

CONTAINS PROPRIETARY INFORMATION

TECHNICAL EVALUATION REPORT

REVIEW OF LICENSEES' RESOLUTION OF OUTSTANDING ISSUES FROM NRC EQUIPMENT ENVIRONMENTAL QUALIFICATION SAFETY EVALUATION REPORTS (F-11 and B-60)

METROPOLITAN EDISON COMPANY

THREE MILE ISLAND NUCLEAR STATION UNIT 1

VOL. 1 OF 2

NRC DOCKET NO. 50-289

FRC PROJECT C5257

NRC TAC NO. 42513

FRC ASSIGNMENT 13

NRC CONTRACT NO. NRC-03-79-118

FRC TASK 492

Prepared by

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Prepared for

Nuclear Regulatory Commission
Washington, D.C. 20555

Lead NRC Engineer: P. Shemanski

November 5, 1982

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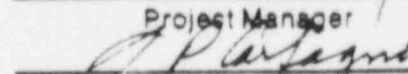
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Department Director



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FOREWORD

This Technical Evaluation Report was prepared by Franklin Research Center under a contract with the U.S. Nuclear Regulatory Commission (Office of Nuclear Reactor Regulation, Division of Operating Reactors) for technical assistance in support of NRC operating reactor licensing actions. The technical evaluation was conducted in accordance with criteria established by the NRC.

IDENTIFICATION OF PROPRIETARY INFORMATION

Some of the information in this technical evaluation report was obtained from manufacturers' proprietary test reports. All proprietary test reports are identified as such in Section 6, References, of this report. Checksheets in Section 4 containing proprietary information are stamped PROPRIETARY.

1. INTRODUCTION

1.1 PURPOSE OF THE EVALUATION

The purpose of this report is to:

- o evaluate licensees' resolutions of outstanding issues related to safety-related electrical equipment environmental qualification (EEQ) discussed in the Nuclear Regulatory Commission (NRC) Safety Evaluation Reports (SERs) in accordance with NRC criteria. The objective is to identify all cases where a licensee's response has not resolved the significant qualification issues.
- o evaluate licensees' qualification documentation of safety-related electrical equipment located in harsh environments in accordance with criteria established by the NRC and to identify (1) equipment for which qualification documentation is adequate, i.e., substantiates that the equipment is capable of performing its specified design basis safety function when it is exposed to a harsh environment and (2) equipment for which qualification documentation is deficient, i.e., does not give reasonable assurance that the equipment is capable of performing its specified safety function.
- o evaluate licensees' qualification documentation of safety-related electrical equipment located in harsh environments required for TMI Lessons Learned Implementation. The objective is to evaluate qualification documentation of equipment within the scope of IE Bulletin 79-01B, Supplement 3 (item 2) [61],* in accordance with criteria established by the NRC in a manner identical to the evaluation of all other safety-related electrical equipment.

1.2 SCOPE OF THE EVALUATION

The scope of this report is limited to the evaluation of environmental qualification of electrical equipment that must function to mitigate the consequences of a loss-of-coolant accident (LOCA) or high energy line break (HELB) and whose environment is adversely affected by that event.

*For References, see Section 6. Note that reference numbers are not presented in sequential order.

With respect to TMI Action Plan Implementation, the scope of this report is limited to those sections of NUREG-0737 [2] applicable to equipment having an installation implementation date of January 1, 1981. Where applicable, a review is to be performed on installed equipment with implementation dates after January 1, 1981 if adequately identified by the Licensee.

The NRC has determined that the evaluation of environmental qualification of equipment items (1) located in plant areas whose environment is not adversely affected by the design basis event (DBE) (e.g., equipment located in "mild" environments) or (2) required to achieve and maintain cold shutdown, is not to be included within the scope of this report. However, where the Licensee has identified these equipment items in the EEQ submittals to the NRC, these items have been listed in NRC evaluation Category III.b in this report (see Section 3 of this report for definition of NRC evaluation categories).

Qualification aspects not included within the scope of this evaluation are:

- o seismic and dynamic qualification
- o equipment protection against natural phenomena
- o equipment operational service conditions (e.g., vibration, voltage, and frequency deviations)
- o equipment located where it is subjected to the outdoor environment
- o equipment protection against fire hazards
- o equipment protection against missiles
- o equipment located in plant areas whose environment is not adversely affected by the design basis event
- o equipment required to achieve and maintain cold shutdown.

1.3 GENERIC ISSUE BACKGROUND

Safety-related electrical equipment must be capable of performing design safety functions under all normal, abnormal, and accident conditions. The purpose of equipment qualification is to provide tangible evidence that equipment will operate on demand and to verify design performance, thereby establishing assurance that the potential for common-mode failure is minimized.

Of particular concern is the assurance that equipment will remain operable during and following exposure to the harsh environmental conditions (i.e., temperature, pressure, humidity [steam], chemical sprays, radiation, and submergence) imposed as a result of a design basis accident. These harsh environments are generally defined by the limiting conditions resulting from the complete spectrum of postulated break sizes, break locations, and single failures consequent to a LOCA, main steam line break (MSLB) inside the reactor containment, or a HELB outside the reactor containment (such as a main steam or feedwater line break). In addition, depending on specific plant design features, other postulated HELB locations may be associated with:

- o the chemical and volume control system (CVCS) letdown line
- o the steam supply piping to
 - the auxiliary feedwater (AFW) pump turbine
 - the reactor core isolation cooling (RCIC) pump turbine
 - the high pressure core injection (HPCI) pump turbine
 - the isolation condenser
- o steam generator blowdown.

The NRC criteria for reviewing the safety of nuclear power generating stations include the requirement that the qualification of safety-related electrical equipment be substantiated by auditable documentation of the program that establishes the ability of the equipment to function as specified in the station design. This report is restricted to a technical evaluation of the equipment's ability to function in harsh environments resulting from DBEs.

Qualification criteria applied during the licensing of the older nuclear power plants have been modified over the years, and specific industry standards concerning qualification have been revised as the design of reactor systems has changed and as regulatory and operating experience has accumulated. Examples of such standards are IEEE Standards 279-71, 323-74, 383-74, 317-76, 334-80, 381-77, 382-80, 535-79, 627-80, 549-80, and 650-79. NRC NUREG documents 0413 and 0588 have been developed to address this topic. In particular, NUREG-0588 (published for comment in December 1979 and reissued as Revision 1 in July 1981) formally presented the NRC staff positions regarding selected areas of environmental qualification of safety-related electrical equipment in the resolution of General Technical Activity A-24,

"Qualification of Class IE Safety Related Equipment." The positions documented therein are applicable to plants that are or will be in the construction permit or operating license review process.

Although qualification standards and regulatory requirements have undergone considerable development, all of the currently operating nuclear power plants are required to comply with 10CFR50, Appendix A, General Design Criteria for Nuclear Power Plants, Section I, Criterion 4. This criterion states in part that "structures, systems and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing and postulated accidents, including loss-of-coolant accidents."

Qualification requirements are also embodied in (1) 10CFR50 Appendix A, General Design Criteria 1, 2, and 23 and (2) 10CFR50 Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants, Criteria III, "Design Control," and XI, "Test Control." These requirements are applicable to safety-related equipment located outside as well as inside containment.

The NRC staff has evaluated the licensees' equipment qualification programs by reviewing the qualification documentation of selected safety-related equipment as part of the operating license review for each plant. The NRC staff has also used a variety of methods to assure that these general requirements are met for electrical safety-related equipment. In the oldest plants, qualification was based on the fact that electrical components were of high industrial quality. After 1971, qualification was judged on the basis of IEEE Std 323-71; however, no regulatory guide was issued adopting this standard. For plants whose SERs were issued after July 1, 1974, the Commission issued Regulatory Guide 1.89, which in most respects adopted the most recent standard, IEEE Std 323-74.

In November 1977, the Union of Concerned Scientists petitioned the NRC Commissioners to upgrade current standards for the environmental qualification of safety-related electrical equipment in operating plants. Subsequently, the NRC staff instituted the Systematic Evaluation Program (SEP) to determine the degree to which the older operating nuclear power plants deviated from current

licensing criteria. The subject of electrical equipment environmental qualification (SEP Topic III-12) was selected for accelerated evaluation as part of this program. Seismic qualification of equipment was to be addressed as a separate SEP topic. In December 1977, the NRC issued a generic letter to all SEP plant licensees requesting that they initiate reviews to determine the adequacy of existing equipment qualification documentation.

Preliminary NRC review of licensee responses led to the preparation of NUREG-0458, an interim NRC assessment of the environmental qualification of electrical equipment. This document concluded that "no significant safety deficiencies requiring immediate remedial actions were identified." However, it was recommended that additional effort should be devoted to examining the installation and environmental qualification documentation of specific electrical equipment in all operating reactors.

On May 31, 1978, the NRC Office of Inspection and Enforcement issued IE Circular 78-08, "Environmental Qualification of Safety-Related Electrical Equipment at Nuclear Power Plants," which required all licensees of operating plants (except those included in the SEP) to examine their installed safety-related electrical equipment and ensure appropriate qualification documentation for equipment function under postulated accident conditions. Subsequently, on February 8, 1979, the NRC Office of Inspection and Enforcement issued IE Bulletin 79-01, which was intended to raise the threshold of IE Circular 78-08 to the level of Bulletin, i.e., action requiring a licensee response. This Bulletin required a complete re-review of the environmental qualification of safety-related electrical equipment as described in IE Circular 78-08.

The review of the licensees' responses indicated certain deficiencies within the scope of equipment addressed, definition of harsh environments, and adequacy of support documentation. It became apparent that generic criteria were needed for evaluating the electrical equipment environmental qualification for both SEP and non-SEP operating plants. Therefore, during the second half of 1979, the Division of Operating Reactors (DOR) of the NRC issued internally a document entitled "Guidelines for Evaluating Environmental Qualification of Class IE Electrical Equipment in Operating Reactors" [57]. (The document is hereafter

referred to as the "DOR Guidelines.") The document was prepared as a screening standard for reviewing all operating plants, including SEP plants. It was originally intended that the licensees evaluate their qualification documentation in accordance with the DOR Guidelines. However, initial NRC review of this documentation, which was compiled to support licensee submittals, revealed the need for obtaining independent evaluations and for accelerating the qualification review program.

In October 1979, the NRC awarded Franklin Research Center a contract to provide assistance in the "Review and Evaluation of Licensing Actions for Operating Reactors," which included an assignment for review of equipment environmental qualification documentation under SEP Topic III-12. The assignment was to review equipment environmental qualification documentation and to present the results in the form of a Technical Evaluation Report for the 11 oldest plants (included in the SEP review). The plants included within the assignment were the Palisades, Oyster Creek, Ginna, Haddam Neck, Yankee Rowe, LaCrosse, and Big Rock Point plants and Zion Station Units 1 and 2, Indian Point Units 2 and 3, Millstone Unit 1, Dresden Unit 2, and San Onofre Unit 1. (This assignment was completed in April 1981.)

On January 14, 1980, the NRC Office of Inspection and Enforcement issued the DOR Guidelines and IE Bulletin 79-01B, which expanded the scope of IE Bulletin 79-01 and requested additional information on environmental qualification of safety-related electrical equipment at operating facilities, excluding the 11 facilities undergoing the SEP review. This Bulletin cited the DOR Guidelines as the criteria to be used in evaluating the adequacy of the safety-related electrical equipment qualification. The scope of the review was expanded to include HELBs (inside and outside containment) in addition to equipment aging and submergence. The NRC advised the licensees that the criteria contained in the DOR Guidelines would be used in its review of licensee submittals; NUREG-0588 would be used as a guide in cases where the DOR Guidelines do not provide sufficient detail.

In early February 1980, the NRC decided that Indian Point Units 2 and 3 and Zion Station Units 1 and 2 should be included within SEP Topic III-12 for the purpose of equipment environmental qualification review.

On February 21, 1980, the NRC and representatives of the SEP Plant Owners Group held an open meeting at NRC headquarters to discuss an accelerated review program in accordance with the DOR Guidelines. Representatives of the Indian Point Units and Zion Station also attended this meeting. The NRC formally issued to all licensees represented at the meeting the DOR Guidelines document which included a second document, "Guidelines for Identification of That Safety Equipment of SEP Operating Reactors for Which Environmental Qualification Is To Be Addressed" [57], together with the request that the licensees review their plant systems and provide additional equipment environmental qualification information to the NRC on an accelerated schedule.

For non-SEP plants, the NRC Office of Inspection and Enforcement formed a task force including a principal reviewer in each region and a task leader from headquarters. The regional members were assigned responsibility for the technical review of the licensees' responses to IE Bulletin 79-01B, and the task leader was assigned responsibility for the overall coordination of the review effort with NRC staff to assure overall consistency. The regional reviewers held meetings with the licensees in their respective regions, which resulted in staff positions being issued in a supplement to IE Bulletin 79-01B dated February 29, 1980.

