



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

SAFETY EVALUATION AND ENVIRONMENTAL ASSESSMENT
BY THE OFFICE OF NUCLEAR REACTOR REGULATION
METROPOLITAN EDISON COMPANY
JERSEY CENTRAL POWER AND LIGHT COMPANY
PENNSYLVANIA ELECTRIC COMPANY
DOCKET NO. 50-320
THREE MILE ISLAND NUCLEAR STATION, UNIT NO. 2

INTRODUCTION

On March 28, 1979 an accident at the Three Mile Island Nuclear Station Unit 2 resulted in substantial damage to the reactor core and to certain reactor systems and components. The facility is not capable of operation and is in a shutdown condition with damaged fuel in the core. Although some systems were damaged or have subsequently failed, the facility is being maintained in a safe and stable cooling condition utilizing a substantial number of systems and components. Some of the systems and components currently being used to maintain the facility in its present mode of operation were not originally included in the facility's technical specifications because these systems were not required for safe operation of the facility under pre-accident conditions.

Since these additional systems and components are now being used to remove decay heat from the core, revised technical specifications to encompass the additional systems and components should be included in the facility license and other technical specifications for equipment not required during the present mode of operation should be deleted.

The systems and components available to provide plant safety, including long term cooling of the core, under the present conditions with the facility in cold shutdown and while cleanup and recovery of the facility proceed, have been reviewed. The reactor is presently being maintained in a stable, long term cooling mode with decay heat being removed by natural convection circulation of primary coolant through the core with heat rejection through the "A" steam generator. The "A" steam generator is producing steam which is condensed in the condenser and recirculated to the "A" steam generator. An alternate means of removing decay heat from the primary coolant is through the "B" steam generator. The steam side of the "B" steam generator has been modified to provide a water solid, closed loop cooling system which is in turn cooled by the secondary services closed cooling water system. Either steam generator cooling mode is adequate to remove decay heat from the primary coolant. If natural circulation cooling of the core should be lost, contingency plans and procedures have been prepared and approved for alternate means of providing long term core cooling. These alternate core cooling means include forced circulation of the primary cooling using the reactor coolant pumps or decay heat removal pumps. Operation of various systems to control the release of radioactive materials will also be required during the cleanup of radioactive materials released within the facility and the recovery of the facility from the effects of the accident. Appropriate Appendix A Technical Specifications governing this period (long term cooling of the core and during cleanup and recovery of the facility) have been established through conferences between the staff and the licensee. This safety evaluation describes the protection required to provide adequate safety during present conditions. It does not authorize removal of fuel from the reactor pressure vessel. Such authorization

must be obtained prior to any such removal and will be addressed in a subsequent safety evaluation.

This amendment does not include any changes in Appendix B (which remains in effect and includes effluent release limits) to the facility operating license, except that Appendix B Technical Specifications 5.1, 5.2 and 5.3, which identify the licensee's pre-accident management organization for activities addressed by the Appendix B Technical Specifications, are deleted since those requirements will now be performed in accordance with proposed Technical Specifications 6.1, 6.2 and 6.5 which will set forth the current requirements for the licensee's management organization for all licensed activities. This evaluation does not encompass operation of the EPICOR-II decontamination system currently being utilized at the facility pursuant to the terms of the Commission's Memorandum and Order of October 16, 1979 to process decontaminated intermediate-level radioactive waste water accumulated in the auxiliary building. The impact of using EPICOR-II was evaluated in an Environmental Assessment (NUREG-0591) prepared by this Office on October 3, 1979. See also Order for Modification of License and Negative Declaration issued by the Director of this Office on October 18, 1979. The Commission's decision of October 16, 1979 does not address the subject of disposal of the decontaminated water processed by EPICOR-II. Pursuant to the Commission's Statement of May 25, 1979, discharge of EPICOR-II processed waste water is not permitted until completion of an environmental review of such discharges.

During the process of preparing revised technical specifications, a new operational mode was defined. This new operational mode (designated the "Recovery Mode" and defined in Technical Specification 1.3) is intended to apply throughout the long-term cooling of the core and facility cleanup and recovery operations. This change in mode applicability is reflected in the revised technical specifications. This amendment deletes other operating modes and thereby precludes operation in other than the shutdown conditions defined for the Recovery Mode.

