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August 14, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In The Matter of	)	
	)	
METROPOLITAN EDISON COMPANY	)	Docket No. 50-289 SP
	)	(Restart)
(Three Mile Island Nuclear Station, Unit No. 1)	)	
	)	

NOTICE TO THE COMMISSION,
APPEAL BOARD, LICENSING
BOARD AND PARTIES

In accordance with our practice of notifying the Commission, Appeal Board, Licensing Board and parties of changed circumstances or new information on issues under consideration, Licensee hereby encloses a report on "The Risks to Safe Operation of TMI-1 Posed by Cleanup Operations at TMI-2" dated August 9, 1984.

Respectfully submitted,

Ernest L. Blake, Jr.
Ernest L. Blake
Counsel for Licensee

Attachment

cc: Attached Service List

DS03

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August 13, 1984

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Mail Stop P-426
Washington, D.C. 20555

Dear Mr. Denton:

I recognize the renewed current interest in assuring that cleanup of TMI-2 does not pose an obstacle to operation of TMI-1 and am aware of the questions raised by the Commonwealth of Pennsylvania in that regard.

Therefore, in early June I asked Dr. James Fletcher, the Chairman of the TMI-2 Safety Advisory Board (SAB), to set up a Subcommittee to provide an independent review of this matter. The SAB members were already familiar with TMI-2 conditions and had assessed the risk it posed off-site. I asked that the Subcommittee review that work and the assessments already made by others of the possible effect of TMI-2 cleanup operations on TMI-1, and conduct additional analyses they felt warranted so as to conclude whether there is any technical basis for concern that TMI-2 poses a potential threat to the safe operation of TMI-1. Dr. Fletcher agreed, and established a Subcommittee consisting of Norman Rasmussen as Chairman, with Lombard Squires and William Stratton as members. Paul Wood of Delian Associates was added to the Subcommittee to assist in carrying out its work. I established with Dr. Fletcher that the Subcommittee would have the same full and free access to all GPUN documents and personnel as the SAB has. We provided substantial information by mail and in meetings.

The report of the Subcommittee is enclosed. We are providing a copy to Governor Thornburgh and serving it on the parties and Licensing Boards for the TMI-1 Restart Proceedings.

The most significant conclusions of the Subcommittee are:

"We find that in their present condition the two plants are nearly completely isolated from each other and thus the potential for interactions between the plants is very low."

"Even using what we believe are very conservative calculations we can find no events that would produce contamination levels in TMI-1 nearly high enough to deny operator access to the plant. We conclude that even in the most serious events the plant could be shut down and safely maintained in a shutdown condition."

"A number of non-radioactive events were examined. No credible accidents in TMI-2 were found that could threaten safe shutdown of TMI-1. It is our belief that in its present condition TMI-2 is less of a risk to safe operation of TMI-1 than if it were a plant operating at power. We therefore believe that the existence of TMI-2 in its present condition is not a valid technical reason for delaying operation of TMI-1."

The Delian Associates reference document, which provides the basis for many of the conclusions in the Subcommittee's report, is being reproduced and copies will be provided to you separately.

I hope this information will be helpful.

Sincerely,

P. R. Clark
President

attachment

PRC/agh

REPORT ON THE RISKS TO SAFE OPERATION OF TMI-1 POSED BY CLEANUP OPERATIONS AT TMI-2

by

A Subcommittee of the TMI-2 Safety Advisory Board

Composed of:

Norman C. Rasmussen, Chairman
Lombard Squires
William Stratton
Paul Wood

Submitted August 9, 1984

PREFACE

This subcommittee of the Safety Advisory Board was formed to investigate recently raised concerns that the cleanup activities of TMI-2 would threaten the safe operation of TMI-1. It has further been suggested that because of this the startup of TMI-1 should be delayed until the cleanup has been completed.

To carry out this review the Safety Advisory Board retained Dr. Paul Wood of Delian Corporation as a consultant and a member of the subcommittee. This corporation, Delian, which has considerable experience in nuclear plant risk analysis, provided staff support to the subcommittee.

