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ECASE

Richard P. Pollock, Director

Critical Mass Energy Project

P.O. Box 1538

Washington, D. C. 20013

RJMattson

ROMeyer

KKniel MAR 3 1980

RPDenise

JMurray, ELD

CMiles, PA

DCrutchfield

MGroff (07729)

GErtter (07729)

I&E (3)

Blue Bag Immediately

SCHIK, SECY (5)

CStenhens, SECY

JNelson GC

JMurray, ELD

HSmith

PREhm

HLevine

RMinogue

HBerkow/Russell

DVassallo

TSchultze (07729)

ZRosztoczy

bcc: ARosenthal, ASLA

J. Yore, ASLBP

J. Buchanan, NSI

TERA Corp.

ACRS (16)

Dear Mr. Pollock:

Your petition of November 2, 1979, on behalf of the Critical Mass Energy Project, requested that the Commission conduct an investigation to determine if grounds exist to suspend or otherwise amend the operating licenses of all U.S. light water reactors which base their emergency core cooling systems upon "faulty analytical codes" for fuel cladding performance under loss of coolant accident (LOCA) conditions.

At the time the petition of Critical Mass Energy Project was received an intensive investigation was already underway into fuel cladding swelling and rupture models for LOCA analysis. A significant conclusion from that investigation--drawn from a major confirmatory research program on cladding behavior under LOCA conditions--was that "the trend of recent data shows the likelihood of more ruptures, larger rupture strains, and greater flow blockages than predicted in the licensing models," as reported in the draft report NUREG-0630, "Cladding Swelling and Rupture Models for LOCA Analysis," dated November 1979. Further, based on a preliminary evaluation of the correlations being developed, the Staff concluded that parts of the ECCS Models might be non-conservative in this area and therefore might not be in compliance with Appendix K of 10 CFR Part 50.

The issue was pursued and, following discussions with reactor vendors, some plant licensees and other interested parties at a meeting on November 1, 1979, the Staff determined that differences between the present models and our preliminary correlations are either (a) small, within the limited range of applicability, or (b) when considered with other model changes that the staff believes are appropriate do not produce large changes in peak cladding temperatures. This determination was confirmed by vendor letters of November 2, 1979. In either case, the differences did not affect compliance with the temperature limit specified in 10 CFR 50.46 for most licensed operating reactors, and the remaining licensed operating reactors made small adjustments in operating limits so they would be in compliance with either the old or the new cladding models.

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perm 50-1

The substance of Critical Mass Energy Project's petition has been implemented. Through a telephone conversation and three letters with Richard P. Denise, Acting Assistant Director for Reactor Safety (see Attachments 1 and 2), you have been kept informed of the progress of the Staff's investigations and have been apprised of the continued ability of each of the fuel vendors' LOCA analyses to meet the limiting cladding temperature requirement of 2200°F specific in 10 CFR 50.46.

Consequently, no further action on your petition was, or is, indicated. If you have additional comments on the analytical fuel codes in question, please contact Mr. Denise at 492-7253.

Sincerely,

Original signed by
E. G. Case

Harold R. Denton, Director
Office of Nuclear Reactor Regulation

Attachments: As stated

	CPB/DSS KKniel 02/12/80	DSS/AD/RS RPDenise 02/27/80	DSS/AB ZRosztoczy 02/20/80			
OFFICE	DSS/CPB	ELD	DSS/DD	DSS/DIR	NRR/DD	NRR/DIR
SURNAME	RQMeyer	JMurray	FSchroeder	RJMattson	ECASE	HRDenton
DATE	02/12/80	02/28/80	02/29/80	02/29/80	02/ /80	02/ /80



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DEC 10 1979

Richard P. Pollock, Director
Critical Mass Energy Project
133 C Street, S. E.
Washington, D. C. 20003

Dear Mr. Pollock:

Your letter to Chairman Hendrie dated November 12, 1979 requested a meeting with the NRC staff to discuss the basis of NRC's ECCS analysis. I called you on November 29th for the purpose of establishing a date and agenda for the meeting. In the telephone conversation you indicated that you wished to receive additional information, which would be reviewed by your consultants, before establishing the meeting date and the participants for the Critical Mass Energy Project. You indicated that you requested a technical discussion of cladding swelling and rupture models for LOCA analysis, a topic which has been the subject of considerable correspondence and meetings since the end of October 1979. In accordance with your request, I agreed to send copies of recent information which I think will be of help to you in understanding the present situation. In addition, I agreed to arrange a mutually acceptable meeting in our Bethesda offices when you indicate your readiness.

The requested information is enclosed. Enclosure 1 lists the information being transmitted, and provides some commentary which should be beneficial in understanding the content and status. When you have completed your review of this information, please call me at 492-7258 to arrange a meeting date and time. If you have questions in the meantime, please call.