In April 1980, the NRC organizational structure was modified and the Equipment Qualification Branch was formed within the new Division of Engineering. Responsibility for reviewing the status of equipment qualification for all plants was assigned to this branch.

On May 23, 1980, the NRC issued Memorandum and Order CLI-80-21 [62], specifying that licensees and applicants must meet the requirements set forth in the DOR Guidelines and NUREG-0588 regarding environmental qualification of safety-related electrical equipment in order to satisfy 10CFR50, Appendix A, General Design Criteria, Section I, Criterion 4. This Order also established that the SERs on this subject, to be prepared by the NRC staff, must be issued on February 1, 1981 and that all subsequent actions to be taken by licensees to achieve full compliance with the DOR Guidelines or NUREG-0588 must be completed no later than June 30, 1982. The Memorandum and Order established the DOR Guidelines and NUREG-0588 as acceptable interpretations of the General

Design Criteria for an interim period. Rulemaking was proposed for the purpose of establishing a permanent interpretation of the General Design Criteria.

The staff held regional meetings with the licensees and interested parties during the week of July 13, 1980. The staff issued a second supplement to IE Bulletin 79-01B, a response to significant questions raised during the public meetings, and two Orders. The Order dated May 30, 1980 required the licensees to comply with the previously issued Commission Memorandum and Order of May 27, 1980 (CLI-80-21). The above orders required the licensees to complete the tasks identified in IE Bulletin 79-01B no later than November 1, 1980 to allow the staff to comply with the February 1, 1981 date imposed by the Commission Order. The responses to the questions were issued on February 29, 1980; and the second and third supplements to IE Bulletin 79-01B, highlighting the staff positions affecting the licensees' responses, were issued on September 29 and October 24, 1980, respectively.

In October 1980, EG&G Idaho, Inc., awarded Franklin Research Center a contract to provide assistance in the equipment environmental qualification review for 13 of the plants whose licensees responded to IE Bulletin 79-01B. The assignment was to evaluate the licensees' equipment environmental qualification submittals and to present the results in the form of a Technical Evaluation Report for each plant. The objective of this Technical Evaluation Report was to review the licensees' submittals to determine if safety-related electrical equipment was reviewed for environmental qualification in accordance with the DOR Guidelines and NUREG-0588 as required by IE Bulletin 79-01B. The NRC was to perform an audit of the qualification documentation references as part of its Safety Evaluation Program. If discrepancies were found, the audit was to be extended. The plants included within this assignment were Nine Mile Point Unit 1, Millstone Unit 2, Salem Unit 1, Browns Ferry Units 1, 2, and 3, Brunswick Units 1 and 2, Hatch Units 1 and 2, Dresden Unit 3, and Quad Cities Units 1 and 2. (This assignment was completed in June 1981.)

In mid-1981, the NRC issued SERs on environmental qualification of safety-related electrical equipment to licensees of all operating plants.

Where additional qualification information was required, the licensees were directed to respond to the NRC within 90 days of receipt of the SER.

In May 1981, under the licensing action assistance contract, NRC authorized Franklin Research Center to proceed with the review and evaluation of the environmental qualification of safety-related electrical equipment located in harsh environments, required for TMI Lessons Learned Implementation on 71 operating plants.

In July 1981, the NRC conducted extensive meetings with the nuclear industry to address concerns and questions regarding qualification of safety-related equipment. In addition, the NRC provided licensees with detailed information with respect to the format and expected content of the licensees' 90-day responses to the NRC SERs. Draft outlines of the following proposed programs were also presented to the industry: environmental qualification of equipment located in "mild" environments, seismic and dynamic qualification, and environmental qualification of mechanical equipment.

On September 23, 1981, the NRC Commissioners considered a petition (SECY-81-486) to extend the deadline for actions to be taken by licensees to achieve environmental qualification of all safety-related equipment. On September 30, 1981, the NRC Commissioners extended this deadline to the second refueling outage after March 31, 1982.

In October 1981, the NRC authorized Franklin Research Center to include within the scope of the existing EEQ assignment (TMI Lessons Learned Implementation Equipment) the evaluation of licensees' resolutions of outstanding issues related to equipment environmental qualification discussed in the NRC SERs in accordance with NRC criteria. The assignment was to review the qualification documentation and to present the results in the form of a Technical Evaluation Report for 71 operating plants. (This report was developed within the scope of this assignment.)

On January 7, 1982, the NRC Commissioners approved the issuance of the proposed rule, "Environmental Qualification of Electric Equipment for Nuclear Power Plants," for public comment. The proposed rule was published in the Federal Register (Volume 47, No. 13) dated January 20, 1982.

In February 1982, Proposed Revision 1 to Regulatory Guide 1.89, "Environmental Qualification of Electric Equipment for Nuclear Power Plants," was issued for public comment. This regulatory guide was issued to (1) reflect current NRC positions on equipment qualification and (2) provide guidelines for meeting the NRC Commissioners proposed rule on equipment qualification.

The final rule, "Environmental Qualification of Electric Equipment for Nuclear Power Plants," was subsequently issued on April 16, 1982 by the NRC (to be published in the Federal Register) to clarify and strengthen the criteria for environmental qualification of electrical equipment. The final rule is to be incorporated into 10CFR50 as Section 50.49, "Environmental Qualification of Electric Equipment for Nuclear Power Plants." The significant features of the rule are:

- o Requalification of electrical equipment in accordance with the rule will not be required for equipment qualified or being qualified in accordance with the DOR Guidelines and IE Bulletin 79-01B or NUREG-0588, provided the qualification program commenced within 90 days after the effective date of the rule.
- o The requirement to qualify equipment needed to complete one path of achieving and maintaining a cold shutdown condition has been deleted.
- o A new section has been added, covering the qualification of equipment located in mild environments.
- o The Commission deadline for actions to be taken by licensees to achieve environmental qualification of all safety-related equipment is extended to the second refueling outage after March 31, 1982.

On April 20, 1982, the NRC staff issued Generic Letter No. 82-09 [63] to all licensees, presenting the NRC's position and clarification of certain aspects of the environmental qualification requirements.

1.4 SPECIFIC ISSUE BACKGROUND

On May 31, 1978, the NRC Office of Inspection and Enforcement issued IE Circular 78-08, "Environmental Qualification of Safety-Related Electrical Equipment at Nuclear Power Plants," which required all licensees of operating plants to examine their installed safety-related electrical equipment and

ensure appropriate qualification documentation for equipment function under postulated accident conditions. Subsequently, on February 8, 1979, the NRC Office of Inspection and Enforcement issued IE Bulletin 79-01, which was intended to raise the threshold of IE Circular 78-08 to the level of Bulletin, i.e., action requiring a licensee response. This Bulletin required a complete re-review of the environmental qualification of safety-related electrical equipment as described in IE Circular 78-08.

On January 14, 1980, the NRC Office of Inspection and Enforcement issued the DOR Guidelines and IE Bulletin 79-01B, which expanded the scope of IE Bulletin 79-01 and requested additional information on environmental qualification of safety-related electrical equipment at operating facilities. This Bulletin cited the DOR Guidelines as the criteria to be used in evaluating the adequacy of the safety-related electrical equipment qualification.

The NRC staff held regional meetings with the licensees and interested parties during the week of July 13, 1980. The staff issued a second supplement to IE Bulletin 79-01B, a response to significant questions raised during the public meetings, and two Orders. The Order dated May 30, 1980 required the licensees to comply with the previously issued Commission Memorandum and Order of May 27, 1980 (CLI-80-21). The above orders required the licensees to complete the tasks identified in IE Bulletin 79-01B no later than November 1, 1980 to allow the staff to comply with the February 1, 1981 date imposed by the Commission Order. The responses to the questions were issued on February 29, 1980; and the second and third supplements to IE Bulletin 79-01B, highlighting the staff positions affecting the licensees' responses, were issued on September 29 and October 24, 1980, respectively.

The NRC Office of Inspection and Enforcement performed (1) a preliminary evaluation of the Licensee's response, documented in a technical evaluation report (TER), and (2) an onsite verification inspection (July 28-August 1, 1980) of selected safety-related electrical equipment. Components of the reactor protection and make-up and purification systems were inspected. The inspection verified proper installation of equipment, overall interface integrity, location with respect to flood level for equipment inside the containment, and manufacturers' nameplate data. The manufacturer's name and

model number from the nameplate data were compared to information given in the Component Evaluation Work Sheets of the Licensee's report. The site inspection is documented in report IE 50-289/80-20. The deficiencies noted are discussed in the NRC SER.

On October 31, 1980 [1], Metropolitan Edison Company provided the NRC with an equipment environmental qualification submittal in response to IE Bulletin 79-01B for the Three Mile Island Nuclear Station Unit 1.

On January 30, 1981 [3], Metropolitan Edison submitted to the NRC further equipment environmental qualification information in response to Supplement 3 to IE Bulletin 79-01B.

The NRC issued a Safety Evaluation Report (SER) to Metropolitan Edison Company on March 24, 1981 [5].

Requests for information [67, 68, 69, 70, 71, 72] were transmitted to the NRC by FRC to obtain qualification documentation referenced by the Licensee in its submittals, TMI Action Plan information, and correlations to NUREG-0737 [2].

By letter dated July 2, 1981 [6], Metropolitan Edison Company transmitted to the NRC a response to the SER.

In References 17 and 65, Metropolitan Edison Company responded to the FRC requests for additional information.

The Licensee provided additional qualification information in References 10, 11, 12, 13, 14, 15, 16, 55, 56, and 64.

2. NRC CRITERIA FOR ENVIRONMENTAL QUALIFICATION

2.1 CRITERIA PROVIDED BY THE NRC

The screening guidelines used to evaluate the electrical equipment environmental qualification program were:

- o DOR Guidelines, "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors," November 1979 [57]
- o NUREG-0588, Revision 1, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," July 1981 [66].

Other appropriate references used in the review of the licensees' electrical equipment environmental qualification submittals are:

- o IE Bulletin 79-01B, "Environmental Qualification of Class 1E Equipment," January 14, 1980; Supplement No. 1, February 29, 1980; Supplement No. 2, September 29, 1980; and Supplement No. 3, October 24, 1980 [58, 59, 60, 61]
- o NUREG-0737, "Clarification of TMI Action Plan Requirements," November 1980 [2]. This document is applicable for the selection of equipment for the evaluation of the environmental qualification of safety-related electrical equipment located in harsh environments required for TMI Lessons Learned Implementation. The scope of the review is limited to equipment associated with specific sections of NUREG-0737 which have an installation implementation date of January 1, 1981. Where applicable, a review is to be performed on installed equipment with implementation dates after January 1, 1981 if adequately identified by the licensee.

2.2 STAFF POSITIONS AND SUPPLEMENTAL CRITERIA

The NRC identified the following staff positions and supplemental criteria to be used in conjunction with the referenced screening guidelines.

2.2.1 Requirements and Applicable Criteria

Items 3 and 17 of Supplement 2 to IE Bulletin 79-01B [60] describe the application of the DOR Guidelines and NUREG-0588 to operating reactors (ORs),

near term operating license applicants (NTOLs), and construction permit applicants (CPs). The qualification requirements and applicable criteria are stated as follows:

[Question 3]

"Define the requirements and applicable criteria for ORs, NTOLs, and OLs. Specifically address the NTOLs whose CP SER is prior to July 1974 and after July 1974. Can a CP whose SER is prior to 1974 use the DOR guidelines?"

[NRC Answer to Question 3]

"Table 1 describes the application of each document. All operating reactors as of May 23, 1980, will be evaluated against the DOR guidelines. In cases where the DOR guidelines do not provide sufficient detail, but NUREG-0588 Category II does, NUREG-0588 will be used.

TABLE 1

REQUIREMENTS

ORs	OLs		CPs
	CP SER Before 7/1/74	CP SER After 7/1/74	
DOR GUIDELINES			
USE NUREG-0588 AS NECESSARY	NUREG-0588 (CAT. II)	NUREG-0588 (CAT. I)	NUREG-0588 (CAT. I) or NEW RULE WHEN IN EFFECT

REPLACEMENT COMPONENTS

USE NUREG-0588 (CAT. I)

All plants licensed after May 23, 1980, shall conform to NUREG-0588. In accordance with Regulatory Guide 1.89, all such operating licenses for facilities whose construction permit SER is dated July 1, 1974 or later, are to be reviewed against IEEE Std. 323-1974. Thus, for these licensees, the operating license applicant is to qualify equipment to the Category I column in NUREG-0588. For operating licenses issued after May 23, 1980, whose construction permit SER is dated before July 1, 1974, the operating license applicant is to qualify equipment to at least Category II column of NUREG-0588; unless the licensee made commitment in the construction permit record to use the 1974 standard, or unless the operating licensee application record indicates that the 1974 standard is to be used, in such cases Column I of NUREG-0588 is to be used.

While there are differences between the Category II column of NUREG-0588 and the DOR guidelines, the differences are in details and in the

optional part of the documents. The minimum requirements set forth by these documents are general and compatible. Thus, the minimum standards set by either of the two documents are equally applicable to ORs and NTOLs."

