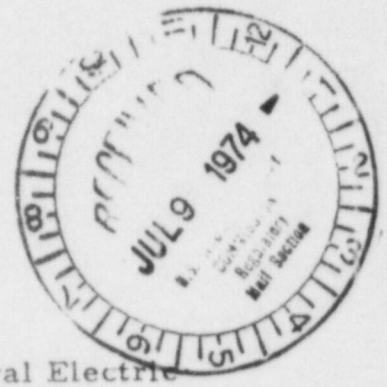
Letter to FBrown 5539

50-268

GENERAL ELECTRIC
GENERAL ELECTRIC COMPANY
175 CURTNER AVENUE
SAN JOSE, CALIFORNIA 95114

ROBERT LOWENSTEIN
COUNSEL
NUCLEAR ENERGY DIVISION

July 8, 1974



Mr. Edson G. Case
Deputy Director
Directorate of Licensing
United States Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Case:

Construction Permit CPCSF-3 was issued to General Electric on December 28, 1967, for construction of the Midwest Fuel Recovery Plant (MFRP). As originally issued, the permit specified a latest completion date of July 1, 1970. The latest completion date has been extended four times by Amendments 7, 12, 23, and 33, dated respectively June 10, 1970, June 17, 1971, March 28, 1972, and March 19, 1973. The last of these amendments specified a latest completion date of April 1, 1974.

By letter dated February 25, 1974, General Electric applied for extension of the latest completion date for the MFRP to April 1, 1975, or until an operating license is issued for the MFRP. By letter dated April 25, 1974, Mr. L. C. Rouse, Chief, Fuel Fabrication and Reprocessing Branch, AEC, requested additional information with respect to the cause of the delays, General Electric's schedule, and an indication as to whether there are significant hazards considerations associated with the delays and General Electric's further pre-operational testing activities. Dr. Bertram Wolfe, General Manager, Advanced Technology Department, replied June 4, 1974 to Mr. Rouse, advising that General Electric was preparing a comprehensive response to the letter of April 25.

This letter, and the enclosed report, constitute General Electric's response to AEC's request of April 25, 1974, for additional information concerning the application dated February 25, 1974, for extension of the latest completion date of Construction Permit CPCSF-3.

Because of their significance, a summary of salient findings and conclusions of the report is set forth below.

SUMMARY OF THE REPORT

Background

The MFRP was planned as a developmental plant. One goal was to increase process efficiency so that relatively small reprocessing plants could operate economically near groups of nuclear power plants, thereby reducing transportation problems. Another goal was to reduce undesirable environmental effects by reducing or eliminating radioactive liquid effluents, and by converting the high-level fission product wastes to a solid form. Compared with earlier processes, these goals were to be achieved through innovative chemical processes and improvements in the design of reprocessing canyons. The MFRP was designed for a 300 ton per year output. This size represented a balance between the desire to test out technical innovations on a small scale, and the need to obtain results which would provide a meaningful basis for building an optimum size plant, in the 1,500 to 2,000 ton range.

Scheduled startup of the MFRP has been extended many times. Original startup estimates were for mid-1970, but it was not until November, 1971, that construction and equipment installation were sufficiently completed to permit the start of equipment testing. At that time, it was anticipated that hot startup would follow in mid-1972.

Numerous equipment failures and operating problems were encountered that made it impossible to operate the plant. Testing and modification of individual pieces of equipment continued. In September of 1972, cold uranium was introduced into some pieces of equipment for the first time. By that time, the hot startup date had been extended to April, 1973. More recently, the scheduled hot startup date had been extended to October, 1974.

As originally conceived in 1964, General Electric expected to invest $20 million in the development and demonstration of the plant and process. In 1968, a $36 million appropriation for the construction of the MFRP was approved by the Board of Directors and in 1970 the Board of Directors approved an additional appropriation of $8 million to cover cost overruns. This increased the total funds obligated to the project to $44 million. On-site employment has built up to about 160 people, with an aggregate annual payroll of about $4 million. By July 1, 1974, including preoperational startup expenses, General Electric expended approximately $64 million for the MFRP, which continues to be a nonoperational facility.

