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Testimony



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Performance of Participants in DOE's
Inertial Confinement Fusion Program

Statement of Victor S. Rezendes
Director, Energy Issues
Resources, Community, and Economic
Development Division

Before the
Department of Energy
Defense Nuclear Facilities Panel
Committee on Armed Services
House of Representatives



Mr. Chairman and Members of the Panel:

We are pleased to be here this morning to discuss our report concerning the performance of the participants in the Department of Energy's (DOE) Inertial Confinement Fusion Program (ICF).¹ The House Armed Services Committee requested that we review the performance of RMS Fusion, Inc. and the other five participants in the ICF program, to determine the performance of each in relation to the program objectives.

BACKGROUND

The goal of the DOE ICF program is to achieve a small thermonuclear explosion in the laboratory for the purposes of weapons physics studies. ICF uses the energy from a laser or particle beam accelerator to heat and compress a tiny fuel capsule (a "target") containing a mixture of hydrogen isotopes (e.g., deuterium and tritium) to a very high density, initiating a fusion reaction throughout the fuel. The fusion reaction may yield an energy output many times greater than the original energy input.

DOE's ICF program has six participants: the Lawrence Livermore, the Los Alamos, and the Sandia National Laboratories;

¹Nuclear Science: Performance of Participants in DOE's Inertial Confinement Fusion Program (GAO/RCED-90-113BR, Mar. 15, 1990) and also, Nuclear Science: DOE's Acceptance of Academy of Sciences' 1986 Inertial Fusion Technical Priorities (GAO/RCED-90-115FS, Mar. 15, 1990).

the Naval Research Laboratory; the University of Rochester; and KMS Fusion, Inc. The Committee's request for our study was precipitated by DOE's allegation that the performance of KMS has not met program expectations. KMS, a private contractor, supports the inertial nuclear fusion research experiments of the other participants, mainly by providing fusion target components for these experiments.

KMS' PERFORMANCE

We found that KMS' performance was mixed during the period we reviewed. While KMS successfully performed some support tasks, for example, delivery of glass target components for Livermore experiments, it performed unacceptably on some other target fabrication and delivery tasks. KMS cites problems in making the transition to its new support role in the ICF program in explaining its performance difficulties.

KMS' role under its current 3-year competitively-awarded contract with DOE (signed on May 1, 1987) represents somewhat of a transition for KMS from its previous ICF program role. Previously, KMS was more involved in initiating and performing its own ICF research. Its role under the current contract is to support the efforts of the other participants, mainly by supplying target components for use in their ICF experiments. DOE has tried to

better focus KMS' efforts in the current contract by closer monitoring, formal progress reviews, evaluations, and feedback.

In 1987 and 1988, the other program participants complained to DOE that KMS had slowed their progress because of KMS' unacceptable performance on some target fabrication and delivery tasks--the main priority of the support contract. For example, in 1987 and 1988, KMS' performance was rated unacceptable in delivering fusion target components that were needed for Los Alamos' experiments. In addition, KMS was not able to provide polymer target components needed for the Livermore and the University of Rochester programs, even though Livermore had transferred this technology to KMS. Sandia was also dissatisfied with KMS' lack of support and contracted outside of the program for some needed support services.

KMS showed some improvement in 1989 in some areas that were previously rated as unacceptable, for example target deliveries to Los Alamos and communications with its laboratory customers. However, progress in a few target fabrication and delivery areas continues to be slow, and some problems still persist. For example, KMS still has not met the needs of the program for polymer target fabrication and delivery--deliveries are more than a year late. In addition, complaints about the quality of some of KMS' cryogenic target work still persist.

While KMS agrees with some of the complaints about its performance, it cites difficulties in making a transition to its new ICF support role, including not having the number and skill mix of staff necessary for performing the type, volume, and priority of work needed for some tasks. KMS said it is working to solve these staffing problems. DOE believes that KMS has had sufficient time (3 years) and funding to overcome any problems associated with making the transition to its current ICF support role.

PERFORMANCE OF THE OTHER PARTICIPANTS

Livermore, the lead laboratory for the ICF glass laser program, accomplished many of its objectives during the period we reviewed. However, Livermore had to defer some important target-physics experiments, mainly because it did not receive sufficient funding to undertake the experiments. The other two major laboratories, Los Alamos and Sandia, also cited funding problems as reasons for not meeting some of their objectives. In addition to funding inadequacies, Los Alamos, the lead laboratory for gas lasers, cited lack of access to other laser facilities (while developing its own) and unanticipated complexity of experiments as reasons for its program's slipping behind schedule by 1 to 2 years. Sandia, the lead laboratory for the particle beam accelerator concept, also cited technical difficulties in meeting its objectives. As in the case of Los Alamos' program, Sandia's program also slipped by 1 to 2 years. The two other smaller ICF

laboratories, located at the University of Rochester and the Naval Research Laboratory, met most of their objectives during the period that we reviewed. A few objectives were accomplished later than originally planned, mainly because of the complexity of the experiments involved.

Although we did not make formal recommendations regarding DOE's ICF program, we would like to mention two observations that we have. First, we believe that comparisons of performance among the six ICF program participants would not be valid because of (1) the different functional role each performs in the program (from major lead laboratory to support contractor), (2) different degree of difficulty of objectives (from conceptual research on the leading edge of the ICF technology to mainly performing assigned support tasks), and (3) different stages of development of participant programs (from the more well-developed Livermore glass laser program to the more conceptual Sandia particle beam accelerator approach to ICF).

Second, with regard to the target development and fabrication support now provided by KMS, DOE plans to re-compete this contract in the near future. In designing this new contract, we believe DOE should consider ways to maintain acceptable contractor performance such as award fees for outstanding performance and withholding award fees for consistently unacceptable work on certain tasks. The current contract has no such provisions.

Mr. Chairman, that completes our brief statement and we would be glad to answer any questions you may have.