[Question 17]

"Define the requirements for 'replacement parts.' Are they the same for 'spare' parts? Clearly discuss the alternatives for existing inventories of parts/components. If equipment is ordered to meet IEEE Std. 323-1974 standard but lead time exceeds June 1982, can we use IEEE Std. 323-1971 qualified components in the interim?"

[NRC Answer to Question 17]

"The requirements for 'replacement' and 'spare' parts are the same for the purposes of complying with the Commission order and memorandum. After May 1980, all parts used to replace presently installed parts shall be qualified to Category I of NUREG-0588 'unless there are sound reasons to the contrary.' Nonavailability and/or the fact that the part to be used as a replacement is a spare part purchased prior to May 23, 1980, and is in stock are among the factors to be considered in weighing whether there are 'sound reasons to the contrary.' All replacement parts shall as a minimum conform to the requirements described in the answer to question 3. Justification for deviation from Category I of NUREG-0588 shall be documented by the licensee and records shall be available for audit, upon request by the NRC."

2.2.2 Application of Requirements and Criteria to TMI Lessons Learned Implementation Equipment

The NRC requested an evaluation of the environmental qualification of safety-related electrical equipment located in harsh environments required for TMI Lessons Learned Implementation in accordance with criteria established by the NRC in a manner identical to the evaluation of all other safety-related electrical equipment. Additionally, Item 21 of Supplement 2 to IE Bulletin 79-01B [60] states:

"TMI Lessons Learned instrumentation will be considered in the February 1, 1981 SER. This equipment is subject to the same requirements as other safety-related electrical equipment. The guidance and requirements of NUREG-0588 referenced daughter standards, and Reg Guides will be used by the staff in assessing the adequacy of the qualification information."

Item 2 of Supplement 3 to IE Bulletin 79-01B [61] states:

"IEB 79-01B required a 90 day response which was due in mid-April 1980. Supplement 1 (Feb. 1980) informed licensees that equipment which was

'planned' to be installed as a result of lessons learned need not be addressed in that response. Some of this equipment has since been installed. Supplement #2 (Q.5, Q.21) identified that the staff position was that equipment which is installed should be treated in a manner similar to all other safety-related electrical equipment and be addressed in the November 1, 1980 submittal. This position represents no change in staff position regarding the scope of the review. However, since the staff position on this issue was unclear the following will apply:

- a. Qualification information for installed TMI Action Plan equipment must be submitted by February 1, 1981.
- b. Qualification information for future TMI Action Plan equipment (ref. NUREG-0737, when issued), which requires NRC pre-implementation review, must be submitted with the pre-implementation review data.
- c. Qualification information for TMI Action Plan equipment currently under NRC review should be submitted as soon as possible.
- d. Qualification information for TMI Action Plan equipment not yet installed which does not require pre-implementation review should be submitted to NRC for review by the implementation date."

2.2.3 Equipment Not in the Scope of the Qualification Review

Supplement 2 of IE Bulletin 79-01B [60] permits deferment of the review of environmental qualification for all safety-related equipment items located in plant areas where the equipment is not exposed to the direct effects of a high energy line break (HELB) or to nuclear radiation emanating from circulation of fluids containing radioactive substances. Supplement 3 of IE Bulletin 79-01B [61] permits deferment of the review of environmental qualification for all equipment required to achieve and maintain the plant in a cold shutdown condition. Supplements 2 and 3 of 79-01B originally permitted deferment until after February 1, 1981 of the qualification review of equipment located in a mild environment or required to achieve and maintain the plant in a cold shutdown condition. Since the issuance of Supplements 2 and 3, the NRC has determined that the review of environmental qualification for this equipment is not within the scope of the present review program.

2.2.4 Clarification of Qualification Requirements

2.2.4.1 Service Conditions Inside Containment for a Loss-of-Coolant Accident (DOR Guidelines Section 4.1)

For pressurized water reactors (PWRs), the DOR Guidelines state that the containment temperature and pressure conditions as a function of time should be based on the most recent NRC-approved service conditions specified in the Final Safety Analysis Report (FSAR) or other licensee documentation. In the specific case of pressure-suppression type containments, the following minimum high temperature conditions may be used: (1) boiling water reactor (BWR) drywells -- 340°F for 6 hours and (2) PWR ice condenser lower compartments -- 340°F for 3 hours. As stated in Supplement 2 to IE Bulletin 79-01B [60], "these values are a screening device, per the Guidelines, and can be used in lieu of a plant-specific profile, provided that expected pressure and humidity conditions as a function of time are accounted for."

Service conditions should bound those expected for coolant and steam line breaks inside containment with due consideration given to analytical uncertainties. The steam line break condition should include superheated conditions, the peak temperature, and subsequent temperature/pressure profiles as functions of time. If containment spray is to be used, the impact of the spray on required equipment should be assessed.

The adequacy of a plant-specific profile depends on the assumptions and design considerations at the time the profiles were developed. The DOR Guidelines and NUREG-0588 provide guidance and considerations required to determine if the calculated plant-specific temperature/pressure profiles encompass the loss-of-coolant accident (LOCA) and HELB accidents inside containment.

2.2.4.2 Submergence

(DOR Guidelines Section 4.1, Subitem 3; and Section 4.3.2, Subitem 3)

Equipment submergence (inside or outside containment) should be addressed where the possibility exists that submergence of equipment may result from HELBs or other postulated occurrences. Supplement 2 to IE Bulletin 79-01B [60] provides the following additional criterion: If the equipment satisfies the

guidance and other requirements of the DOR Guidelines or NUREG-0588 for the LOCA and HELB accidents, and the licensee demonstrates that its failure will not adversely affect any safety-related function or mislead the operator after submergence, the equipment can be considered exempt from the submergence portion of the qualification requirements.

2.2.4.3 Simulated Service Conditions and Test Duration (DOR Guidelines Section 5.2.1)

The Guidelines require that the test chamber environment envelop the required service conditions for a time equal to the period from the initiation of the accident until the service conditions return to normal. Supplement 2 to IE Bulletin 79-01B [60] provides the following additional criterion:

"Equipment designed to perform its safety-related function within a short time into an event must be qualified for a period of at least 1 hour in excess of the time assumed in the accident analysis. The staff has indicated that time is the most significant factor in terms of the margins required to provide an acceptable confidence level that a safety-related function will be completed. The 1-hour qualification requirement is based on the acceptance of a type test for a single unit and the spectrum of accidents (small and large breaks) bounded by the single test."

2.2.4.4 Test Sequence (DOR Guidelines Section 5.2.3)

Supplement 2 to IE Bulletin 79-01B [60] provides the following additional criteria:

"Sequential testing requirements are specified in NUREG-0588 and the DOR Guidelines. Licensees must follow the test requirements of the applicable document.

1. If the test has been completed without aging in sequence, justification for such a deviation must be submitted.
2. If testing of a given component has been scheduled but not initiated, the test sequence/program should be modified to include aging.
3. Test programs in progress should be evaluated regarding the ability to comply by incorporating aging in the proper sequence. These programs would then fall in the first or second category."

2.2.4.5 Radiation

(DOR Guidelines Sections 4.1.2, 4.2.2, and 4.3.2, Subitem 2)

Supplement 2 to IE Bulletin 79-01B [60] provides the following additional criteria:

"Both the DOR Guidelines and NUREG-0588 are similar in that they provide the methods for determining the radiation source term when considering LOCA events inside containment (100% noble gases/50% iodine/1% particulates). These methods consider the radiation source term resulting from an event which completely depressurizes the primary system and releases the source term inventory to the containment.

NUREG-0578 provides the radiation source term to be used for determining the qualification doses for equipment in close proximity to recirculating fluid systems inside and outside of containment as a result of LOCA. This method considers a LOCA event in which the primary system may not depressurize and the source term inventory remains in the coolant.

NUREG-0588 also provides the radiation source term to be used for qualifying equipment following non-LOCA events both inside and outside containment (10% noble gases/10% iodine/0% particulates).

When developing radiation source terms for equipment qualification, the licensee must ensure consideration is given to those events which provide the most bounding conditions. The following table summarizes these considerations:

	<u>LOCA</u>	<u>Non-LOCA HELB</u>
Outside Containment	NUREG-0578 (100/50/1 in RCS) [*]	NUREG-0588 (10/10/0 in RCS)
Inside Containment	<u>Larger of</u> NUREG-0588 (100/50/1 in containment)	NUREG-0588 (10/10/0 in RCS)
	or NUREG-0578 (100/50/1 in RCS)	

*The numbers in parentheses represent % noble gases/% iodine/% particulates. RCS means reactor coolant system.

Gamma equivalents may be used when consideration of the contributions of beta exposure has been included in accordance with the guidance given in the DOR Guidelines and NUREG-0588. Cobalt 60 is one acceptable gamma radiation source for environmental qualification of safety-related equipment. Cesium 137 may also be used."

2.2.5 Additional Clarification of Qualification Requirements

The NRC has worked with a number of licensees, at their requests, to provide further clarification on environmental qualification requirements. On January 20, 1982, the NRC issued Generic Letter No. 82-09 [63] presenting staff positions on certain aspects of the qualification requirements. Generic Letter No. 82-09 states:

"1. Operator Display Instrumentation

- Q. Given the interrelated activities associated with display instrumentation (e.g., NUREG-0700, NUREG-0799, proposed Regulatory Guide 1.97 and Equipment Qualification efforts), what display instrumentation referenced in emergency operating procedures must be identified in licensee submittal to the NRC?
- A. All display instrumentation referenced in the emergency procedures need not be identified. The NRC requires that licensees need only identify and have available qualification documentation on those operator display instruments which are safety-related (see Question 2). If licensees have previously supplied a listing of all display instrumentation referenced in emergency procedures, licensees may identify (such as by the use of an *) which of those instruments are safety-related. The staff will defer review of the basis for this safety-related classification until other NRC activities¹ have been implemented. When these other activities are implemented, additional instruments presently not requiring qualification may require upgrading to a safety-related status and/or may require qualification. Licensees will be required at that time to qualify this instrumentation in accordance with the following criteria:
 - o For new or upgraded instrumentation with a required operation date prior to the equipment qualification deadline, qualification must be accomplished by the equipment qualification deadline.

¹ Such activities include preparation of new emergency procedures (NUREG-0799), control room design reviews (NUREG-0700), and upgrading of accident monitoring instrumentation (Reg. Guide 1.97 and NUREG-0737).

- o For new or upgraded instrumentation with a required operation date after the equipment qualification deadline, qualification must be accomplished prior to equipment operation and plant acceptance.

2. Safety-Related Equipment

- Q. For Equipment Qualification purposes, what constitutes all safety-related electrical equipment?
- A. The Commission, in CLI-80-21, required the environmental qualification of only safety-related electrical equipment. Identification of the safety-related equipment installed at specific plants can be obtained from PSARs, Technical Specifications and other docketed correspondence setting forth NRC requirements or licensee commitments. Identification of safety-related equipment installed in harsh environments at specific plants must be supplied by the licensee. The necessity for upgrading nonsafety-related system to safety-related status will be the subject of other NRC reviews.

3. Replacement Parts

- Q. Please clarify the NRC requirements on replacement parts.
- A. In CLI-80-21, the Commission stated that unless there were sound reasons to the contrary, replacement equipment should be qualified to the standards set forth in Category I of NUREG-0588. The Commission's position was designed to promote the policy of upgrading the environmental qualification and reliability of installed safety-related electrical equipment. To meet this overall goal, licensees must institute internal policy practices consistent with the Commission's statement.

Situations may arise in which upgrading to NUREG-0588, Category I of replacement equipment qualified to NUREG-0588, Category II or the DOR Guidelines will not be compatible with overall station safety and performance goals. Licensees must review such situations on a case-by-case basis and determine that 'sound reasons to the contrary' do, in fact, exist which warrant the use of replacement equipment (not necessarily in-kind) qualified to the DOR Guidelines or NUREG-0588, Category II. For equipment located in a harsh environment, licensees' procedures must provide for documentation and substantiation of such determinations.

Conditions which reflect sound reasons why qualification standards for replacement of equipment in a harsh environment need not be upgraded to NUREG-0588, Category I include the following:

1. The licensee has replacement equipment in stock that meets the DOR Guidelines or NUREG-0588, Category II, and procurement actions regarding such replacement equipment had commenced prior to May 23, 1980.
2. Replacement equipment qualified to the NUREG-0588, Category I standards does not exist.
3. Replacement equipment qualified to the NUREG-0588, Category I standards is not available to meet installation and operation schedules. Equipment qualified to the DOR Guidelines or NUREG-0588, Category II may be used for an interim period until Category I equipment is obtained and an outage of sufficient duration is available for replacement. Justification for use of the non-Category I qualified replacement equipment beyond this interim period must be submitted to the NRC for approval prior to the end of the interim period and in sufficient time for reasonable NRC review.
4. Replacement equipment qualified to NUREG-0588, Category I standards would require significant plant modifications to accommodate its use.
5. Operating performance and reliability data for the Category I equipment indicates poor overall equipment performance. For example, mean time to failure is significantly shorter for the Category I replacement equipment.
6. The use of replacement equipment qualified to NUREG-0588, Category I standards has a significant probability of creating human factor problems that will negatively affect plant safety and performance, e.g., (1) knowledge, skills and ability of existing plant staff require significant upgrading to operate or maintain the specific Category I replacement equipment; (2) the use of equipment qualified to Category I standards creates a one-of-a-kind application; or (3) maintenance, surveillance or calibration activities are unnecessarily complex.

