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U.S. Nuclear Regulatory Commission
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Gentlemen:

Three Mile Island Nuclear Station, Unit-1 (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
TMI-1 Level 1 Probabilistic Risk Assessment (PRA)

Our letter of March 17, 1989 provided a status summary of our consideration of the recommendations contained in the TMI-1 Probabilistic Risk Assessment (PRA) that we transmitted to you on December 7, 1987. We have completed our consideration of the recommendations and are providing the enclosed updated status summary.

As we indicated in our March 17, 1989 letter, we anticipate that some aspects of the PRA will be revisited and potentially modified in response to the IPE requirements. While there are some issues and recommendations identified in the enclosure that we have concluded cannot be resolved on a cost beneficial basis at this time, we will re-examine them if they are determined by the IPE to be significant. However, for the purposes of responding to the recommendations made in the 1987 PRA we consider them closed.

Sincerely,

H. D. Hukill
Vice President and Director, TMI-1

/cjg
Enclosure
cc: R. Hernan, USNRC
W. Russell, USNRC, Region I
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ENCLOSURE

GENERAL STATUS SUMMARY
OF CONSIDERATION OF
TMI-1 PRA RECOMMENDATIONS
AS OF DECEMBER 31, 1989

This status summary is intended to provide a broad overview of status and does not detail every action taken in response to the recommendations. The summary description of the recommendations provided below were excerpted from the TMI-1 PRA Executive Summary Report, pages 3-3 through 3-8.

RECOMMENDATION SUMMARY

- Control Building Ventilation System. Since failures of the control building ventilation system contribute to 43% of the total core damage frequency from internal events, several actions are recommended to better understand this problem, improve the reliability of the system, and improve the operator's ability to cope with system failures.

  Closeout Summary

  Testing in the Fall of 1987 and further analysis (results submitted to NRC on May 5, 1988, C311-88-2010) have shown that control building temperatures would not exceed values that would render equipment inoperable for the first seventy two (72) hours after loss. This information has been used to update the PRA model and to recalculate CDF (Core Damage Frequency). The contribution to calculated CDF is now much less than 0.1%. Therefore, GPUN does not plan to pursue CBVS recommendations any further.

- Reactor Coolant Pump Seals. Because RCP seal leakage and failure following loss of seal injection and seal cooling are important in many core damage scenarios, a better understanding of this issue is important and improvements to these important support systems should be sought.

  Closeout Summary

  GPUN continues to follow industry activities on RCP seals and strives to use the latest proven technology when replacing seals. Key components in systems that support seal cooling, such as Intermediate Closed Cooling Water, Make-up/Seal Injection, and Instrument Air have been given increased attention. For example, ICCW pump discharge check valves were inspected and repaired in the 7R refueling outage to improve reliability of that system, and a test was conducted to confirm local air accumulator capacity for seal injection supply valve MUV-20, and ICCW valves IC-V3 and IC-V4 in June 1987. The Loss of Instrument Air procedure has been upgraded to provide guidance on maintaining seal cooling. In addition, the Instrument Air system is planned to be upgraded during 8R and Cycle 8 to include an additional compressor, air dryer, and filters to improve reliability. Other procedures that impact seal cooling have been reviewed and determined to be adequate.

- Fire. The fire hazard scenarios, which were significant contributors to the core damage frequency in the TMI-1 PRA, should be examined more carefully to confirm the validity of the assumptions about which cables and other equipment are damaged. All Appendix R modifications that have been completed to date and recovery actions currently in procedures should be included in the PRA model.

  Closeout Summary

  Five key fire scenarios have been re-examined in light of Appendix R changes. As a result, fires are now estimated to represent on the order of only 2% of the total calculated CDF vs. approximately 16% reported in the PRA. This issue is considered closed.

- Onsite Electric Power. Failures in the onsite electric power system are significant contributors to core damage frequency. Several vulnerabilities and potential improvements have been identified.

  Closeout Summary

  The GPUN April 17, 1989 response to the station blackout rule provided our plans for utilizing a TMI-2 DG as an alternate AC source in 9R. Our examination of the effects of this planned modification indicates a reduction of greater than 5% in the overall calculated core damage frequency (CDF). More significantly, the issues raised in the PRA regarding potential improvements in the onsite electric power system are no longer significant when the AAC source is taken into account, and thus will not be pursued further at this time.

- Offsite Electric Power. The ability to restore offsite power after an extended loss could be jeopardized by the design of the switchyard in which power for air compressors and breaker heaters comes from the switchyard itself. In cold weather, a station blackout could result in the breakers becoming inoperable after some period of time, as the SF_6 gas cools down.

  Closeout Summary

  Two additional small diesel generators, separate from the plant emergency diesel generators, have been installed. These will mitigate this scenario. This issue is considered closed.

- Decay Heat Removal Closed Cooling Water, and River Water. Combinations of unavailability or failure of components in these systems (or associated power supplies) contribute significantly to core damage frequency. This is due largely to the strict separation of the trains, which produces many pairs of train A and B failures.