Very truly yours,

A handwritten signature in dark ink, appearing to read "Richard P. Denise", is written over the typed name.

Richard P. Denise, Acting Assistant
Director for Reactor Safety
Division of Systems Safety

Enclosure: As stated

Handwritten:
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8001670138
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ENCLOSURE 1

Documents transmitted to Mr. Richard P. Pollock, Director,
Critical Mass Energy Project on December 7, 1979

Enclosure 2

A copy of the draft report, "Cladding Swelling and Rupture Models for LOCA Analyses," NUREG-0630, by D. A. Powers and R. O. Meyer. This report differs in two ways from the information that was provided at the November 1, 1979 meeting: (1) the typing of figure numbers and non-essential information (e.g., Table 1) has been completed, and (2) the important Section 4 showing comparisons with vendor models is included. Approval to release the proprietary information in Section 4 had not been obtained on November 1, 1979.

Enclosure 3

A summary dated November 20, 1979 of the public meeting held on November 1, 1979. This summary says why we thought there was a problem in the first place and why, by the end of that day, we believed that there was no major safety problem. The last enclosure to that summary is a memorandum to the Commissioners providing more detail on the disposition of the problem.

Enclosure 4

Six letters dated November 2, 1979 from the fuel vendors and Yankee Atomic Electric Company confirming their oral presentations at the November 1, 1979 meeting.

Enclosure 5

Six letters dated November 8, 1979 from the NRC to the fuel vendors and Yankee Atomic asking for their comments on the NRC staff report, NUREG-0630.

Enclosure 6

A letter dated November 9, 1979 to all operators of light water reactors. This letter advises the licensees of the situation and requires them to confirm the representations made in their behalf by a fuel supplier.

Enclosure 7

Six letters from the fuel vendors and Yankee Atomic Electric Company discussing the rupture temperature correlation noted in Enclosure 6 above.

Enclosure 8

A letter from B&W dated November 9, 1979 providing corrections to their November 2, 1979 letter.

Enclosure 9

A letter from Exxon dated November 4, 1979 providing further information requested by the staff.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

JAN 17 1980

Richard P. Pollock, Director
Critical Mass Energy Project
P. O. Box 1538
Washington, D. C. 20013

Dear Mr. Pollock:

In response to your request for a meeting to discuss cladding swelling and rupture models for LOCA analysis, I wrote to you on December 10, 1979. In that letter I gave you additional background material on the subject of your requested meeting and suggested that you call me when you were ready to arrange a meeting date and time.

I have not received your call, but some additional information is now available that you might find of interest. That information is enclosed and consists of letters from five fuel vendors and Yankee Atomic Electric Company providing their comments on our draft report, NUREG-0630, which is at the center of recent interest in this subject.

We are still available to meet with you on this subject. However, we are working on a schedule that includes reviewing technical comments in January, revising NUREG-0630 in February, and publishing the final report in March. In order for your comments to be adequately considered, they will have to be received very soon.

Please call me at 492-7258 if you still wish to meet with us on this subject or if you have further questions.

Sincerely,

Richard P. Denise, Acting Assistant
Director for Reactor Safety
Division of Systems Safety

Enclosure:
As stated

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

FEB 6 1980

Richard P. Pollock, Director
Critical Mass Energy Project
P. O. Box 1538
Washington, D. C. 20013

Dear Mr. Pollock:

Since you have expressed an interest in cladding swelling and rupture models for LOCA analysis, you might be interested in an ACRS Subcommittee meeting on this subject to be held on Thursday, February 14, 1980. The meeting will run from about 8:45 a.m. to 11:30 a.m. and will be held on the 10th floor of 1717 H Street in Washington.

Sincerely,

A handwritten signature in dark ink, appearing to read "Richard P. Denise", is written over the typed name.

Richard P. Denise, Acting Assistant
Director for Reactor Safety
Division of Systems Safety

D-1p
8003310423
1p

CRITICAL MASS

ENERGY PROJECT

P.O. Box 1538, Washington, D.C. 20013 Phone: (202) 546-4790

November 2, 1979

Mr. Joseph M. Hendrie, Chairman
Mr. Richard Kennedy
Mr. Peter Bradford
Mr. John Aherne
Mr. Victor Gilinsky
Office of the Commissioners
Nuclear Regulatory Commission
1717 H Street, NW
Washington, D.C.

DW
400321006
388

Dear Commissioners,

Pursuant to 10 CFR 2.206 the Critical Mass Energy Project hereby files an emergency petition before the U.S. Nuclear Regulatory Commission to investigate the grounds for suspending or otherwise amending the Operating Licenses of all U.S. Light Water Reactors which base their emergency core cooling system upon faulty analytical codes for fuel cladding under loss of coolant accident conditions, as specified by the NRC's director of Operating Reactors, Mr. Darrell G. Eisenhut, in a proceeding in Bethesda, Md. on November 1, 1979. CMEP attended that proceeding with representatives of reactor manufacturers, nuclear fuel suppliers and NRC licensees. Due to the urgent nature of this matter we are filing this letter-petition.