5. Submergence Outside Containment

- Q. For equipment qualification purposes, what are the staff requirements concerning submergence of equipment outside containment?

- A. The Staff requires that the licensee submit documentation on the qualification of safety-related equipment that could be submerged due to a high energy line break outside containment.

6. Radiation

- Q. Is the staff screening value of 4×10^7 rads applicable to all operating reactors?

- A. No. This screening value is applicable only to PWRs with dry type containments. However, for PWRs with dry type containments, the licensee may choose to use plant specific analysis instead of the screening value. For plants with other containment types, the licensee must use plant specific analysis.

Acceptable to the Staff for equipment qualification purposes are radiation values developed as part of the plant licensing process provided that they are based on the TID14844 source terms and are conservatively performed. In order to assure that the methodologies are appropriate, the Staff requests two component specific sample calculations (one for inside and one for outside containment), and a brief written description of each of the methodologies used, their application and associated conservatism. Such sample calculations and a statement by the licensee that the values of radiation exposure of components so derived are appropriate for environmental qualification of equipment will satisfy the Staff's concern on the 'Radiation Specification Value' used during the qualification reviews.

7. Containment Service Conditions

- Q. Must the Staff value (identified in the SERs) of T_{SAT} for PWRs and $T_{SAT} + 20^\circ F$ for BWRs be used as the maximum in-containment temperature for the purpose of equipment qualification?

- A. No. The Staff will accept the use of these values. However, an acceptable alternative to the NRC staff's temperature criterion used for the service conditions must base that service condition on the PSAR analysis or other NRC approved analysis, provided that the specific analysis, or a summary of that analysis, together with reference to the previous NRC acceptance of the analysis is submitted by the licensee. In addition, some of the information in the associated safety evaluation may require clarification.

8. One Hour Minimum Operating Time

- Q. The Staff has previously indicated that certain exceptions to the one hour minimum operating time rule are permitted. Can further clarification be provided?

- A. With regard to plants subject to the qualification requirements of the DOR Guidelines or Category II of NUREG-0588, for those pieces of equipment tested prior to May 23, 1980, the test data and analysis may be used to qualify the equipment to the required operating time plus an appropriate margin. The one hour margin requirement need not be applied. However, subsequent failures should be shown not to be detrimental to plant safety.

The one hour time margin rule is not applicable to equipment whose safety function is performed prior to significant changes in the environment at the equipment location.

9. Aging

- Q. Must a qualified life be developed for all safety-related electrical equipment located in harsh environments?
- A. Section 7 of the DOR Guidelines and Section 4.2, Category II of NUREG-0588, do not require a qualified life to be established for all safety-related electrical equipment located in harsh environments. A qualified life, in accordance with the provisions in IEEE 323-1974, is required for equipment, including replacement parts, qualified to Category I of NUREG-0588 that is located in a harsh environment.

An acceptable method for addressing in-service degradation is through a preventive maintenance/surveillance program with equipment and component refurbishment and/or replacement based on known susceptibility to aging degradation, the results of inspections, or manufacturers recommendations. These elements of the program lead to an understanding on a device specific basis of the nature and extent of the increased stress levels encountered during Design Basis Accidents and resultant degradation (if any) which may occur. Arrhenius or other appropriate accelerated aging methodologies may be used to establish replacement and refurbishment schedules if the component's design and materials application are sufficiently simple and the necessary data are available to allow a meaningful application.

In plants subject to the qualification requirements of either the DOR Guidelines or NUREG-0588 Category II, for equipment that has been identified as being susceptible to significant degradation due to thermal and radiation aging, the schedule for inspection of and/or replacement of the susceptible components in that equipment must be incorporated into the preventive maintenance and surveillance programs, and that information should be incorporated into the system component evaluation worksheets (SCEWS). For other equipment, the aging column in the SCEWS should be marked 'No Known Susceptibility'."

3. METHODOLOGY USED FOR THE EVALUATION

3.1 INTRODUCTION

As discussed in Section 1.3 of this report, the NRC issued Safety Evaluation Reports (SERs) on environmental qualification of safety-related equipment to licensees of all operating plants in mid-1981.

The SERs identified various equipment qualification deficiencies as indicated below:

LEGEND: DESIGNATION FOR DEFICIENCY

R - Radiation	M - Margin
T - Temperature	I - HELB Evaluation Outside Containment Not Completed
QT - Qualification Time	QM - Qualification Method
RT - Required Time	RPN - Equipment Relocation or Replacement, Adequate Schedule Not Provided
P - Pressure	EXN - Exempted Equipment Justification Inadequate
H - Humidity	SEN - Separate Effects Qualification Justification Inadequate
CS - Chemical Spray	QI - Qualification Information Being Developed
A - Material Aging Evaluation, Replacement Schedule, Ongoing Equipment Surveillance	RPS - Equipment Relocation or Replacement Schedule Provided
S - Submergence	
(R) - Licensee has committed to replace equipment	

The SERs directed licensees to "either provide documentation of the missing qualification information which demonstrates that safety-related equipment meets the DOR Guidelines or NUREG-0588 requirements or commit to a corrective action (re-qualification, replacement [etc.]) to establish qualification by June 30, 1982." Licensees were required to respond to the NRC within 90 days of receipt of the SER.

As stated in Section 1.1, the purpose of this report is (1) to evaluate licensees' resolutions of outstanding issues related to safety-related electrical equipment environmental qualification (EEQ) discussed in the NRC's SERs in accordance with NRC criteria, and (2) to evaluate licensees' qualification documentation of safety-related electrical equipment, including

TMI Lessons Learned Implementation equipment, located in harsh environments in accordance with criteria established by the NRC (see Section 2 of this report). The methodology used to evaluate (1) the Licensee's response to the NRC SER and (2) the equipment environmental qualification is presented herein.

3.2 METHODOLOGY

The Licensee, Metropolitan Edison Company, provided a response to the SER and additional qualification information in its submittals [6, 10, 11, 12, 13, 14, 15, 16, 17, 55, 56, 64, 65] to the NRC for the Three Mile Island Unit 1 Nuclear Power Plant.

The following bases provided by the NRC were used to determine the relative completeness of the Licensee's submittals:

- o Determine whether the Licensee provided specific responses to the SER concerns.
- o Determine whether the Licensee proposed corrective actions and a schedule for completion of the actions.
- o Determine whether the Licensee addressed the NRC's concern for margin with respect to the containment environmental conditions.
- o Determine whether the Licensee revised the environmental parameters.
- o Determine whether the Licensee's System Component Evaluation Work Sheets (SCEWS) were updated to correct deficiencies and add supplemental information.
- o Determine whether the Licensee provided justifications for interim operation for all unqualified equipment.
- o Determine whether the Licensee addressed aging and incorporated the results into the equipment maintenance program.

The extensive list of safety-related electrical equipment* in various locations of the plant identified by the Licensee was analyzed, and all identical equipment located within plant areas that are exposed to the same environmental service conditions was grouped together and designated an

*In this report, the term "safety-related electrical equipment" refers to the equipment defined by the two NRC Guidelines referenced in Section 2.1.

"equipment item." In this report, the term "equipment item" refers to a specific type of electrical equipment, designated by manufacturer and model, which is representative of all identical equipment in a plant area exposed to the same environmental service conditions (e.g., Flow Transmitter, Fischer & Porter, Model 10B2496, located within containment). This analysis resulted in a reduced listing of equipment (equipment items) that formed the basis for the review.

Appendix A contains the environmental service conditions for each location. Appendix B contains the tabulation of the equipment items, locations, function, plant identification numbers, required operating time, and applicable qualification documentation references. Appendix C lists the plant systems identified by the Licensee and the NRC as being essential to safety.

Each item in the list of safety-related electrical equipment items was reviewed in relation to:

- o the Licensee's response to the SER concerns
- o technical information received from the Licensee as a result of requests for additional information (Appendix E)
- o technical data derived from the Licensee's submittal
- o NRC DOR Guidelines or NUREG-0588 Revision 1 criteria
- o the Licensee's definition of harsh service environments (Appendix A)
- o documentation cited by the Licensee as evidence of qualification
- o applicable and available qualification documentation associated with the overall equipment environmental qualification program
- o the Licensee's analysis and/or justification of qualification
- o Licensee-proposed corrective action for qualification deficiencies
- o the Licensee's equipment/part replacement schedules
- o the Licensee's technical arguments concerning the adequacy of equipment, based on system operational considerations
- o the Licensee's rationale concerning exemption of equipment from qualification.

Topics not within the scope of the evaluation are:

- o completeness of the Licensee's listing of safety-related equipment
- o acceptability of Licensee-provided environmental service conditions.

The NRC requested an evaluation of the environmental qualification of safety-related electrical equipment located in harsh environments required for TMI Lessons Learned Implementation. The objective is to evaluate qualification documentation of equipment within the scope of IE Bulletin 79-01B, Supplement 3 (item 2), in accordance with criteria established by the NRC (see Section 2 of this report) in a manner identical to the evaluation of all other safety-related electrical equipment. The scope of this review is limited to TMI Action Plan equipment associated with those sections of NUREG-0737 which have an equipment installation implementation date of January 1, 1982 (sections are identified below). Where applicable, a review was to be performed on installed equipment with implementation dates after January 1, 1981 if adequately identified by the licensee.

II.B.3 (ALL/1-1-81) Post-Accident Sampling Capability of Reactor Coolant and Containment

II.D.3 (ALL/1-1-81) Direct Indication of Relief and Safety Valve Position

II.E.1.2 (PWR/1-1-81) Auxiliary Feedwater System Automatic Initiation and Flow Indication

II.E.3.1 (PWR/1-1-81) Emergency Power Supply for Pressurizer Heaters (Safety-Grade Interfaces)

II.E.4.1 (ALL/7-1/81) Dedicated Hydrogen Penetrations

II.E.4.2 (ALL/1-1-81) Containment Isolation Dependability

II.F.2 (PWR/1-1-81) Instrumentation for Detection of Inadequate Core Cooling

II.G.1 (PWR/1-1-81) Emergency Power for Pressurizer Equipment (Safety-Grade Interfaces)

II.K.2.10 (PWR/B&W/7-1-81) Safety-Grade Anticipatory Reactor Trip

II.K.3.9 (PWR/W/1-1-81) PID Controller Modification (If Hardware Change Involved)

- II.K.3.12 (PWR/W/1-1-81) Anticipatory Reactor Trip upon Turbine Trip
- II.K.3.13 (PWR/GE/7-1-81) Separation of HPCI and RCIC Initiation Signals
- II.K.3.15 (BWR/GE/7-1-81) Prevention of Spurious Isolation of HPCI and RCIC Systems
- II.K.3.19 (BWR/GE/7-1-81) Interlock on Recirculation Pump Loop
- II.K.3.21 (BWR/GE/7-1-81) Restart of Core Spray and LPCI Systems (If Hardware Changed Out)
- II.K.3.27 (BWR/GE/7-1-81) Provide Common Reference Level for Vessel Level Instrumentation (If Hardware Changed Out)

Licensees whose plants were included within the NRC Systematic Evaluation Program received a Technical Evaluation Report (TER) in addition to the SER. The TER was based on a review of equipment environmental qualification documentation associated with the Licensee's EEQ submittals. The qualification deficiencies identified in the SER were derived from the TER. Plants included within this program were the Palisades, Oyster Creek, Ginna, Haddam Neck, Yankee Rowe, LaCrosse, and Big Rock Point plants and Zion Station Units 1 and 2, Indian Point Units 2 and 3, Millstone Unit 1, Dresden Unit 2, and San Onofre Unit 1. For these plants, the evaluation presented herein is based on (1) the result of the initial TER, (2) the Licensee's response to the NRC SER and the TER, and (3) the Licensee's updated EEQ submittal(s).

TERs were also developed for the following plants: Nine Mile Point Unit 1, Millstone Unit 2, Salem Unit 1, Browns Ferry Units 1, 2, and 3, Brunswick Units 1 and 2, Hatch Units 1 and 2, Dresden Unit 3, and Quad Cities Units 1 and 2. The objective of those TERs was to review the Licensee's submittals to determine if safety-related electrical equipment was reviewed for environmental qualification by the Licensee in accordance with the DOR Guidelines and NUREG-0588 as required by IE Bulletin 79-01B. For these 13 plants and all other plants, excluding the 14 plants associated with the Systematic Evaluation Program, the evaluation presented herein is based solely on (1) the Licensee's response to the NRC SER and (2) the Licensee's revised EEQ submittal(s).