  Closeout Summary

  The feasibility of system crossties has been investigated with the conclusion that decay heat and closed cooling water crossties would not be cost effective. Decay heat river water crossties were also considered and determined to be not cost beneficial from a CDF reduction standpoint at this time. The impact of maintenance on decay heat river water pumps has been assessed. The current practice of taking the pumps out of service when desilting was a significant contributor to decay heat river water pump unavailability in the PRA. However, further examination of this issue has determined that current communications practices of the diving team provide a significant ability to terminate desilting and recover a non-running pump. Therefore, this issue is considered closed.

- High Pressure Injection. The HPI system and several operator actions associated with it appear as important contributors to core damage frequency. Certain aspects of the HPI system design should be considered for possible improvement.

  Closeout Summary

  Changes to move the controls for the HPI recirculation valves (MU-V-36 and 37) from the back panels to the control console will be implemented in 8R. These changes reduce the likelihood that operators would fail to reestablish recirculation flow after throttling HPI and thus reduce the likelihood of pump damage and consequent loss of RCP seal injection. Increased emphasis has been placed on this human action in the operator training program.

  The possibility of motorizing and then operating with HPI suction crosstie valves open has been considered as a means of improving system reliability, but has been determined to be not cost beneficial from a CDF reduction standpoint at this time.

  A modification to the power supply for the "B" HPI oil pumps is being implemented in 8R that will assure these pumps are supplied from the same source as the respective HPI pump. This will reduce the chances of pump failure if power is lost as identified in the PRA. This issue is considered closed.

- LOCA Outside the Reactor Building (Event V-Sequence). Although this sequence is not a major contributor to core damage frequency at TMI-1, it could be reduced even further.

  Closeout Summary

  Changes to torque switch settings for DH-V-4A and B are being implemented in 8R that will improve the ability of the valves to be closed against a higher differential pressure. Current procedures for surveillance testing of DH-V-4A&B contain instructions to ensure downstream check valves have properly seated before DH-V-4A&B are fully stroked. Further procedural guidance was deemed unnecessary at this time.

- Preventive Maintenance. Preventive maintenance is important for ensuring the reliable performance of components and systems. However, the time that a component or system is out of service for preventive maintenance is also one contributor to the unavailability of the system. In the case of some systems at TMI, this contribution is significant. For example, desilting the intake screen and pump house causes a large portion of the unavailability of the river water pumps, and the yearly overhaul of the emergency diesel generators significantly increases the time that the diesels are unavailable during TMI-1 operations. We recommend that the preventive maintenance program, policies, and practices be reviewed and revised, when necessary, to achieve the highest possible system availability (which means minimizing the sum of all of the contributors to unavailability).

Closeout Summary

Desilting has been addressed as described under Decay Heat River Water above. Diesel Generator maintenance is no longer considered to be an issue as described under Onsite Power above. The PRA is being utilized as one input to the Reliability Centered Maintenance (RCM) evaluation process to ensure that PRA identified failure modes are considered in the development or changing of preventive maintenance actions resulting from the RCM program. This issue is considered closed.

o Operator Actions. Many operator actions are important in the TMI-1 PRA and contribute significantly to reducing the calculated core damage frequency However, the failure of the operators to successfully perform certain actions contributed to core damage in a portion of the scenarios.

- Failure to switch over from injection to recirculation after a LOCA is the dominant source of recirculation failure.

  Closeout Summary

  Various options for resolution of this concern have been considered. Increased emphasis has been placed on this human action in the operator training program. No hardware changes are planned at this time.

- Failure to provide HPI pump minimum - flow recirculation was discussed elsewhere with potential system improvements. If these system improvements are not feasible, then improvements in training and procedures are in order to improve the reliability of this human action.

  Closeout Summary

  See discussion of High Pressure Injection above.

- Failure to initiate HPI cooling is the most significant cause of failure of the HPI core cooling mode. The human action analysis involved should be examined for any actions that increase the reliability of HPI cooling initiation.

  Closeout Summary

  A study of this issue has concluded that automatic initiation of HPI cooling is not practical and that existing control room indications and training emphasis are appropriate. A survey to determine any operator reluctance to initiate HPI has been completed with the result that no significant reluctance exists. This item is considered closed.

- In many scenarios, recovery of failed or unavailable systems is important to preventing core damage. Some examples are recovery of offsite power or a diesel generator after a station blackout, recovery of river water systems after a loss of river water (intake screen clogging), recovery of control building ventilation, and recovery of decay heat removal systems.

Closeout Summary

Recovery of offsite power or a diesel generator is considered to be resolved pursuant to the recommendations on Onsite Electric Power described above.

Procedural changes for recovery of river water have been considered. The technical efficacy of these changes is being reviewed, however, the procedure has been determined to be beyond design basis and inappropriate for the control room.

Maintenance practices and stocking of spare parts for decay heat removal systems have been reviewed. Current practices were deemed adequate.

Further procedural changes for recovery of control building ventilation are not being pursued for the reasons described earlier.