The March 28, 1979 accident resulted in excessively high radiation areas in certain portions of the facility; therefore, provisions have been included in the surveillance requirements for the revised technical specifications which relieve the licensee from the requirement to perform certain surveillance requirements when access to the equipment would result in excessive occupational exposures. It is expected that the areas in which this relief is necessary will be reduced as cleanup of the facility progresses.

Minor changes have been made in Technical Specifications 3.3.3.1, 3.3.3.3, 3.3.3.4, 3.3.3.5, 3.3.3.6, 3.3.3.7, 3.3.3.8, 3.4.3, 3.6.1.3, 3.6.1.4, 3.6.1.5, 3.6.4.1, 3.7.3.1, 3.7.3.2, 3.7.4.1, 3.7.6.1, 3.7.7.1, 3.7.10.1, 3.7.10.2, 3.7.10.3, 3.7.10.4, 3.7.11 and 3.8.2.3. These minor changes consist of changes in applicability requirements, changes to existing action statements which require reactor shutdown or prohibit plant startup with inoperable equipment, and deletion of operability requirements for equipment which has failed and cannot be repaired or equipment which is not required in the plant's present condition. These changes do not significantly increase the probability or consequences of an accident or significantly decrease a safety margin and, in fact, are of no safety significance.

The following Technical Specifications are being deleted since they are applicable only during operation in Modes 1, 2, 3, 4 and 6: 2.1.1, 2.1.2, 2.2.1, 3.0.4, 4.0.4, 4.0.5, 3.1.1.3, 3.1.1.4, 3.1.2.1 - 3.1.2.9, 3.1.3.2 - 3.1.3.9, 3.2.1 - 3.2.5, 3.3.3.2, 3.4.2, 3.4.4 - 3.4.8, 3.4.9.2, 3.4.10.1, 3.5.1 - 3.5.4, 3.6.1.2, 3.6.1.6, 3.6.1.7, 3.6.2.1 - 3.6.2.3, 3.6.3.1, 3.6.4.2, 3.6.4.4, 3.6.5, 3.7.1.2 - 3.7.1.6, 3.7.2.1, 3.7.5.1, 3.7.8.1, 3.7.9.1, 3.8.1.2, 3.8.2.2, 3.8.2.4, 3.9.1 - 3.9.11 and 3.10.1 - 3.10.4. Operation in Modes 1, 2, 3, 4 and 6 is no longer authorized; deletion of these Technical Specifications, therefore, does not significantly increase the probability or consequences of an accident or significantly decrease a safety margin. Therefore, these deletions do not involve a significant hazards consideration and in fact are of no safety significance.

EVALUATION

1. Nuclear Safety

The full length control rods (safety and regulating) were fully inserted into the core during the reactor trip which occurred at the beginning of the March 28, 1979 accident. To provide assurance that control rod motion will not cause a change in core reactivity, Technical Specification 3.1.3.1 requires that the control rod drive breakers be maintained open. Since the integrity of the control rods and the fuel rods is unknown, the staff has performed analyses which show that with a reactor coolant boron concentration of about 3000 ppm, the core will be maintained subcritical in all possible configurations (Reference 1). Consequently, revised Technical Specifications 3.1.1.1 and 3.1.1.2 have been prepared requiring two operable systems for injecting borated cooling water into the reactor coolant system and requiring

the reactor coolant boron concentration to be maintained between 3000 and 4500 ppm. The maximum boron concentration has been specified to assure that boron precipitation will not occur. A concentration of 4500 ppm boron in water has a precipitation temperature of approximately 45°F. Therefore, a requirement has been added to maintain the reactor coolant minimum temperature above 50°F thereby assuring that boron precipitation will not occur.

2. Core Cooling, Water Inventory and Reactor Coolant System Pressure Control

The core is presently being maintained in a stable cold shutdown condition and is being cooled by the reactor coolant system operating in natural circulation. Heat removal from the reactor coolant system is through the "A" steam generator which is producing steam. The steam is being routed to the condenser where it is being condensed and then recirculated to the "A" steam generator. An alternate means of removing decay heat from the primary coolant is available through the "B" steam generator. The steam side of the "B" steam generator has been modified to provide a water solid, closed loop cooling system which is in turned cooled by the secondary services closed cooling water system (Reference 2). Operability of the steam generators and associated cooling water system is required by Technical Specifications 3.7.1 and 3.7.2.1. Either steam generator cooling mode is adequate to remove the decay heat from the primary coolant (Reference 1). Technical Specification 3.4.1 requires that the reactor coolant pumps be maintained operable for possible forced circulation of reactor coolant in the event forced circulation cooling is required.