Because of time constraints much of the information about the current status of TMI-2, TMI-1, and their interconnections comes from documents generated for the hearing process of TMI-1 restart. The subcommittee has not personally investigated all aspects of these reports by personal inspection but has found no reason to doubt them. During the review the subcommittee was given full access to the TMI staff and records. The draft report was submitted to the TMI staff to check for any misinterpretations of the information they supplied. The technical conclusions are those of the subcommittee.

The subcommittee has used its collective experience of more than 100 years in nuclear safety to postulate ways current operations at TMI-2 might impact the safety of TMI-1. We have tried to do this in a logical and methodical way. Each of the events identified as having the potential for threatening safety

was examined using conservative calculations to determine the magnitude of the threat. Where possible, judgements about the probability of such events have been included. The submission to the President of GPUN consists of the Subcommittee's Report and a reference document prepared by the Delian Corporation, which provides the basis for many of the conclusions in the subcommittee's report.

It should be noted that this report deals with potential radiation exposures that might be created on the island itself as a result of accidents at TMI-2. The potential exposure to persons in the general public as a result of such accidents is much less. The Safety Advisory Board commented upon this in its recently released annual report.

1. Current Status of TMI-2

The TMI-2 reactor has been shut down since March 28, 1979. The current level of radioactivity remaining as a result of its operation has decreased from its level of about 30×10^{10} Ci at the time of the accident to about 5×10^{6} Ci today. In the event of the accidental release of any of this radioactivity the isotopes 134 Cs and 137 Cs are of most concern because they would be the dominant source of γ-ray dose (over 75%). About 40% of the Cs isotopes have been recovered by cleanup operations and shipped from the island. About 400,000 Ci of Cs remain.

The heat being generated by the remaining radioactivity is about 15 kw. This is down from about 200,000 kw shortly after the accident. This heat output is equivalent to about 15 toasters. This power level is not capable of heating the over 100 tons of UO_2 fuel to its melting point of over 5000°F because of the inevitable conduction and convection of heat to the surroundings. For some time now these natural heat removal processes, unaided by forced cooling, have adequately maintained the core temperature well below the boiling point of water.

The two plants are for the most part independent except for the fuel-handling building. Following the accident the few shared facilities have been separated as much as is practical so that today there are almost no interconnections between the plants. There are still of course some shared services such as the utility grid, the river water and a few others.

2. Potential Accidents and Their Consequences

2.1 Release of Airborne Radioactivity from TMI-2

The obvious way to release a large fraction of the remaining radioactivity from TMI-2 would be to heat the fuel to its melting point. We find no credible way of doing this with the current power level of 15 kw since the UO_2 melting point is about 5000°F. In the absence of melting, we judge the largest plausible release fractions would be similar to those postulated non-melt releases of WASH-1400. For Cs these are 5×10^{-4} (0.05%). Calculations performed in Appendix A of the Delian report indicate that contamination levels on parts of the island from such a release from containment would be about 16 mrem/hr or less. These dose fields are not large enough to prevent personnel from the access to TMI-1 needed to assure that it is shut down and maintained in a safe condition for as long as is required to clean up the contamination. We have been unable to postulate any mechanism to overpressure the containment building to anything approaching its design pressure of 60 psi. For this reason a failure of containment has an exceedingly low probability. The calculation is also very conservative because it gives no credit for the shielding that would be provided by buildings. The shielding factors could reduce doses inside of the buildings by a factor of 10 to 10,000 depending on actual location.

We also estimated the inhalation dose to workers in the control room of TMI-1 as a result of such a postulated release. Under a pessimistic set of circumstances a whole body dose of

0.8 rem was calculated. This is well below the allowed occupational dose and clearly would not prevent the safe shutdown of the plant.

In our judgement the most credible accident with potential for serious contamination would be the accidental spill of ion exchange resins used to clean up radioactive water. A container of ion exchange resins might be loaded to a level of about 1000 to 10,000 Ci in future cleanup operations. (In the early decontamination of reactor water a number were loaded to 60,000 Ci and handled without incident.) These resins would be inorganic and hence nonflammable. The maximum postulated release fraction from such a spill is estimated to be less than 5×10^{-4} used in the previous case.

