wanted to claim title to the basic idea of laser fusion—the implosion process—which the AEC thought belonged to it alone. Each of the 24 patent claims is still being contested by the government.

Brueckner, at age 50, is widely acknowledged to be an outstanding theoretical physicist, who has received many professional awards, including election to the National Academy of Sciences. After taking leave for 3 years to be executive vice-president and chief scientist for KMS Fusion, he has recently returned to the University of California, San Diego. He was one of the founders of Jason, the group of fast-rising young physical scientists organized to pass judgment on the feasibility of the Pentagon's most ambitious weapons systems. For one year in 1961, Brueckner was the director of research for the Institute of Defense Analysis, and he served the AEC as a consultant from 1953 through the decade of the 1960's. In filing the 24 patents for KMS, Brueckner contended that he conceived of the implosion idea for laser fusion independently, without assistance from classified information. But several AEC scientists had worked on implosion schemes on and off since the late 1950's. His claim to independent arrival at a laser fusion scheme similar in many ways to the AEC laser fusion plans was met with particular skepticism in Washington because he had been a consultant to the magnetic confinement fusion program of the AEC and had apparently been called on to evaluate some fusion plans involving lasers.

At first the AEC insisted that KMS must stop its laser fusion research altogether, directing Brueckner not to talk to anyone about his idea or even do calculations, except in his head, because the ideas were part of weapons research and therefore classified. In February 1971, the AEC relaxed its restrictions to the point that KMS could perform laser fusion research under a contract that provided for government control, but without government funding or access to government research.

At one point, the AEC also exercised power to veto prospective KMS employees who had worked in the federal laser or nuclear weapons programs. For a time this restriction made it quite difficult for KMS to acquire experienced personnel, but it has now been eased considerably. Another problem for KMS was that classifications that rigidly prohibited researchers from releasing their data on laser-induced implosions were in effect until last October, so the company could not adequately explain its research progress in public. KMS Industries has been almost continually strapped for money since its $19 million fusion effort began. The AEC did give secret clearances to technical specialists from two companies which seubsequently gave financial backing to KMS so they could evaluate the progress of the laser effort, but company officials nevertheless think that the AEC classification policy hindered their ability to raise capital. The company took a particularly bad beating from the news media during the last half year of strict classification, and no doubt feel they could have defended themselves better under a different policy.

Now that KMS is an official government research contractor, it seems that a new era of peacemaking may succeed the old era of contention. The AEC would probably not have granted KMS such a fine contract (the KMS facility can produce eight laser shots per day, so only a few weeks work may be involved), but with the coming of ERDA, the official attitude of the atomic establishment seems to have softened significantly, and laser fusion administrators have apparently decided that it is in the national interest to join forces with KMS.

According to the head of the ERDA laser office, James McNally, the new contract is part of a trend toward greater participation in laser fusion research. The coming years, he says, may see the level of funding for industrial and university centers rise from 10 to 15 percent of the federal program.—W.D.M.

Auto Emissions: EPA Decision Due on Another Clean-up Delay

On 3 March Russell Train, administrator of the Environmental Protection Agency (EPA), will announce his decision on whether to grant auto makers an additional 1-year suspension, under the Clean Air Act of 1970, of emissions standards scheduled to go into effect for the 1977 model year. He will also be making long-term recommendations to Congress that could affect the rate at which cleanup efforts proceed, as well as the nature of the technology that is brought to bear on the problem.

EPA officials say this may be the toughest set of decisions the agency has yet confronted. In the past, says one, the attitude has been, "If the technology is there you go ahead" with enforcing the law. But now, with the economy in shambles and fuel prices going out of sight, the name of the game more than ever is trade offs. Public health and environmental needs must be weighed against fuel economy (mileage per gallon) goals, rising car prices, and the need to keep the auto industry—which contributes 16 percent of the gross national product—financially viable.

The Clean Air Act originally mandated that regulated emissions from automobiles be reduced by 90 percent from 1970 levels by 1975. This amounts to a goal of 0.41 gram of hydrocarbons (HC) per mile, 3.4 grams of carbon monoxide (CO), and 0.4 gram of oxides of nitrogen (NO_x). Since then, manufacturers have twice been granted reprieves. Currently, the law says the CO and HC standards must be met by 1977 and the NO_x standard by 1978 (Table 1). Train must decide, taking available technology and the public welfare into account, whether to give auto makers until 1978 to get their CO and HC emissions into line.

EPA research, backed by studies by the National Academy of Sciences, leave little doubt that achievement of statutory emission standards is technically feasible. The public welfare question is trickier—auto makers claim that the costs to both the industry and the car-buying public would outweigh the benefits of marginally cleaner air in 1977. (The introduction of catalytic converters in 1975 models to bring emissions down to the interim 1975 and 1976 standards has achieved 83 percent of the final goal.) Manufacturers claim that more advanced and costly emission control devices needed for the 1977 and 1978 standards are the last thing the country needs to get Detroit moving again; that they will have to stop production of some model lines, which will add to unemployment; and that they need more time to perfect various techniques for improving mileage and cleanliness and for developing workable alternatives to and refinements of the internal combustion engine.

These arguments were advanced by industry during several weeks of hearings EPA held to consider the suspension request. Auto manufacturers also used the hearings as a forum to push for what they really want, which is a 5-year freeze, starting in 1977, on emission standards as they now apply. Since the ultimate cleanup standards have already been pushed back from 1975 to 1978, amendment of the law to conform with industry's desires would amount to a 7-year rollback of the original deadlines.

President Ford, with the apparent prematurity that has marked some of his other actions, in January offered auto makers a compromise deal. In return for a pledge to improve fuel economy by 40 percent between 1974 and 1980, he suggested a 5-year freeze (1977 to 1981) at the emission levels for HC and CO now mandated in California. These are tighter than those prescribed for the rest of the nation but not as tight as the statutory levels. He recommended that the NO_x standard be allowed to stay at the current level of 3.1 grams per mile (the California standard is 2). Train, also somewhat prematurely, expressed sympathy with the Ford idea, as did auto makers.

All of this would seem to make the subsequent suspension hearings some-

Table 1. Current and projected auto emission standards (grams per mile).

Standard	Hydrocarbons	Carbon monoxide	Oxides of nitrogen
Interim 49-state standards for 1975 and 1976	1.5	15	3.1
California interim standards	0.9	9	2
President's recommendation for 1977 to 1981	0.9	9	3.1
Statutory 1977 standards	0.41	3.4	2
Statutory 1978 standards	0.41	3.4	0.4