A standby reactor coolant system pressure control system has been added to the facility to maintain the reactor coolant system level and pressure for normal operation in the "Recovery Mode" and over a wide range of anticipated transient events which would cause shrinkage of the reactor coolant (Reference 2). These anticipated transients include loss of natural circulation cooling due to a loss of all secondary side cooling with restart of one secondary cooling loop following a hot leg temperature rise of 50°F. More severe transients which this system is not designed to accommodate would be handled by the high pressure injection pumps, the operability of which is required by Technical Specification 3.1.1.1. Appropriate surveillance requirements which demonstrate the operability of these systems have been incorporated. The operability of borated water sources which are sufficient to accommodate all possible transients is assured by appropriate surveillance requirements.

Technical Specification 3.4.9.1 has been modified to restrict the reactor coolant system temperature and pressure to 280°F and 600 psig. This provides assurance that the reactor pressure vessel will not be subjected to conditions which could result in its brittle fracture.

3. Instrumentation

Since the reactor will not be operated during this time period, the only portions of the reactor protection instrumentation required to be maintained in an operable condition are the source range and intermediate range neutron monitoring channels. Although the reactor will be

maintained subcritical via boron in the reactor coolant (Reference 1), these instruments are required to be maintained in an operable condition per Technical Specification 3.3.1.1 to provide the capability for monitoring the neutron level in the core.

The only Engineered Safety Feature Actuation System (ESFAS) instrumentation required to be maintained operable during this period is that provided to start the Class 1E diesel generators upon detection of a loss of offsite electrical power. This instrumentation is required operable per Technical Specification 3.3.2.1. Other ESFAS instrumentation is not required due to the low decay heat loads and the ample time available for manual initiation of systems available to accommodate possible transients. This is acceptable based upon the present plant conditions (Reference 2).

Since the reactor coolant system pressure instrumentation, reactor building water level instrumentation and the incore thermocouples are being used to assure core cooling and to provide assurance that vital equipment in the containment is not flooded, their operability is required and operability requirements for this instrumentation have been added to Technical Specification 3.3.3.6.

4. Containment Systems

Significant quantities of radioactive materials have been released into the containment. Containment integrity is required to be maintained by Technical Specification 3.6.1.1 to ensure that these materials are

not inadvertently released to the environs. This Technical Specification also prohibits venting or purging or other treatment of the reactor building atmosphere until such activity has been approved by the NRC. Since the licensee has proposed that the containment atmosphere be removed by purging through the hydrogen purge cleanup system (Reference 3), Technical Specification 3.6.4.3 is being retained to ensure the operability of this system in the event purging of the containment is approved and authorized.

5. Fire Detection and Fire Suppression

As part of the facility modifications made for long term cooling of the core, additional fire detection instrumentation and deluge/sprinkler systems were installed. These additions included fire detection instrumentation to protect the self-contained skid mounted "Grey" and "White" Balance of Plant (BOP) diesel generators and a deluge/sprinkler system to protect the auxiliary building exhaust filter. Operability requirements for this added equipment have been incorporated into Technical Specifications 3.3.3.8 and 3.7.10.2. The operability of these fire suppression systems ensures that adequate fire suppression capability is available to confine and extinguish fires. The surveillance requirements provide assurance that the minimum operability requirements of the fire suppression systems are met.

6. Electrical Power

The electrical energy to operate the systems being used to remove decay heat from the core is provided by redundant circuits from the offsite transmission network and by onsite power supplies. The present cooling mode requires the use of electrical power to operate equipment which previously did not require protection against loss-of-offsite power. Therefore, an additional 13.2 kv circuit from the Middletown Junction Substation and two redundant balance of plant diesel generators have been installed to increase the reliability of the offsite and onsite electrical power supplies (Reference 2). The new 13.2 kv circuit provides a backup offsite electrical power supply for two circulating water pumps (one of these pumps provides adequate cooling for removing decay heat). In the event of a total loss of offsite power the core can be cooled using only the onsite diesel generators as a power supply (Reference 2). The redundant self-contained skid-mounted "Gray" and "White" diesel generators have been installed to provide backup protection to all electrical loads which are required for core cooling and which were not previously protected against loss-of-offsite power. Therefore, Technical Specification 3.8.1.1 has been modified to require the operability of the backup 13.2 kv circuit and the two additional, redundant, balance of plant ("Gray" and "White") diesel generators.

