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SECY-610

November 6, 1970

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This document consists of 7 pages
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OST REPORT ON KMS MATTER

Note by the Secretary

The General Manager has requested that the attached memorandum of November 4, 1970 from the Director of Research, with enclosures, be circulated for the information of the Commission.

W. B. McCool

Secretary of the Commission

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DEPARTMENT OF ENERGY DECLASSIFICATION REVIEW

1ST REVIEW-DATE: 8/10/2009 DETERMINATION

AUTHORITY: DDC

NAME:

2ND REVIEW-DATE:

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NO DOE CLASSIFIED INFO

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7 pp

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SECY Papers

- 1 -

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UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

NOV 4 1970

R. E. Hollingsworth, General Manager

THRU: S. G. English, AGMRD

OFFICE OF SCIENCE AND TECHNOLOGY REPORT ON THE KMS MATTER

In my memorandum of October 21, 1970, I referred to an OST document on the KMS matter. Attached is a copy of the final report which Dr. David received. You may wish to circulate this to the Commission for their information.

Paul W. McDaniel

Paul W. McDaniel, Director
Division of Research

Enclosure:
OST Report dtd 10/28/70

[redacted]

[redacted]

UNCLASSIFIED

- 2 -

[redacted]

[redacted]

UNITED STATES GOVERNMENT

Memorandum

[redacted]

TO : Dr Edward E David, Jr

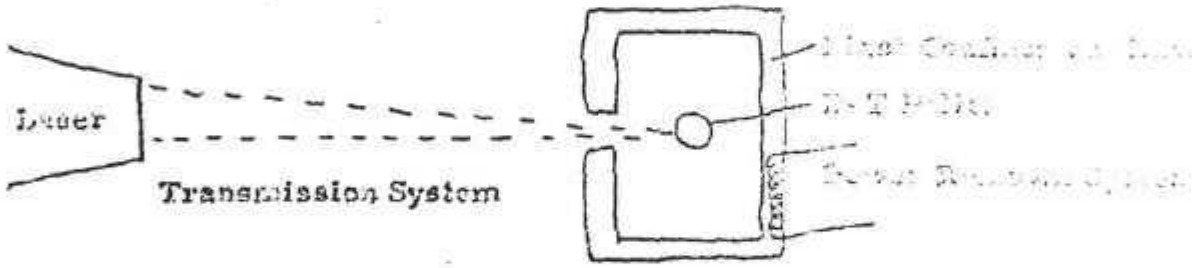
DATE:

FROM : J Frederick Weinhold

SUBJECT: Status of Pulsed - Laser Produced Fusion Research

Although the thought of using lasers to produce plasma has been considered for several years, a concerted effort using laser pulses to cause fusion of suitable pellets has been underway only since the fall of 1969

The basic concept is shown in the following sketch:



A very rapid laser pulse on the order of a nanosecond is directed at a D-T or other fuel pellet causing a fusion reaction which releases energy. This energy is contained in a heat conversion device from which thermal energy is extracted. Such a system designed for periodic laser pulses, a fuel pellet supply and pellet thermonuclear reactions could theoretically produce useful power. On the other hand, such a device could also be a trigger for a thermonuclear weapon.

This subject first came to our attention in October 1969 when Professor Keeve M. Siegel, Chairman of KMS Industries, sent a telegram to the President advising us of their recently filed patent based on the work of Dr. Kieth Brueckner of the University of California (San Diego). This patent application was brought to AEC's attention causing quite a stir all the way up to the Commission itself because of the security implications and the fact that [redacted] had been involved in AEC's fusion program. Currently pertinent information on both AEC's and the private work is classified Secret Restricted Data in contrast to the unclassified [redacted] dissemination approach in the regular, controlled thermonuclear [redacted]

[redacted]

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(CTR) program. AEC is making only very general, noncommital statements on the existance of laser-pellet work.

The AEC is currently conducting an extensive effort in this area through the weapons program at the Los Alamos and LRL Livermore Labs estimated at $5 million per year now and expected to increase significantly.

One major thrust of the work involves the development of a high power laser capable of generating pulses on the order of 1-10 nanoseconds. The energy needed per pulse ranges from 100 joules to perhaps 10^5 joules depending on whether one is talking of a theoretical breakeven between the laser light energy and the thermonuclear reaction or of the energy which may be needed for a power generation system producing net energy. Glass lasers do not appear capable of the higher power needed but CO_2 lasers do if short pulses can be produced efficiently. The labs are presently working on both kinds. Chemical lasers offer promise for the future and are also being studied.

The other major area involves the tradeoff between laser pulse shaping and pellet construction. For example LASL is looking at bubbles with a 1 to 5 mm radius.

DOE
b(3)

Deleted

Without such compression, the breakeven energy is in the range of 10^7 to 10^9 joules.

It is the reduction in estimated breakeven energy combined with advancements in high energy laser technology which have led to the current increased enthusiasm on the subject.

It should be emphasized that the discussion to this point is based on theoretical computer analysis, not experiment. Livermore plans to laser-pulse some pellets this month as the start of an experimental effort. A great deal more work is needed to develop efficient high power, short pulse lasers; to develop suitable pellet

[redacted]

designs; and to obtain commercially interesting energy [illegible] per pulse event.

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Preliminary thinking about power plants using such a technology is that comparatively small systems - 50 to 100 MW - may be feasible as compared with the several thousand megawatt size conventional CTR plants.