This technical evaluation was conducted to identify (1) whether the Licensee provided an adequate response to the SER concerns (and TER concerns,

where applicable), (2) major deficiencies within the equipment qualification program, and (3) whether the Licensee proposed adequate corrective actions to resolve qualification deficiencies and provided a schedule for completion of the corrective actions. The TER was written primarily to address deviations from the NRC criteria and requirements. Technical data or test results that satisfy the qualification criteria are not discussed herein.


The evaluation presented in Section 4 of this report includes completed equipment environmental qualification review checksheets (partially handwritten) which compile both the technical information necessary to conduct the review and the results of the evaluation. Parameters listed on these checksheets were derived from the appropriate NRC screening criteria. The evaluation of each equipment item includes several checksheet pages. Only those checksheet pages necessary to complete the evaluation for each equipment item are included in this report. A complete listing of the checksheet pages is shown on the bottom of Checksheet 1a, reproduced here as Figure 3-1.

The checksheets contain the following information:

- o Equipment item information (see Figure 3-1), for example:
 Solenoid Valve Located in Turbine Building (Area #7)
 Automatic Switch Co. (ASCO) Model LB8300B61U
 Actuates Feedwater Control Valves (V-4269, V-4270)
 Licensee Reference 839
 Required Operating Time: Short term (SI signal)
 TER Checksheet No. 1
 Reference 59, Section 4.5.2.6
 Licensee Submittal: Page 9 [62]; Table 3, Page 1 [1]; SCEW 1
- o Qualification deficiencies identified in the SER (see Figure 3-1)
- o Licensee's response to the SER
- o Licensee's statements and rationale for qualification
- o Licensee's corrective action and replacement schedule
- o Evaluation of qualification including identification of all deficiencies
- o Evaluation of system considerations presented by the Licensee as a rationale for excluding equipment from qualification.

The results of the evaluation are summarized on Checksheet 2 (Equipment Environmental Qualification Summary Form) for each equipment item. Checksheet



 Franklin Research Center A Division of The Franklin Institute 2201 and Race Streets, Philadelphia, PA 19103 (215) 446-1000	NRC Contract No. NRC-03-79-118 FRC Project No. C5257 FRC Assignment No. 13 FRC Task No. _____	Page 1a
EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. ____		

Equipment Item No. 1
 Solenoid Valves Located in Turbine Building (Area #7)
 Automatic Switch Co. (ASCO) Model LB8300B61U
 Actuates Feedwater Control Valves (V-4269, V-4270)
 Licensee Reference 1617
 Required Operating Time: Short term (SI signal)
 TER Checksheet No. 1
 Reference 59, Section 4.5.2.6
 Licensee Submittal: Page 9 [62]; Table 3, Page 1 [1]; FRC SCEW 1

DESIGNATION FOR DEFICIENCY IDENTIFIED BY TER NRC SIZE - CIRCLED ITEM(S) ONLY:
 (See Section 3 of this TER for Legend)

R, T, QT, RT, P, E, CS, A, S, (R), M, I, JM, EFW, EKH, EES, QI, EPS, Hoss,

Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

<u>Content</u>	<u>Cheksheet Page No.</u>
Equipment Item	1a
Summary of Licensee Responses to the NRC EER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC EER	3a, 3b, 3c, 3d
System Consideration Review	4a, 4b, 4c, 4d, 4e, 4f
Equipment Environmental Qualification Review	5a, 5b, 5c, 5d, 5e, 5f, 5g, 5h, 5i, 5j
Installed TMI Lessons Learned Implementation Equipment Summary	6a, 6b
Maintenance and Replacement Schedule Summary	7a, 7b, 7c

Figure 3-1. Sample Checksheet Page 1a
 "Equipment Item"

2 specifically identifies any qualification deficiencies determined by the evaluation and identifies the NRC qualification category to which the equipment item was assigned. A sample Checksheet 2 is presented in Figure 3-2.

All information was reviewed for conformance to the NRC criteria referenced in Section 2 of this report. As requested by the NRC, all applicable and available qualification documentation associated with the overall Equipment Environmental Qualification (EEQ) program was used by the reviewers, whether referenced by the Licensee or not.

Upon completion of the review for each equipment item, an overall evaluation of the component and a specific conclusion with respect to its qualification was developed. Based on the evaluation, each equipment item was assigned to one of the generic qualification categories provided by the NRC. The NRC category descriptions are presented in Section 3.3 of this report.


3.3 NRC QUALIFICATION CATEGORIES AND DEFINITIONS

- o NRC Category 1.a
EQUIPMENT THAT SATISFIES ALL APPLICABLE REQUIREMENTS OF THE DOR GUIDELINES OR NUREG-0588, OR HAS ACCEPTABLE DEVIATIONS FROM THE DOR/NUREG CRITERIA

This category includes equipment items which are fully acceptable on the basis that all applicable criteria defined in the DOR Guidelines or NUREG-0588 are (1) satisfied and the equipment has been found to be qualified or (2) sufficient information has been presented to determine that deviations from the criteria are acceptable or insignificant.

- o NRC Category 1.b
EQUIPMENT FOR WHICH DEVIATIONS FROM THE DOR GUIDELINES OR NUREG-0588 ARE JUDGED CONDITIONALLY ACCEPTABLE PROVIDED THAT SPECIFIC MODIFICATIONS ARE MADE

This category includes equipment items that do not satisfy one or more of the applicable criteria defined in the DOR Guidelines or NUREG-0588; however, the Licensee has stated that specific modifications will be made on or before a designated date. This equipment is considered by NRC to be conditionally acceptable provided that the specific modifications are made by the Licensee. When the modifications are completed as proposed, the Licensee states that the equipment will satisfy all applicable NRC requirements. Examples of specific modifications are (1) replacement of unqualified equipment with qualified equipment, (2) equipment hardware

 Franklin Research Center A Division of The Franklin Institute 30th and Race Streets, Phila. Pa. 19103 (215) 448-1000	NRC Contract No. NRC-03-79-118 FRC Project No. C5257 FRC Assignment No. 13 FRC Test No. _____	Page 2
EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. _____		

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS

DESIGNATION:

X = DEFICIENCY

Documented Evidence of Qualification Adequate	_____
Adequate Similarity Between Equipment and Test Specimen Established	_____
Aging Degradation Evaluated Adequately	_____
Qualified Life or Replacement Schedule Established (If Required)	_____
Program Established to Identify Aging Degradation	_____
Criteria Regarding Aging Simulation Satisfied (If Required)	_____
Criteria Regarding Temperature/Pressure Exposure:	_____
o Peak Temperature Adequate	_____
o Peak Pressure Adequate	_____
o Duration Adequate	_____
o Required Profile Enveloped Adequately	_____
o Steam Exposure (If Required) Adequate	_____
Criteria Regarding Spray Satisfied	_____
Criteria Regarding Submergence Satisfied	_____
Criteria Regarding Radiation Satisfied	_____
Criteria Regarding Test Sequence Satisfied	_____
Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied	_____
Criteria Regarding Functional Testing Satisfied	_____
Criteria Regarding Instrument Accuracy Satisfied	_____
Test Duration Margin (1 hour + Function Time) Satisfied	_____
Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I)	_____

NRC QUALIFICATION CATEGORY

DESIGNATION:

X = CATEGORY

I.a	Equipment Qualified	_____
I.b	Equipment Qualification Pending Modification	_____
II.a	Equipment Qualification Not Established	_____
II.b	Equipment Not Qualified	_____
II.c	Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified	_____
III.a	Equipment Exempt From Qualification	_____
III.b	Equipment Not in the Scope of the Qualification Review	_____
IV	Documentation Not Made Available	_____

Figure 3-2. Sample Checklist Page 2

Equipment Environmental Qualification Summary Form

modification, (3) equipment relocation above submergence level, (4) relocation or shielding of equipment from radiation source, (5) verification of qualification by additional testing, (6) equipment relocation to a mild environment, and (7) qualification testing of equipment in progress.

o NRC Category II.a

EQUIPMENT FOR WHICH QUALIFICATION DOCUMENTATION IS INSUFFICIENT TO ESTABLISH THAT THE EQUIPMENT IS OR IS NOT QUALIFIED IN ACCORDANCE WITH THE DOR GUIDELINES OR NUREG-0588

The qualification of equipment items in this category, in accordance with the requirements of the DOR Guidelines or NUREG-0588, is significantly deficient or inconclusive based upon review of (1) the documentation provided by the Licensee or (2) applicable and available qualification documentation associated with the overall equipment environmental qualification program. The qualification documentation indicates significant deficiencies, which can be categorized as follows: (1) appropriate documentation reflecting qualification has not been cited and made available for review by the Licensee and there is no knowledge of applicable documentation; (2) the Licensee is awaiting qualification from the equipment vendor; or (3) the qualification documentation indicates significant deficiencies; however, where testing was conducted, no reported failures or severe anomalies were observed which would unquestionably affect the ability of the equipment to perform its design basis safety function(s).

o NRC Category II.b

EQUIPMENT THAT IS UNQUALIFIED

This category includes equipment items whose qualification documentation has been judged to be seriously deficient based upon review of (1) the documentation provided by the Licensee, or (2) applicable and available qualification documentation associated with the overall equipment environmental qualification program. The qualification documentation indicates serious deficiencies reported during testing; for example, severe anomalies or failure of the test specimen, which could affect the ability of the equipment to perform its safety function. NRC has requested immediate written notification when an equipment item is placed in this category during the course of the review.

o NRC Category II.c

EQUIPMENT THAT SATISFIES ALL APPLICABLE REQUIREMENTS OF THE DOR GUIDELINES OR NUREG-0588 WITH THE EXCEPTION OF QUALIFIED LIFE

This category includes equipment items that are acceptable on the basis that all applicable criteria defined in the DOR Guidelines or NUREG-0588 are satisfied with the exception of the qualified life criterion. The Licensee (1) has not evaluated qualified life or replacement schedule, (2) has not adequately evaluated qualified life or replacement schedule, or (3) has not adequately interpreted qualified life in terms of calendar time. [Note: The component replacement schedule discussed in Section 7.0 of the

DOR Guidelines is, in effect, a qualified life. It is not essential to use the term "qualified life," but the replacement schedule must be justified.)

- o NRC Category III.a
EQUIPMENT THAT IS EXEMPT FROM QUALIFICATION

This category includes equipment items that are exempt from qualification on the basis that (1) the equipment does not provide a safety function (i.e., should not have been included in the equipment list submitted by the Licensee), or (2) the specific safety-related function of the equipment can be accomplished by some other designated equipment that is fully qualified and satisfies the single failure criterion. In addition, any failure of the exempt equipment must not mislead the operator or degrade the ability of qualified equipment to perform its required safety-related function.

- o NRC Category III.b
EQUIPMENT NOT IN THE SCOPE OF THE QUALIFICATION REVIEW

This category includes equipment items addressed by the Licensor in the equipment environmental qualification submittals which are (1) required to achieve and maintain the plant in a cold shutdown condition or (2) located in a mild environment. Supplement 2 of IE Bulletin 79-01B permits deferment of the review of environmental qualification for all safety-related equipment items located in plant areas where the equipment is not exposed to the direct effects of a high energy line break (HELB) or to nuclear radiation emanating from circulation of fluids containing radioactive substances. Supplement 3 of IE Bulletin 79-01B permits deferment of the review of environmental qualification for all equipment required to achieve and maintain the plant in a cold shutdown condition. Supplements 2 and 3 of IE Bulletin 79-01B originally permitted deferment until after February 1, 1981 of the qualification review of equipment located in a mild environment or required to achieve and maintain the plant in a cold shutdown condition. Since the issuance of Supplements 2 and 3, the NRC has determined that the review of environmental qualification for this equipment is not within the scope of this report.

- o NRC Category IV
EQUIPMENT FOR WHICH QUALIFICATION DOCUMENTATION HAS NOT BEEN MADE AVAILABLE FOR REVIEW

This category includes equipment items for which qualification documentation in accordance with the requirements of the DOR Guidelines or NUREG-0588 has been cited by the Licensee as evidence of qualification; however, this documentation has not been made available for review. Therefore, a conclusion cannot be reached with respect to qualification of this equipment.

3.4 IMPLEMENTATION GUIDE FOR FULFILLING NRC CRITERIA

The NRC has requested that a detailed implementation guide for fulfilling NRC criteria be prepared as part of this assignment. The implementation guide will present a fully detailed discussion of the principal qualification criteria presented in the DOR Guidelines and NUREG-0588. The primary emphasis will be to clarify technical points, eliminate possible misconceptions, and clearly provide definitive guidance to enable licensees to understand and resolve, in an expeditious manner, qualification deficiencies identified as a result of this TER. The implementation guide (TER-C5257-532) has been prepared and issued to the NRC. The implementation guide is either appended to this TER or will be forwarded to the Licensee by the NRC under a separate letter. The Licensee is encouraged to review that document.