7. Control of Radioactive Materials in Gaseous Effluents

The auxiliary building air cleanup system has been installed to filter gaseous effluents from the auxiliary building. Operation of this system in conjunction with the fuel handling building air cleanup system, ensures that any radioactive materials in effluents from these buildings will be processed through HEPA filters prior to release to the environs. The operability requirements for the auxiliary building air cleanup system have been added to Technical Specification 3.9.12 which previously contained the operability requirements for only the fuel handling building air cleanup system. The Surveillance Requirements for the charcoal adsorbers in the fuel handling building air cleanup system have been deleted since the radioactive iodine is no longer present; it has decayed away.

8. Control of Radioactive Materials in Liquid Effluents

The discharge of water processed by the EPICOR-II system and the processing and discharge of highly contaminated water contained in the Reactor Building sump and Reactor Coolant System is prohibited in accordance with the Commission's Statement of May 25, 1979 pending evaluation of these actions.

Furthermore, on November 21, 1979, the Commission announced its decision to prepare a programmatic environmental impact statement to address, among other things, the decontamination and disposal of radioactive waste water resulting from the accident. "Statement

of Policy and Notice of Intent to Prepare a Programmatic Environmental Impact Statement" (44 F.R. 67738). The Commission observed that as the decontamination of TMI-2 progresses the Commission will make available any new information to the public and to the extent necessary will also prepare separate environmental statements or assessments for individual portions of the overall cleanup effort. The Commission also indicated that in the event it should decide before completion of its programmatic statement that it is in the best interest of the public health and safety to decontaminate the high-level waste water now in the containment building or to purge the building of its radioactive gases, such action would not be taken until it had undergone an environmental review consistent with its May 25, 1979 Statement. The Commission has further recognized, however, the possibility that an emergency situation, now unforeseen, may arise which could require rapid action.

Accordingly, Technical Specifications 3.9.13 and 3.9.14 have been added to implement these requirements.

9. Review and Audit Functions

The accident of March 28, 1979 has resulted in the generation of large quantities of radioactive wastes. Therefore, the licensee has augmented the membership of his Plant Operations Review Committee and Generation Review Committee to provide additional expertise in the area of radioactive waste management. We have added requirements to sections 6.5.1 and 6.5.2 in the Technical Specifications to implement these additional functions. We consider the addition of this expertise in radioactive waste management to these committees to be appropriate since the licensee will be handling and processing significant quantities of

radioactive wastes. These committees will assure that such activities are properly reviewed and controlled by licensee personnel with appropriate and adequate expertise.

In addition, Appendix B Technical Specifications 5.1, 5.2 and 5.3, which identify the licensee's pre-accident management organization for activities addressed by the Appendix B Technical Specifications (which were imposed for the protection of the environment) are deleted since those requirements will now be performed in accordance with proposed Technical Specifications 6.1, 6.2 and 6.5 which will set forth the current requirements for the licensee's management organization for all licensed activities. The deletion of these Appendix B Technical Specifications does not affect any existing limits on effluent releases and discharges and does not authorize a change in effluent types or amounts nor does it affect the power level of the facility. Furthermore, their deletion would not result in any increase in the probability or consequences of an accident nor will it result in a decrease in a margin of safety since the requirements will in any event be continued in an updated requirement of proposed Technical Specifications 6.1, 6.2 and 6.5 which reflects the current, post-accident requirements for the facility's maintenance. Thus, deletion of Appendix B Technical Specifications 5.1, 5.2 and 5.3 will have no environmental impact or effect on plant safety, and is purely administrative in nature.

10. Summary

The technical specification changes associated with this amendment reflect the changes that are necessary to account for the present condition of the facility and to assure the continued maintenance of the safe, stable condition of the facility in the "Recovery Mode". Certain additional controls and equipment requirements, not required in the pre-accident technical specifications, have been added to provide additional assurance that the facility will be maintained in a safe and stable cold shutdown condition during the present and planned activities for facility recovery from the accident. The technical specifications associated with this amendment include these added controls and equipment requirements.

Except as necessitated by the physical realities that exist due to damage caused by or as a result of the accident, no safety limit, limiting condition for operation or surveillance requirement in the pre-accident technical specifications that is pertinent to the present cold shutdown condition of the facility has been modified, relaxed, or deleted by this amendment.