In the course of the proceeding, it was revealed that tests conducted by the Oak Ridge Test Facility at the Oak Ridge National Laboratory and other tests conducted in West Germany show that heretofore unpredicted high temperature swelling of Zircaloy fuel cladding would block the flow of necessary coolant during a loss of coolant accident. This larger than expected ballooning of the fuel cladding could render the emergency core cooling system ineffective.

The emergency core cooling system is the centerpiece of reactor safety. Its function is to restore cooling water to a hot reactor core in the event a pipe rupture causes loss of normal cooling water. If this backup cooling system fails to work effectively, the core could overheat, melting could occur, setting the stage for a major release of radiation.

The successful operation of the emergency core cooling system, long under controversy, is based on analytical codes which attempted to predict the behavior of many complex chemical, thermal and physical interactions. One of the key assumptions

CRITICAL MASS

ENERGY PROJECT

P.O. Box 1538, Washington, D.C. 20013 Phone: (202) 546-4790

(2)

is the predicted behavior of the Zircalloy fuel cladding, or covering.

The early analytical code on ~~estimated~~ swelling of cladding led to the 1974 Acceptance Criteria for Emergency Core Cooling Systems and regulations 10 CFR part 50 Appendix K of the U.S. Atomic Energy Commission, NRC's predecessor agency. Each utility company relies on the specifications of Appendix K and the emergency core cooling system acceptance criteria to design its backup cooling system.

D.A. Powers and R.O. Meyer of the NRC now confirm that the previous estimates on fuel cladding were in error. In their draft report of October 31, 1979 which was presented at the Nov. 1 meeting, they state, "The trend of these recent data shows the likelihood of more ruptures, larger rupture strains, and greater flow blockages, than we previously believed. Consequently, we see the need to reevaluate all loss of coolant accident cladding models to assure that licensing analyses are performed in accordance with Appendix K."

As stated by the NRC in its public notice on this matter, the new findings "indicate that emergency core cooling system analytical codes currently used to evaluate the effects of postulated loss-of-coolant accidents might not be in compliance with NRC regulations."

This condition means that virtually all Light Water Reactors licensed to operate in the United States may be operating with flawed emergency core cooling systems. It is similar to an automobile operating without assurance that its brakes will work.

These sobering conclusions are not the first time grave clouds of doubt have been placed over the successful operation of the emergency core cooling system and the general safety of U.S. Light Water Reactors. From 1971 to 1973 the scientific community raised serious concern about the basis upon which the emergency core cooling system was certified.

In August 1971, Mr. George Brockett, an emergency core cooling system researcher identified by the Atomic Energy Commission regulatory staff as one of the nation's leading authorities on reactor safety systems testified that the reactor safety analysis used by the Atomic Energy Commission was "unverified," "inadequate," "incomplete," and "uncertain."

CRITICAL MASS

ENERGY PROJECT

P.O. Box 1538, Washington, D.C. 20013 Phone: (202) 546-4790

(3)

Mr. Milton Shaw, in an internal memo at the Atomic Energy Commission to R.E. Hollingsworth, the General Manager of the Atomic Energy Commission, stated in February 1971:

Although test information is available on the response of simulated fuel pin bundles to a range of emergency coolant flow conditions, no assurance is yet available that emergency coolant can be delivered at the rates intended and in the time period prior to clad and subsequent fuel melting due to decay heat generation.

The inadequacy of the data base upon which the safety tests were conducted for nuclear fuel are confirmed by the 1979 Powers-Meyer report. "There are holes in this data base," they note, "particularly with regard to the absence of large bundle tests..."

Dr. Morris Rosen, the Technical Advisor to the Director of Reactor licensing at the Atomic Energy Commission also concluded in 1971 that the "consummate message" from the Atomic Energy Commission safety analysis was that reactor safety system performance "cannot be defined with sufficient assurance to provide a clear basis for licensing."

There is sufficient evidence to warrant either the suspension or other amendment of the Operating Licenses of those Light Water Reactors until such time as a full reevaluation of all loss of coolant accident cladding models has been conducted and assurance is given that the emergency core cooling system can comply with the Commission's acceptance criteria and 10 CFR Part 50 Appendix K requirements.

For the foregoing reason, the Critical Mass Energy Project hereby petitions the Nuclear Regulatory Commission to conduct an investigation into the issues concerning the design of the emergency core cooling system and to decide whether there is sufficient evidence to warrant suspension or amendment to the licensing of Light Water Reactors.

Sincerely,


Richard P. Pollock