Optimism for this approach stems not from the fact that pulsed laser pellet fusion has passed milestones which conventional CTR has not, but from the rapid theoretical progress made in the past year and the opinion that the next steps involve lasers and other relatively low cost, short lead time items rather than massive plasma experiments. In addition it draws heavily upon weapons technology developed over a number of years. All of these could enable this approach to overtake the conventional CTR programs in a matter of years.

A factor which complicates the application of this technology to civilian power programs is its close relations to weapons technology and the question of proliferation.

DOE b(3)

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This might require continued classification of developments.

The issue of KMS Industry's continued work in the area is still before the AEC commissioners and has not been resolved. AEC has, however, permitted KMS to use a classified computer to verify their calculations. Perhaps the most vexing aspect of this issue will be the legal patent problems since the labs as well as KMS began working in this area about the same time.

cc: Mr. Gordon Moe, OST
Mr Frederick C. Schuldt, OMB
Dr. Robert L. Hirsch, AEC

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UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C.

October 15, 1970

Paul W. McDaniel, Director
Division of Research

OFFICE OF SCIENCE AND TECHNOLOGY REPORT ON KMS

During the week of September 28, Mr. J. Frederick Weinhold, OST Energy Policy Section, called me regarding a magazine article on KMS. I had had an informal conversation with Weinhold on this subject in October of last year when KMS first contacted the White House regarding their "breakthrough" and I had assisted him in drafting a reply at that time. During this call, Mr. Weinhold informed me that he had been requested to prepare a short summary of this matter for Dr. Edward David, the President's Science Adviser, and he asked if I would be willing to assist him after he had completed a draft. I indicated my willingness to provide whatever help he needed. I subsequently discussed this matter with Mr. Jack Pender, OGC, and he stated that communication with Weinhold on the KMS matter could be relatively free, short of discussing the Commission's current thinking of course. In addition to direct assistance on his report, I suggested to Weinhold that he might wish to attend our classified briefing on lasers which was planned for the second day of the regular CTR Standing Committee meeting, October 8 at H Street. He subsequently attended this meeting and later stated that it had been most instructive and that it had helped him consolidate his views on this matter.

During a telephone conversation on October 13, Weinhold indicated that his draft would be completed by October 15 or 16. I will provide you further information on this subject as it develops.

Robert L. Hirsch
Controlled Thermonuclear
Research Program
Division of Research

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Spectrum

UNDER PRESSURE from Congressman William Ryan (Dem., N.Y.) the Monsanto Company has somewhat curtailed sales of its polychlorinated biphenyls (PCBs). It will not discontinue manufacturing any of the products, however, contrary to its earlier statements.

In Environment, January-February 1970, the hazards of PCBs were described. PCBs resemble DDT chemically, are at least as persistent in the environment, are nearly as widespread, and pose similar hazards to wildlife. Congressman Ryan, after reading the article, issued a statement in which he called for "immediate action to prevent what may well be a major ecological disaster."

On April 10, the day of Ryan's announcement, Monsanto issued a statement in which they said, "Steps have been taken to...replace those grades of PCB which linger in nature." Monsanto claimed this action had been planned well before the Environment article appeared. In response to questions, Monsanto wrote to Environment, "(Substitutes) are being developed to replace those grades (of PCBs) which have been appearing in the environment..." but refused to give details on what the new products would be and which PCBs would be discontinued.

In response to continued pressure from Congressman Ryan, Monsanto issued a new statement July 16 in which they said the use of PCBs, of which they are the sole U.S. manufacturer, would be restricted after August 30, 1970. In a telephone interview a Monsanto spokesman acknowledged that, despite the earlier announcement, the company planned to continue manufacturing all grades of PCBs, but that these would not be sold to customers who might use them in ways which would, in Monsanto's opinion, allow their release into the environment. The spokesman refused to estimate how much PCB sales might be reduced by such action.

GLASGOW, a scientist announced that pollution of Loch Ness had killed its monster. "We have lost our greatest asset," said Douglas Drysdale, according to a Reuters dispatch August 1. The report was hotly disputed by defenders of the monster, who claimed it had been seen by nine people the week before.

CONTROLLED FUSION power may be only five years away, according to Keeve M. Siegel, president of KMS Industries, Inc., Ann Arbor. In June, KMS's annual report announced an advance in controlling the nuclear reactions that provide the explosive force of the hydrogen bomb, and called it potentially the most important discovery of modern times. Nine patents have been filed. The nature of the discovery has not been disclosed, and the patent applications have been classified "secret" by the Atomic Energy Commission. Under an agreement with the AEC, the Ann Arbor firm will develop a prototype fusion power plant at its own expense under AEC security restrictions; the government would have the right to military applications of the development program free of charge.

In a telephone interview, Siegel told Environment he expects permission from the AEC "momentarily" to proceed with development of a laboratory-scale pilot plant, which he estimates could be completed in five years. Other scientists in the field commonly estimate that twenty to thirty years will elapse before there is successful demonstration of controlled fusion power. According to Siegel, the discovery which makes fusion power now possible was made by Dr. Keith Brueckner, head of KMS's Technology Center in San Diego.

Fusion power could operate on cheap fuel derived from sea water, and produce electricity without creating pollution. Successful development of this power source would make the present nuclear power program obsolete just as it is beginning, and would remove the need for development of a new reactor type, the "fast breeder," to which AEC plans to commit $2 billion.

DDT CAUSES MUTATIONS in rats, according to research conducted by Dr. Marvin Legator, head of the federal Food and Drug Administration's Cell Biology Division. Massive single doses of DDT to rats were