Although the facility is presently being maintained in accordance with NRC approved procedures, the present plant conditions were not expressly contemplated nor provided for in the facility operating

license; consequently, the current facility operating license does not include any provisions or technical specifications for assuring the continued maintenance of the plant in a safe, stable condition or for providing for foreseeable off-normal conditions. These revised technical specifications explicitly impose such license requirements and thereby provide an increased assurance of plant safety. In addition, by deletion of operating modes other than the Recovery Mode and by the changes to existing Technical Specifications discussed herein, planned operation of the facility in other than the stable shutdown condition of the Recovery Mode is precluded. Based on the above, the public health, safety and interest required that the requirements imposed by the proposed Technical Specifications set forth in Attachment 1 to the Director's Order of this date become effective immediately.

ENVIRONMENTAL ASSESSMENT

The environmental impacts resulting from normal operation of the facility were evaluated by the Staff as set forth in the Final Environmental Statement issued in December 1972 and in the Final Supplement to the Final Environmental Statement issued in December 1976. Although the licensee's authority to operate the facility was suspended by Order for Modification of License dated July 20, 1979, and is now limited to maintenance of the reactor in its current mode, the limits on effluent releases and discharges previously established are not changed by virtue of revised and/or new Technical Specifications being imposed, nor do they authorize a change in effluent types or total amounts nor an increase in power level. Thus, any environmental impacts which are attributable to maintenance of the facility

in accordance with the revised and/or new Technical Specifications will be within, indeed likely substantially less than, the impacts previously evaluated and found acceptable. Furthermore, those license conditions and Technical Specifications (Appendix B) imposed for the protection of the environment upon issuance of the TMI-2 operating license are not being relaxed in any way by these Technical Specifications.

The eight areas affected by the revised and/or new Technical Specifications: Nuclear Safety; Core Cooling, Water Inventory and Reactor Coolant System Pressure Control; Instrumentation; Containment Systems; Fire Detection and Fire Suppression; Electrical Power; Control of Radioactive Materials in Liquid and Gaseous Effluents; and Review and Audit Functions have been revised from the standpoint of safety considerations, as discussed above.

From the environmental standpoint, no reasonable or meaningful alternatives to the provisions of the Technical Specifications have been identified. However, the staff is including Technical Specifications which specifically prohibit certain activities which would otherwise be authorized at a normally operating facility. In particular, the Technical Specifications include prohibitions against the purging or other treatment of the reactor building atmosphere, the discharge or other disposal of water decontaminated by the EPICOR-II system and the treatment and discharge or other disposal of the high-level radioactively contaminated water now in the reactor building, even though such activities might be conducted in full compliance with effluent limitations or Commission regulations currently in effect and applicable to TMI-2. It is possible, as an alternative, that these activities could have been allowed under the same effluent limitations as would apply

in the case of a normally operating facility. However, the Commission has determined that the public interest warrants prohibiting these undertakings pending completion of an environmental review. See Commission's Statement of May 25, 1979 respecting decontamination of radioactively contaminated water, and Commission's Statement of Policy and Notice of Intent to Prepare a Programmatic Environmental Impact Statement, dated November 21, 1979 (44 F.R. 67738). A variety of longer range alternatives associated with the overall decontamination and cleanup of the facility will be addressed in the programmatic environmental impact statement.

The Technical Specifications do not authorize any new releases external to the facility. Consequently, no off-site environmental impacts are anticipated. Onsite maintenance of the facility pursuant to these Technical Specifications similarly does not entail any new releases of effluents nor the exposure of any workers to a radiological environment except as previously evaluated and found acceptable, and, as a result, no change in on-site impacts will result.

For the foregoing reasons, it has been determined that this action is insignificant from the standpoint of environmental impact and that an environmental statement need not be prepared. Accordingly, pursuant to 10 CFR §51.5(c)(1), a negative declaration will be issued.

CONCLUSION

The changes in technical specifications authorized in connection with this evaluation result in enhancement of safety under present conditions, as

discussed above. Based on these considerations, we have concluded that:

(1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

References:

1. NUREG-0557, "Evaluation of Long-Term Post-Accident Core Cooling of Three Mile Island Unit 2," NRC Staff Report, May 1979.
2. Memorandum for R. Vollmer from A. Ignatonis, "TMI-2 Plant Modifications for Cold Shutdown, Revision 2," June 8, 1979.
3. Letter to R. Vollmer, NRC, from R. C. Arnold, Metropolitan Edison Company, "Reactor Containment Building Atmosphere Cleanup", November 13, 1979.