4. TECHNICAL EVALUATION

4.1 INTRODUCTION

The technical evaluation presented in this section represents the equipment environmental qualification (EEQ) assessment for each equipment item listed in Appendix B in accordance with the methodology presented in Section 3 of this report. The evaluations were conducted to identify any major deficiencies within the Licensee's equipment qualification program and to determine whether the Licensee (1) provided an adequate response to the SER concerns, (2) proposed adequate corrective actions to resolve qualification deficiencies, and (3) provided a schedule for completion of the corrective actions.

The evaluations are based on the available qualification documentation provided by the Licensee, complemented in several cases by other relevant technical information. The major qualification deficiencies that have been identified and the results of the evaluation are shown in the Equipment Environmental Qualification Summary Forms (Tables 4-1, 4-2, 4-3, and 4-4) presented in Section 4.2.

Observations concerning the Licensee's qualification methodology presented in response to the NRC SER are presented in Section 4.3.

Technical evaluations of the environmental qualification of the equipment items are presented in Section 4.4.

4.2 SUMMARY OF THE EVALUATION

The following tabulations represent a summary of the results of the equipment environmental qualification evaluation conducted in accordance with the methodology presented in Section 3.

Table 4-1 summarizes the number of equipment items assigned to each NRC qualification category as a result of the evaluation.

Table 4-2 summarizes the number of equipment items found to have a specific qualification deficiency.

Table 4-3 summarizes the number of equipment items for which the Licensee has proposed a specific corrective action to resolve a qualification deficiency.

Table 4-4 consists of Equipment Environmental Qualification Summary Forms for the equipment items, identifying (1) compliance with the qualification requirements defined in Section 2, (2) the resultant NRC qualification category, and (3) the Licensee-proposed corrective action.

TABLE 4-1
NUMBER OF EQUIPMENT ITEMS IN EACH QUALIFICATION CATEGORY

NRC CATEGORY	CATEGORY / DESCRIPTION	NUMBER OF EQUIPMENT ITEMS
I.A	EQUIPMENT QUALIFIED----- [EQUIPMENT ITEM NO(S).: 110,112]	2
I.B	EQUIPMENT QUALIFICATION PENDING MODIFICATION----- [EQUIPMENT ITEM NO(S).: 116]	1
II.A	EQUIPMENT QUALIFICATION NOT ESTABLISHED----- [EQUIPMENT ITEM NO(S).: 1, 2, 3, 6, 7, 10, 11, 14, 15, 26, 27, 28, 29, 32, 45, 46, 49, 50, 51, 53, 57, 60, 66, 67, 71, 78, 79, 81, 93, 98, 106,107,108,109,111,114,115,118,119,120]	40
II.B	EQUIPMENT NOT QUALIFIED-----	0
II.C	EQUIPMENT SATISFIES ALL REQUIREMENTS EXCEPT QUALIFIED LIFE OR REPLACEMENT SCHEDULE JUSTIFIED----- [EQUIPMENT ITEM NO(S).: 5, 17, 18, 19, 20, 21, 22, 24, 33, 36, 39, 40, 56, 58, 59, 63, 64, 69, 72]	19
III.A	EQUIPMENT EXEMPT FROM QUALIFICATION----- [EQUIPMENT ITEM NO(S).: 4, 31, 52, 54, 55, 74, 75, 80, 82, 83, 84, 86, 89, 92, 94, 95, 96, 97, 99,100,101,102,103,104,105]	25
III.B	EQUIPMENT NOT IN THE SCOPE OF THE REVIEW----- [EQUIPMENT ITEM NO(S).: 8, 9, 12, 13, 16, 23, 25, 30, 34, 35, 37, 38, 41, 43, 48, 61, 62, 65, 68, 70, 73,117]	22
IV	DOCUMENTATION NOT MADE AVAILABLE----- [EQUIPMENT ITEM NO(S).: 42, 44, 47, 76, 77, 85, 87, 88, 90, 91,113]	11
TOTAL		120

TABLE 4-2
QUALIFICATION DEFICIENCY SUMMARY

MRC REQUIREMENT	NUMBER OF DEFICIENT EQUIPMENT ITEMS
1. DOCUMENTED EVIDENCE OF QUALIFICATION ADEQUATE----- [EQUIPMENT ITEM NO(S).: 2, 10, 11, 14, 15, 26, 32, 47, 53, 55, 57, 60, 66, 67, 71, 76, 77, 85, 88, 90, 91, 93, 98, 113, 114, 115, 116, 118, 120]	29
2. ADEQUATE SIMILARITY BETWEEN EQUIPMENT AND TEST SPECIMEN ESTABLISHED----- [EQUIPMENT ITEM NO(S).: 1, 2, 3, 6, 7, 10, 11, 14, 15, 27, 28, 29, 33, 36, 39, 40, 45, 46, 49, 50, 51, 57, 78, 79, 81, 106, 107, 108, 111, 114, 115, 118, 119, 120]	34
3. AGING DEGRADATION EVALUATED ADEQUATELY----- [EQUIPMENT ITEM NO(S).: 1, 2, 3, 5, 6, 7, 10, 11, 14, 15, 17, 18, 19, 20, 21, 22, 24, 27, 28, 29, 44, 45, 46, 49, 50, 51, 56, 63, 64, 66, 67, 68, 69, 70, 72, 77, 78, 81, 109, 118, 119, 120]	42
4. QUALIFIED LIFE OR REPLACEMENT SCHEDULE ESTABLISHED (IF REQUIRED)----- [EQUIPMENT ITEM NO(S).: 1, 2, 3, 5, 6, 7, 10, 11, 14, 15, 17, 18, 19, 20, 21, 22, 24, 33, 36, 39, 40, 44, 45, 46, 49, 50, 51, 56, 57, 58, 59, 63, 64, 66, 67, 68, 69, 70, 72, 77, 79, 90, 91, 109, 118, 119, 120]	47
5. PROGRAM ESTABLISHED TO IDENTIFY AGING DEGRADATION-----	0
6. CRITERIA REGARDING AGING SIMULATION (IF REQUIRED)----- [EQUIPMENT ITEM NO(S).: 44, 45, 46, 49, 50, 51]	6
7. CRITERIA REGARDING TEMPERATURE/PRESSURE EXPOSURE:	
A. - PEAK TEMPERATURE ADEQUATE----- [EQUIPMENT ITEM NO(S).: 10, 11, 14, 15, 51, 51]	5

Table 4-2 (Cont.)

QUALIFICATION DEFICIENCY SUMMARY

NRC REQUIREMENT	NUMBER OF DEFICIENT EQUIPMENT ITEMS

B. - PEAK PRESSURE ADEQUATE----- [EQUIPMENT ITEM NO(S): 51, 57]	2
C. - DURATION ADEQUATE----- [EQUIPMENT ITEM NO(S): 51, 57]	2
D. - REQUIRED PROFILE ENVELOPED ADEQUATELY----- [EQUIPMENT ITEM NO(S): 51, 57, 66, 67]	4
E. - STEAM EXPOSURE (IF REQUIRED) ADEQUATE----- [EQUIPMENT ITEM NO(S): 51, 57]	2
8. CRITERIA REGARDING SPRAY SATISFIED----- [EQUIPMENT ITEM NO(S): 2, 109]	2
9. CRITERIA REGARDING SUBMERGENCE SATISFIED-----	0
10. CRITERIA REGARDING RADIATION SATISFIED----- [EQUIPMENT ITEM NO(S): 2, 49, 50, 109]	4
11. CRITERIA REGARDING TEST SEQUENCE SATISFIED----- [EQUIPMENT ITEM NO(S): 78, 81]	2
12. CRITERIA REGARDING TEST FAILURES OR SEVERE ANOMALIES (IF ANY) SATISFIED-----	0
13. CRITERIA REGARDING FUNCTIONAL TESTING SATISFIED-----	0
14. CRITERIA REGARDING INSTRUMENT ACCURACY SATISFIED-----	0
15. TEST DURATION MARGIN (1 HOUR + FUNCTION TIME) SATISFIED--- [EQUIPMENT ITEM NO(S): 57, 78, 81]	3
16. CRITERIA REGARDING MARGINS SATISFIED (NUREG-0588, CAT. 1)-	0

TABLE 4-3,
LICENSEE CORRECTIVE ACTION SUMMARY

CORRECTIVE ACTION DESCRIPTION	NUMBER OF EQUIPMENT ITEMS
1. EQUIPMENT REPLACEMENT WITH QUALIFIED EQUIPMENT----- [EQUIPMENT ITEM NO(S): 116]	1
2. EQUIPMENT MODIFICATION-----	0
3. EQUIPMENT RELOCATION ABOVE SUBMERGENCE LEVEL-----	0
4. RELOCATE OR SHIELD EQUIPMENT FROM RADIATION SOURCE-----	0
5. VERIFY QUALIFICATION BY ADDITIONAL TESTING/ANALYSIS-----	0
6. EQUIPMENT RELOCATION TO A MILD ENVIRONMENT-----	0
7. QUALIFICATION TESTING OF EQUIPMENT IN PROGRESS-----	0
8. OTHER (FOR DETAILED DESCRIPTION SEE SPECIFIC EQUIPMENT ITEMS)--	0
SCHEDULE FOR COMPLETION OF CORRECTIVE ACTION(S) HAS BEEN PROVIDED (SEE SPECIFIC EQUIPMENT ITEM FOR COMPLETION DATE)-----	0

Table 4-4

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM		EQUIPMENT TYPE NUMBER	
1001021003100410051006100710081009101011012101310141015		1001021003100410051006100710081009101011012101310141015	
1. ADEQUATE EVIDENCE OF QUALIFICATION ADEQUATE			
2. TEST OFFICER ESTABLISHED			
3. AGING DEGRADATION EVALUATED ADEQUATE			
4. QUALIFIED LIFE OR REPLACEMENT SCHEDULE			
5. PROGRAM ESTABLISHED TO IDENTIFY AGING DEGRADATION			
6. CRITERIA REGARDING AGING SIMULATION SATISFIED (IF REQUIRED)			
7. CRITERIA REGARDING TEMPERATURE/PRESSURE EXPOSURE			
A. - PEAK TEMPERATURE ADEQUATE			
B. - PEAK PRESSURE ADEQUATE			
C. - DURATION ADEQUATE			
D. - REQUIRED PROFILE ENVELOPED ADEQUATE			
E. - RFEM EXPOSURE (IF REQUIRED) ADEQUATE			
8. CRITERIA REGARDING SPRAY SATISFIED			
9. CRITERIA REGARDING SUBMERGENCE SATISFIED			
10. CRITERIA REGARDING RADIATION SATISFIED			
11. CRITERIA REGARDING TEST SEQUENCE SATISFIED			
12. CRITERIA REGARDING TEST FAILURES OR SEVERE ANOMALIES			
(IF ANY) SATISFIED			
13. CRITERIA REGARDING FUNCTIONAL TESTING SATISFIED			
14. CRITERIA REGARDING INSTRUMENT ACCURACY SATISFIED			
15. TEST DURATION MARGIN (1 HOUR + FUNCTION TIME) SATISFIED			
16. CRITERIA REGARDING MARGINS SATISFIED (NUSC-0588, CAT. 1)			
EQUIPMENT CATEGORY (DESIGNATIONS X = CATEGORY)			
1. EQUIPMENT QUALIFIED			
1.1. EQUIPMENT QUALIFICATION PENDING MODIFICATION			
1.2. EQUIPMENT QUALIFICATION NOT ESTABLISHED			
1.3. EQUIPMENT NOT QUALIFIED			
1.4. EQUIPMENT SATISFIES ALL REQUIREMENTS EXCEPT			
QUALIFIED LIFE OR REPLACEMENT SCHEDULE JUSTIFIED			
1.5. EQUIPMENT EXEMPT FROM QUALIFICATION			
1.6. EQUIPMENT NOT IN THE SCOPE OF THE REVIEW			
1.7. DOCUMENTATION MAY BE AVAILABLE			
CORRECTIVE ACTION SPECIFIED (DESIGNATIONS X = ACTION SPECIFIED)			
1. EQUIPMENT REPLACEMENT WITH QUALIFIED EQUIPMENT			
2. EQUIPMENT MODIFICATION			
3. EQUIPMENT RELOCATION ABOVE THE SUBMERGENCE LEVEL			
4. REDUCTION OF SHIELD EQUIPMENT FROM RADIATION SOURCE			
5. VERIFY QUALIFICATION BY ADDITIONAL TESTING/ANALYSIS			
6. EQUIPMENT RELOCATION TO A MILD ENVIRONMENT			
7. QUALIFICATION TESTING OF EQUIPMENT IN PROGRESS			
8. OTHER SPECIFIC EQUIPMENT ITEM IS CHECKED			
SCHEDULE FOR COMPLETION OF CORRECTIVE ACTION(S) HAS BEEN PROVIDED			

EQUIPMENT ENVIRONMENTAL QUALIFICATION BINARY FORM[illegible]

Table 4-4 (Cont.)