It was recognized that loading the MFRP with irradiated fuel represented a critical step which should not be taken until a high-level review had been conducted. In March of 1974, with the startup of the MFRP projected to occur within six months, Mr. R. H. Jones, Chief Executive Officer of General Electric, requested that Dr. C. E. Reed, Senior Vice President-Corporate Studies and Programs, make a corporate review of the technical and operational capability of the MFRP.

As a first step toward evaluating the technical and operational capability of the MFRP, Dr. Reed convened an Advisory Board of experts. The Board members were chosen for their previous experience in radioactive chemical processes, decontamination and maintenance of equipment, and the pertinent types of chemical engineering and process technology in use at the MFRP. The Advisory Board was composed of the following:

Dr. C. E. Reed — Chairman
Senior Vice President
Corporate Studies and Programs

Mr. A. W. Robinson — Secretary
Staff Executive
Corporate Studies and Programs

Dr. R. H. Beaton
Vice President and General Manager
Energy Systems and Technology Division

Mr. D. E. Debacher
General Manager
Silicone Products Business Department

Dr. W. H. Reas
Manager - Nuclear Process Development
Vallecitos Nuclear Center
Nuclear Energy Products Division

Dr. R. B. Richards
Manager - International Business Development
Nuclear Energy Products Division

Dr. S. Seltzer
Manager - Intermediate Manufacturing
Silicone Products Business Department

Mr. W. B. Webster
General Manager
Overseas Nuclear Projects Department
Nuclear Energy Products Division

Fundamental Plant Technical Problems

The Technical Study Report dated July 5, 1974, identifies, and reviews in considerable detail, fou broad categories of fundamental technical problems. The four areas are:

A. Radioactivity in the uranium nitrate process stream requires remote operation.

The radiation level of the uranium nitrate stream flowing to the uranium conversion and purification/load-out process prohibits contact operation and maintenance of these processes. Although a separation of 99.99% of the radioactivity is projected for the solvent extraction cycle, between 400 and 500 curies per metric ton of uranium still remain in the product stream.

B. Fission product deposition in the uranium conversion and purification systems.

Certain of the fission product fluorides present in the uranium nitrate stream can be expected to plate out on the inside walls of the equipment throughout the uranium fluoride purification system leading to levels of radiation which reinforce the need for remote operation and maintenance of this equipment.

C. Inoperable vital canyon equipment.

The radioactivity from the process stream and fission product deposition results in a highly radioactive uranium conversion and purification process. The equipment testing

and trial runs during the past two years with unirradiated material have demonstrated that the UNH calciner, solids transfer system and fluorinator cannot be operated and maintained remotely. A detailed description of the design and testing of these units, with a summary of the many unsuccessful efforts to solve the fundamental problems, is set forth in the Report.

D. Plant configuration and close coupling of process equipment

To improve product recoveries and enrichment segregations, the MFRP was designed as a closely coupled operation with little or no storage capacity between the various unit operations and subsystems. The failure rate of equipment experienced during testing in the past two years indicates that the time operating efficiency of the present plant will be extremely low because of the anticipated small percentage of the time when all equipment would be simultaneously operating correctly and because of the large amount of productive time that will be wasted on recycle of off-standard product streams between the major systems.

Outlook for Acceptable Solution of Major Problems

The most fundamental problems of the MFRP derive from a process flowsheet which requires final decontamination of the uranium to be effected by a series of calcination and fluorination processes carried out in a remote operation and maintenance mode in fluidized solids reactors and associated equipment.

Many of the problems of plugging, erosion and caking normally encountered in fluidized bed equipment were anticipated, and special designs were developed through which it was expected to work out these problems during the plant startup period. All such problems have now been found to be intensified by the high density and difficult flow properties, caking properties, and plugging properties of uranium nitrate, uranium oxide and their partially hydrated forms. These will result in equipment failures which could be corrected in a normal hands-on operating mode but which cannot be corrected in the remote operating mode without extended shutdowns for repairs. Even with long design and development programs, it is

difficult to see any satisfactory solutions to many of these problems which would be compatible with the constraint of remote operation and maintenance of such equipment over the life of the plant.

Appraisal of Plant Operating Capability

Notwithstanding the contemplated improvements in the fluidized solids reactors and associated equipment used to calcine uranium nitrate to uranium oxide and to fluorinate the latter to uranium hexafluoride, it is the considered judgment of the technical experts that these systems will continue to be unreliable. Following radioactively hot operation with the constraints of remote operation and maintenance, it is judged that the expected plant downtime and forced outage levels resulting from the barrier type problems with these systems alone would:

(a) Limit the first year plant throughput to 10-15 metric tons.