We believe a possible location for such a spill might be the fuel handling building. For this reason we feel it would be wise not to have fuel handling operations of both reactors occurring simultaneously until the matter has been more thoroughly studied. It is our understanding that GPUN has already agreed to such a stipulation.

Some of the resins used in the water polishing operations are organic and under some circumstances are flammable. However, the loadings of Cs in such resin canisters are from 1 Ci to 10 Ci. The burning of a canister of these resins would produce a release well below the levels postulated above and pose no threat to the safe operation of TMI-1

In summary, we have postulated a series of highly unlikely accidents that might release airborne radioactivity from TMI-2.

Using accepted methods we have conservatively estimated the dose fields that might be created in and around TMI-1. In all cases we find the doses to the operating crew of TMI-1 would be well below the 5 rem/yr permitted occupational dose. These dose levels are in the range routinely received by reactor personnel. They are well below the levels that would interfere with the safe shutdown of TMI-1.

2.2 Accidental Liquid Releases

It is possible to postulate a number of events that might cause an accidental release of radioactive liquids. However, because the specific activity of the liquids in TMI-2 is relatively low, none of them would lead to problems in the safe shutdown of TMI-1.

The principal point of connection between TMI-1 and TMI-2 is the fuel handling building. A liquid spill in the TMI-2 part could lead to contamination of the TMI-1 fuel handling building. Since these facilities are designed to operate with a modest level of contamination in the pool water, this should not present a serious problem. In any event TMI-1 can be operated and safety maintained in a shutdown condition with very limited access to the fuel handling building.

We can identify no potential liquid release accident in TMI-2 that could prevent the safe shutdown of TMI-1.

2.3 Accidental Criticality

It is clear that the potential exists for an accidental criticality for a variety of mixtures of fuel and water. To avoid this possibility the water in the primary system has boron

added to maintain a concentration of 5000 ppm. This concentration of boron provides a very confortable margin of safety against a criticality. The boron concentration is regularly monitored and addition of nonborated water is carefully controlled to small amounts. We judge the probability of loss of boron to a dangerous level to be very low. In addition the experience with over 2 dozen criticality accidents has established that the total energy release is quite small and any effects are quite local. Although such events should be avoided we can postulate no credible way such an event in TMI-2 could prevent the safe shutdown of TMI-1.

2.4 Nonradioactive Hazards

We have examined a number of possible nonradioactive hazards that might be created by operations in TMI-2 and produce undesired effects in TMI-1. These include poisonous gases, missiles, fires, explosions, and flooding. We find that the current level of isolation between the plants and the hardening of the reactor and control room buildings makes such events either impossible or highly unlikely. We conclude that the current state of TMI-2 (cold shutdown) makes the risks to safe operation of TMI-1 smaller than if TMI-2 were operating at power. We find nothing in the cleanup operations that creates special risks of these types.

3. Conclusions

During the last month the subcommittee and its staff have reviewed the potential for accidents in TMI-2 causing unsafe conditions to develop in TMI-1. Details of this effort can be

found in the accompanying Delian Report. We find that in their present condition the two plants are nearly completely isolated from each other and thus the potential for interactions between the plants is very low. Nevertheless, it is possible to postulate a variety of events in TMI-2 that might cause effects in TMI-1. We have used our collective experience combined with fault tree logic to identify as complete a list as possible of such events. This list of events identified is reviewed in the Delian Report.

Of the events identified the most serious involve the accidental release of radioactivity from TMI-2 cleanup operations. The amounts and types of radioactive materials present in TMI-1 today limit the possible effects of such accidents. Even using what we believe are very conservative calculations we can find no events that would produce contamination levels in TMI-1 nearly high enough to deny operator access to the plant. We conclude that even in the most serious events the plant could be snut down and safety maintained in a shutdown condition.

A number of nonradioactive events were examined. No credible accidents in TMI-2 were found that could threaten safe shutdown of TMI-1. It is our belief that in its present condition TMI-2 is less of a risk to safe operation of TMI-1 than if it were a plant operating at power. We therefore believe that the existence of TMI-2 in its present condition is not a valid technical reason for delaying operation of TMI-1.

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