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUPPORT FORM

REQ REQUIREMENTS		DESIGNATIONS & DEFICIENCIES		FMC EQUIPMENT ITEM NUMBER	
				1-381032101310341035103610371038103910401041042104310441045	
1. DOCUMENTED EVIDENCE OF QUALIFICATION ADEQUATE					
2. ADEQUATE SIMILARITY BETWEEN EQUIPMENT AND TEST SPECIMEN ESTABLISHED					
3. AGING DEGRADATION EVALUATED ADEQUATELY					
4. QUALIFIED LIFE OR REPLACEMENT SCHEDULE ESTABLISHED (IF REQUIRED)					
5. PROGRAM ESTABLISHED TO MONITOR AGING DEGRADATION					
6. CRITERIA REGARDING AGING SIMULATION SATISFIED (IF PROVIDED)					
7. CRITERIA REGARDING TEMPERATURE/PRESSURE EXPOSURE					
A. - PEAK TEMPERATURE ADEQUATE					
B. - PEAK PRESSURE ADEQUATE					
C. - DURATION ADEQUATE					
D. - REQUIRED PROFILE ENVELOPED ADEQUATELY					
E. - MEAN EXPOSURE (IF REQUIRED) ADEQUATE					
8. CRITERIA REGARDING SPREAD SATISFIED					
9. CRITERIA REGARDING SURGE/SCIENCE SATISFIED					
10. CRITERIA REGARDING RADIATION SATISFIED					
11. CRITERIA REGARDING TEST SEQUENCE SATISFIED					
12. CRITERIA REGARDING TEST FAILURES OR REVERSE ANOMALIES (IF ANY) SATISFIED					
13. CRITERIA REGARDING FUNCTIONAL TESTING SATISFIED					
14. CRITERIA REGARDING INSTRUMENT ACCURACY SATISFIED					
15. TEST DURATION MARGIN (1 HOUR & FUNCTION TIME) SATISFIED					
16. CRITERIA REGARDING MARGINS SATISFIED (MUEC-0588, CAT. 1)					
REQ QUALIFICATION CATEGORY		DESIGNATIONS & CATEGORY			
1. EQUIPMENT QUALIFIED					
1.A. EQUIPMENT QUALIFICATION PENDING MODIFICATION					
1.B. EQUIPMENT QUALIFICATION NOT ESTABLISHED					
1.C. EQUIPMENT NOT QUALIFIED					
1.D. EQUIPMENT SATISFIES ALL REQUIREMENTS EXCEPT QUALIFIED LIFE OR REPLACEMENT SCHEDULE JUSTIFIED					
1.E. EQUIPMENT EXCEPT FROM QUALIFICATION					
1.F. EQUIPMENT NOT IN THE SCOPE OF THE REVIEW					
1.G. EQUIPMENT NOT MADE AVAILABLE					
1.H. EQUIPMENT NOT MADE AVAILABLE					
CORRECTIVE ACTION SPECIFIED		DESIGNATIONS & ACTION SPECIFIED			
1. EQUIPMENT REPLACEMENT WITH QUALIFIED EQUIPMENT					
2. EQUIPMENT MODIFICATION					
3. EQUIPMENT REPLACEMENT ABOVE THE SUBMERGENCE LEVEL					
4. RELOCATE OR SHIELD EQUIPMENT FROM RADIATION SOURCE					
5. REVIEW QUALIFICATION BY ADDITIONAL TESTING/ANALYSIS					
6. EQUIPMENT RELOCATION TO A FIELD ENVIRONMENT					
7. QUALIFICATION TESTING OF EQUIPMENT IN PROGRESS					
8. OTHER CORRECTIVE ACTION SPECIFIED					
9. SCHEDULE FOR COMPLETION OF CORRECTIVE ACTION(S) HAS BEEN PROVIDED					

Table 4-4 (Cont.)

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

REQ. REQUIREMENTS		DESIGNATION X = DEFICIENCY		FPC EQUIPMENT TEST NUMBER	
1. DOCUMENTED EVIDENCE OF QUALIFICATION ADEQUATE					
2. ADEQUATE SIMILARITY BETWEEN EQUIPMENT AND TEST SPECIMEN ESTABLISHED					
3. AGING DEGRADATION EVALUATED ADEQUATELY					
4. QUALIFIED LIFE OR REPLACEMENT SCHEDULE ESTABLISHED (IF REQUIRED)					
5. PROGRAM ESTABLISHED TO IDENTIFY AGING DEGRADATION					
6. CRITERIA REGARDING AGING SIMULATION SATISFIED (IF REQUIRED)					
7. CRITERIA REGARDING TEMPERATURE/PRESSURE PROFILES					
A. - PEAK TEMPERATURE ADEQUATE					
B. - PEAK PRESSURE ADEQUATE					
C. - HUMIDITY ADEQUATE					
D. - REQUIRED PROFILE ENVELOPED ADEQUATELY					
E. - VIBRATION EXPOSURE (IF REQUIRED) ADEQUATE					
8. CRITERIA REGARDING SPRAY SATISFIED					
9. CRITERIA REGARDING SUBMERSION SATISFIED					
10. CRITERIA REGARDING RADIATION SATISFIED					
11. CRITERIA REGARDING TEST SEQUENCE SATISFIED					
12. CRITERIA REGARDING TEST FAILURE OR SEVERE ANOMALY (IF ANY) SATISFIED					
13. CRITERIA REGARDING FUNCTIONAL TESTING SATISFIED					
14. CRITERIA REGARDING INSTRUMENT ACCURACY SATISFIED					
15. TEST DURATION MARGIN (1 HOUR + FUNCTION TIME) SATISFIED					
16. CRITERIA REGARDING MARGINS SATISFIED (MUREC-0500, CAT. 1)					
NAC QUALIFICATION CATEGORY		DESIGNATION X = CATEGORY			
I. A. EQUIPMENT QUALIFIED					
I. B. EQUIPMENT QUALIFICATION PENDING MODIFICATION					
II. A. EQUIPMENT QUALIFICATION NOT ESTABLISHED					
II. B. EQUIPMENT NOT QUALIFIED					
II. C. EQUIPMENT SATISFIES ALL REQUIREMENTS EXCEPT QUALIFIED LIFE OR REPLACEMENT SCHEDULE JUSTIFIED					
III. A. EQUIPMENT EXEMPT FROM QUALIFICATION					
III. B. EQUIPMENT NOT IN THE SCOPE OF THE REVIEW					
IV. DOCUMENTATION NOT MADE AVAILABLE					
CORRECTIVE ACTION SPECIFIED		DESIGNATION X = ACTION SPECIFIED			
1. EQUIPMENT REPLACEMENT WITH QUALIFIED EQUIPMENT					
2. EQUIPMENT MODIFICATION					
3. EQUIPMENT RELOCATION ABOVE THE SUBMERSION LEVEL					
4. RELOCATE OR SHIELD EQUIPMENT FROM RADIATION SOURCE					
5. VERIFY QUALIFICATION BY ADDITIONAL TESTING/ANALYSIS					
6. EQUIPMENT RELOCATION TO A FIELD ENVIRONMENT					
7. QUALIFICATION TESTING OF EQUIPMENT IN PROGRESS					
8. OTHER CORRECTIVE ACTION SPECIFIED ITEM IF CHECKED					
SCHEDULE FOR COMPLETION OF CORRECTIVE ACTION(S) HAS BEEN PROVIDED					

[illegible]

Table 4-4 (Cont.)

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

EQUIPMENT ITEM NUMBER		EQUIPMENT ITEM NUMBER	
107410710181019108010811082108310841085108610871088108910901		107410710181019108010811082108310841085108610871088108910901	
1. DOCUMENTED EVIDENCE OF QUALIFICATION ADEQUATE			
2. ADEQUATE RELIABILITY BETWEEN EQUIPMENT AND TEST SPECIMEN ESTABLISHED			
3. AGING OPERATIONS EVALUATED ADEQUATELY			
4. QUALIFIED LIFE OR REPLACEMENT SCHEDULE ESTABLISHED (IF REQUIRED)			
5. PROGRAM ESTABLISHED TO IDENTIFY AGING DEGRADATION			
6. CRITERIA REGARDING AGING SIMULATION SATISFIED (IF REQUIRED)			
7. CRITERIA REGARDING TEMPERATURE/PRESSURE EXPOSURE			
A. - PEAK TEMPERATURE ADEQUATE			
B. - PEAK PRESSURE ADEQUATE			
C. - DURATION ADEQUATE			
D. - REQUIRED PROFILE ENVELOPED ADEQUATELY			
E. - STEAM EXPOSURE (IF REQUIRED) ADEQUATE			
8. CRITERIA REGARDING SURVIVANCE SATISFIED			
9. CRITERIA REGARDING RADIATION SATISFIED			
10. CRITERIA REGARDING TEST SEQUENCE SATISFIED			
11. CRITERIA REGARDING TEST SEQUENCE SATISFIED			
12. CRITERIA REGARDING TEST FAILURES OR SEVERE ANOMALIES (IF ANY) SATISFIED			
13. CRITERIA REGARDING FUNCTIONAL TESTING SATISFIED			
14. CRITERIA REGARDING INSTRUMENT ACCURACY SATISFIED			
15. TEST DURATION MARGIN (1 HOUR + FUNCTION TIME) SATISFIED			
16. CRITERIA REGARDING MARGINS SATISFIED (NOREG-0388, CH. 3)			
1. EQUIPMENT QUALIFIED			
2. EQUIPMENT QUALIFICATION PENDING MODIFICATION			
3. EQUIPMENT QUALIFICATION NOT ESTABLISHED			
4. EQUIPMENT NOT QUALIFIED			
5. EQUIPMENT SATISFIES ALL REQUIREMENTS EXCEPT			
6. QUALIFIED LIFE OR REPLACEMENT SCHEDULE JUSTIFIED			
7. EQUIPMENT EXCEPT FROM QUALIFICATION			
8. EQUIPMENT NOT IN THE SCOPE OF THE REVIEW			
9. DOCUMENTATION NOT MADE AVAILABLE			
CORRECTIVE ACTION SPECIFIED (DESIGNATIONS X = ACTION SPECIFIED)			
1. EQUIPMENT REPLACEMENT WITH QUALIFIED EQUIPMENT			
2. EQUIPMENT MODIFICATION			
3. EQUIPMENT RELOCATION ABOVE THE SURVIVANCE LEVEL			
4. RELOCATE OR RADIATE EQUIPMENT FROM RADIATION SOURCE			
5. VERIFY QUALIFICATION BY ADDITIONAL TESTING/ANALYSIS			
6. EQUIPMENT RELOCATION TO A "FIELD ENVIRONMENT"			
7. QUALIFICATION TESTING OF EQUIPMENT IN PROGRESS			
8. OTHER (SPECIFY EQUIPMENT ITEM IF CHANGED)			
SCHEDULE FOR COMPLETION OF CORRECTIVE ACTIONS HAS BEEN PROVIDED			

Table 4-4 (Cont.)