(b) Limit subsequent years' throughput to 50-100 metric tons.

From the standpoint of overall integrated plant operation, as discussed in Section III. D of the Report, there is a substantial risk that in radioactively hot operation, the required time for stabilization of plant process streams may well be of the same order as the mean time to failure, resulting in a time operating efficiency which could limit ultimate plant output to a level even less than the 50-100 metric tons estimated in (b). There is also a serious problem regarding satisfactory storage and disposition of the excessive quantities of radioactively contaminated failed equipment which can be anticipated from the present process. Despite best efforts with the present plant configuration, there is significant risk that the plant would suffer a disabling failure during the early years of operation from which it could not recover without a shutdown of extended duration -- perhaps measured in years. The Report therefore concludes that the MFRP, with its present flowsheet and the present plant configuration, should not be committed to radioactively hot operation.

It is not believed that the plant design presents any significant problems of safety with respect to the offsite public. However, problems of operability interact with considerations of on-site personnel safety. Prior to commencing commercial operation of the fuel reprocessing plant, the probability of equipment failure must be reduced to a level where the potential radiation exposure to the operators due to the accidental spread of contamination or associated repair procedures will be within acceptable limits.

Alternative Process Flowsheet and Plant Configuration

The Report concluded that the only technically feasible solution to the problems of the MFRP lies in the development of a new process flowsheet and a new plant configuration. Although such extensive changes to the process flowsheet and plant configuration, as envisaged by the board of experts, could result in a plant with an acceptable time operating efficiency, they recognized that such changes would represent a complete departure from the original approach. A preliminary estimate contained in the Report indicates that a minimum of four years would be required for the engineering, construction and startup of such a new plant with no allowance for contested regulatory proceedings; and that the costs would be in the range of $90-130 million.

In view of the findings and conclusions of the Report that are summarized above, General Electric is embarking on a comprehensive study of its future activities in the reprocessing field. A detailed technical and financial analysis of the feasibility of a new plant is planned. The possibility of establishing a reprocessing joint venture is also being explored.

In light of the foregoing and the applicable laws and regulations, we understand it will be necessary for the AEC to take action that will result in termination of our construction permit and denial of our application for an operating license.

In order to be prepared for that contingency, we are making arrangements with the nuclear liability insurance pools for liability insurance coverage with respect to future activities at the MFRP site, primarily the handling and storage of irradiated fuel and of the unirradiated radioactive materials used in the preoperational test program. This insurance would become effective upon Commission termination of the construction permit and thus of Price-Anderson indemnity coverage.

At the present time, approximately 60 metric tons of uranium contained in irradiated nuclear fuel elements are in storage at the MFRP in accordance with Special Nuclear Material License No. 1265. We plan to continue receiving additional shipments of irradiated fuel until the irradiated fuel storage capacity of the MFRP is filled and, thereafter, to store the fuel as long as necessary. We also have small amounts of radioactive materials needed for instrument calibration and laboratory standards under Special Nuclear Material License No. 1281. Any action

by the AEC which terminates our construction permit should leave in effect so much of the authority granted by these licenses as is necessary for our continued receipt and storage of irradiated fuel, and for our continued possession of the natural and depleted uranium presently at the MFRP.

Sincerely,

RL:jah

Enclosure

ROUTING AND TRANSMITTAL SLIP

Date: 6/9/87

TO: (Name, office symbol, room number, building, Agency/Post)	Initials	Date
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3.		
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5.		

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	As Requested		For Correction		Prepare Reply
	Circulate		For Your Information		See Me
	Comment		Investigate		Signature
	Coordination		Justify		

REMARKS

The enclosed report and letter concerning Docket 50-268 General Electric Midwest Fuel Recovery Plant Technical Study Report should be included on the DCS system with PDR availability. It is part of the earlier docket file. Other file locations cited should include 72-1 (70-1308). Please return the original to me .

I have also forwarded a hard copy to PDR personnel for their use.

Thank you.

DO NOT use this form as a RECORD of approvals, concurrences, disposals, clearances, and similar actions

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5041-102 ★U.S.GPO:1985-0-461-274/20024

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