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

EQUIPMENT ITEM NUMBER		FBC EQUIPMENT ITEM NUMBER	
106108210931094100951096109710081099110011011021103110411051			
<p>1. DOCUMENTED EVIDENCE OF QUALIFICATION ADEQUATE</p> <p>2. ADEQUATE SIMILARITY BETWEEN EQUIPMENT AND TEST SPECIMEN ESTABLISHED</p> <p>3. AGING DEGRADATION EVALUATED ADEQUATELY</p> <p>4. QUALIFIED LIFE OR REPLACEMENT SCHEDULE ESTABLISHED (IF REQUIRED)</p> <p>5. PROGRAM ESTABLISHED TO IDENTIFY AGING DEGRADATION</p> <p>6. CRITERIA REGARDING AGING SIMULATION SATISFIED (IF REQUIRED)</p> <p>7. CRITERIA REGARDING TEMPERATURE/PRESSURE EXPOSURE</p> <p>A. - PEAK TEMPERATURE ADEQUATE</p> <p>B. - PEAK PRESSURE ADEQUATE</p> <p>C. - DURATION ADEQUATE</p> <p>D. - EQUIPPED PROFILE ENVELOPED ADEQUATELY</p> <p>E. - STEAM EXPOSURE (IF REQUIRED) ADEQUATE</p> <p>8. CRITERIA REGARDING SPRAY SATISFIED</p> <p>9. CRITERIA REGARDING SUBMERGENCE SATISFIED</p> <p>10. CRITERIA REGARDING RADIATION SATISFIED</p> <p>11. CRITERIA REGARDING TEST SEQUENCE SATISFIED</p> <p>12. CRITERIA REGARDING TEST FAILURES OR REVERSE ANOMALIES (IF ANY) SATISFIED</p> <p>13. CRITERIA REGARDING FUNCTIONAL TESTING SATISFIED</p> <p>14. CRITERIA REGARDING INSTRUMENT ACCURACY SATISFIED</p> <p>15. TEST DURATION MARGIN (1 HOUR + FUNCTION TIME) SATISFIED</p> <p>16. CRITERIA REGARDING MARGINS SATISFIED (MUREC-0509, CAT. 1)</p>			
<p>1. EQUIPMENT QUALIFIED</p> <p>2. EQUIPMENT QUALIFICATION PENDING MODIFICATION</p> <p>3. EQUIPMENT QUALIFICATION NOT ESTABLISHED</p> <p>4. EQUIPMENT NOT QUALIFIED</p> <p>5. EQUIPMENT SATISFIES ALL REQUIREMENTS EXCEPT</p> <p>6. QUALIFIED LIFE OR REPLACEMENT SCHEDULE JUSTIFIED</p> <p>7. EQUIPMENT EXEMPT FROM QUALIFICATION</p> <p>8. EQUIPMENT NOT IN THE SCOPE OF THE REVIEW</p> <p>9. DISCUSSION NOT N/A AVAILABLE</p> <p>10. CORRECTIVE ACTION SPECIFIED (DESIGNATIONS X = ACTION SPECIFIED)</p> <p>1. EQUIPMENT REPLACEMENT WITH QUALIFIED EQUIPMENT</p> <p>2. EQUIPMENT MODIFICATION</p> <p>3. EQUIPMENT RELOCATION ABOVE THE SUBMERGENCE LEVEL</p> <p>4. RELOCATE OR SHIELD EQUIPMENT FROM RADIATION SOURCE</p> <p>5. VERIFY QUALIFICATION BY ADDITIONAL TESTING/ANALYSIS</p> <p>6. EQUIPMENT RELOCATION TO A "HOLD ENVIRONMENT"</p> <p>7. QUALIFICATION TESTING ON EQUIPMENT IN PROGRESS</p> <p>8. OTHER (PLEASE SPECIFY EQUIPMENT ITEM IS CHECKED)</p> <p>9. SCHEDULE FOR COMPLETION OF CORRECTIVE ACTION(S) HAS BEEN PROVIDED</p>			

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

MPC REQUIREMENTS		(DESIGNATIONS X = DEFICIENCY)		SRC EQUIPMENT ITEM NUMBERS	
1.	DOCUMENTED EVIDENCE OF QUALIFICATION ADEQUATE				
2.	ADEQUATE SIMILARITY BETWEEN EQUIPMENT AND TEST SPECIMEN ESTABLISHED				
3.	AGING DEGRADATION EVALUATED ADEQUATELY				
4.	QUALIFIED LIFE OR REPLACEMENT SCHEDULE ESTABLISHED (IF REQUIRED)				
5.	PROGRAM ESTABLISHED TO IDENTIFY AGING DEGRADATION				
6.	CRITERIA REGARDING AGING SIMULATION SATISFIED (IF REQUIRED)				
7.	CRITERIA REGARDING TEMPERATURE/PRESSURE EXPOSURE				
8.	CRITERIA REGARDING SPRAY SATISFIED				
9.	CRITERIA REGARDING SURVIVANCE SATISFIED				
10.	CRITERIA REGARDING RADIATION SATISFIED				
11.	CRITERIA REGARDING TEST SEQUENCE SATISFIED				
12.	CRITERIA REGARDING TEST FAILURE OR SEVERE ANOMALIES (IF ANY) SATISFIED				
13.	CRITERIA REGARDING FUNCTIONAL TESTING SATISFIED				
14.	CRITERIA REGARDING IMPURITIES SATISFIED				
15.	TEST DURATION MARGIN (1 HOUR + FUNCTION TIME) SATISFIED				
16.	CRITERIA REGARDING MARGINS SATISFIED (NUREG-0508, CAT. 1)				
MPC QUALIFICATION CATEGORY		(DESIGNATIONS X = CATEGORY)			
1.A.	EQUIPMENT QUALIFIED				
1.B.	EQUIPMENT QUALIFICATION PENDING MODIFICATION				
11.A.	EQUIPMENT QUALIFICATION NOT ESTABLISHED				
11.B.	EQUIPMENT NOT QUALIFIED				
11.C.	EQUIPMENT SATISFIED ALL REQUIREMENTS EXCEPT QUALIFIED LIFE OR REPLACEMENT SCHEDULE JUSTIFIED				
111.A.	EQUIPMENT EXEMPT FROM QUALIFICATION				
111.B.	EQUIPMENT NOT IN THE SCOPE OF THE REVIEW				
111.C.	DOCUMENTATION NOT MADE AVAILABLE				
CORRECTIVE ACTION SPECIFIED		(DESIGNATIONS X = ACTION SPECIFIED)			
1.	EQUIPMENT REPLACEMENT WITH QUALIFIED EQUIPMENT				
2.	EQUIPMENT MODIFICATION				
3.	EQUIPMENT RELLOCATION ABOVE THE SURVIVANCE LEVEL				
4.	RELOCATE OR SHIELD EQUIPMENT FROM RADIATION SOURCE				
5.	VERIFY QUALIFICATION BY ADDITIONAL TESTING/ANALYSIS				
6.	EQUIPMENT RELLOCATION TO A FIELD ENVIRONMENT				
7.	QUALIFICATION TESTING OF EQUIPMENT IN PROGRESS				
8.	OTHER (---NEW SPECIFIC EQUIPMENT ITEM IF CHECKED---)				
SCHEDULE FOR COMPLETION OF CORRECTIVE ACTION(S) HAS BEEN PROVIDED					

4.3 METHODOLOGY USED BY THE LICENSEE

This section includes observations concerning the Licensee's qualification methodology presented in the response [6] to the NRC SER.

4.3.1 Completeness of Safety-Related Equipment List

Section 3.1 of the NRC SER [5] identified the following concern:

"Display instrumentation which provides information for the reactor operators to aid them in the safe handling of the plant was not specifically identified by the licensee. A complete list of all display instrumentation mentioned in the LOCA and HELB emergency procedures must be provided. Equipment qualification information in the form of summary sheets should be provided for all components of the display instrumentation exposed to harsh environments. Instrumentation which is not considered to be safety related but which is mentioned in the emergency procedure should appear on the list. For these instruments, (1) justification should be provided for not considering the instrument safety related and (2) assurance should be provided that its subsequent failure will not mislead the operator or adversely affect the mitigation of the consequences of the accident. The environmental qualification of post-accident sampling and monitoring and radiation monitoring equipment is closely related to the review of the TMI Lessons-Learned modifications and will be performed in conjunction with that review.

The licensee identified 275 items of equipment which were assessed by the staff."

In response to this concern, the Licensee stated [6]:

"A 'Master List' of instruments mentioned in the appropriate LOCA/HELB emergency procedures will be provided as part of the July 20, 1981 submittal. Some of the instruments included will not be environmentally qualified. The essential instruments needed to respond to these events are environmentally qualified and appropriate component evaluation work sheets summarizing their qualifications will be provided.

Other instruments included in the list will not mislead the operator nor result in an adverse affect in mitigation of any accident for these reasons:

1. the operator training program stresses the use of alternate/multiple instruments to assess plant conditions.
2. the emergency procedures also specify assessment and confirmation of indication using alternate indications.

3. As discussed above, all instruments essential in responding to LOCA/HELB are environmentally qualified and considered safety related."

It is concluded that the Licensee has provided a satisfactory response to the NRC concern.

4.3.2 Containment Spray System

Section 3.2 of the NRC SER [5] identified the following concern:

"During this review, the staff assumed that for plants designed and equipped with an automatic containment spray system which satisfies the single-failure criterion, the main-steam-line-break (MSLB) environmental conditions are enveloped by the large-break-LOCA environmental conditions. The staff assumed, and requires the licensee to verify, that the containment spray system is not subjected to a disabling single-component failure and therefore satisfies the requirements of Section 4.2.1 of the DOR guidelines.

Equipment submergence has also been addressed where the possibility exists that flooding of equipment may result from HELBs."

In response to this concern, the Licensee stated [6]:

"As assumed by the NRC staff, TMI-1 does have a containment spray system not subject to a disabling single component failure. That is, no single failure will result in the inability of the Reactor Building Spray System to deliver spray in sufficient amounts to minimize containment pressure and temperature. The RBSS is currently under review with respect to chemical performance in response to NRC letter dated March 7, 1980. The results of this review will be forwarded by the end of July, 1981 and will demonstrate RBSS performance within the range specified for equipment qualification."

It is concluded that the Licensee has provided a satisfactory response to the NRC concern.

4.3.3 Environmental Service Conditions

4.3.3.1 Temperature, Pressure, and Humidity Conditions Inside Containment

Section 3.3 of the NRC SER [5] identified the following concern:

"The licensee has provided the results of accident analyses as follows:

	<u>Max Temp (°F)</u>	<u>Max Press (psig)</u>	<u>Humidity (%)</u>
LOCA	275	50.6	100

The staff has concluded that the minimum temperature profile for equipment qualification purposes should include a margin to account for higher-than-average temperatures in the upper regions of the containment that can exist due to stratification, especially following a postulated MSLB. Use of the steam saturation temperature corresponding to the total building pressure (partial pressure of steam plus partial pressure of air) versus time will provide an acceptable margin for either a postulated LOCA or MSLB, whichever is controlling, as to potential adverse environmental effects on equipment.

The licensee's specified temperature (service condition) of 275°F does not satisfy the above requirement. A saturation temperature corresponding to the peak profile (298°F peak temperature at 50.6 psig) should be used instead. The licensee should update his equipment summary tables to reflect this change. If there is any equipment that does not meet the staff position, the licensee must provide either justification that the equipment will perform its intended function under the specified conditions or propose corrective action."

The Licensee responded to the NRC concern as follows [6]:

"The temperature profile provided in our response indicated a peak temperature of 286°F not 275°F as assumed by the NRC staff. This value was conservatively calculated as discussed in the FSAR Sections 14.2.2.3 and 6.1.2.12. The conservatism inherent in the calculations are ample assurance that the worst containment conditions have been bounded. Furthermore, neither the IE Bulletin 79-01B nor the Commissions Order (CLI-80-21) require going beyond the DOR Guidelines which state in part '...equipment qualified for a LOCA environment is considered qualified for MSLB accident environment in plants with automatic spray systems not subject to a disabling single component failure.' (The TMI-1 system is such a system as discussed in 3.2 above.) This recent NRC staff criteria revision clearly goes beyond the DOR Guidelines without adequate justification."

It appears that the Licensee has not resolved the NRC concern. Since the Licensee is responsible for identifying the environments, the parameters identified by the Licensee have been used in the evaluations contained in this Technical Evaluation Report. These parameters are reproduced in Appendix A.

4.3.3.2 Temperature, Pressure, and Humidity Conditions Outside Containment

Section 3.4 of the NRC SER [5] stated the following:

"The licensee has provided the temperature, pressure, humidity and applicable environment associated with an MSLB within the intermediate building.

The staff has verified that the parameters identified by the licensee for the MSLB are acceptable."

4.3.3.3 Nuclear Radiation Dose (Inside and Outside Containment)

Section 3.8 of the NRC SER [5] identified the following concern:

"The licensee has provided values for the radiation levels postulated to exist following a LOCA. The application and methodology employed to determine these values were presented to the licensee as part of the NRC staff criteria contained in the DOR guidelines, in NUREG-0588, and in the guidance provided in IEB-79-01B, Supplement 2. Therefore, for this review, the staff has assumed that, unless otherwise noted, the values provided have been determined in accordance with the prescribed criteria. The staff review determined that the values to which equipment was qualified enveloped the requirements identified by the licensee.

The value required by the licensee inside containment is an integrated dose of 2×10^7 rads. The radiation service condition provided by the licensee is lower than provided in the DOR guidelines for gamma and beta radiation. The licensee is requested to either provide justification for using the lower service condition or use the service condition provided in the DOR guidelines for both gamma and beta radiation. If the former option is chosen, then the analysis--including the basis, assumptions, and a sample calculation--should be provided.

A required value outside containment of 3.4×10^6 rads has been used by the licensee to specify limiting radiation levels for the decay heat removal pumps in the auxiliary building. This value considers the radiation levels influenced by the source term methodology associated with post-LOCA recirculation fluid lines and is therefore acceptable.

For some equipment, the licensee has used a calculated integrated radiation dose at 1 hour after a LOCA as the required radiation environment. Without additional justification (as discussed in Section 4.2 of this SER), specifying these lower radiation levels is not acceptable and, therefore, radiation has been listed as a deficiency for these components. Radiation has also been identified as a deficiency if the licensee used other than the values listed in Appendix C of the DOR guidelines, unless the Appendix C values also enveloped the specified value.

In the January 30, 1981 submittal, the licensee does not provide a comparison of the radiation values given in Appendix C with those taken

from other sources. Therefore, the licensee should verify that the radiation values used to show qualification of all components are at least as conservative as the values given for the various materials listed in Appendix C to the DOR guidelines."

In response to this concern, the Licensee stated [6]:

"The DOR guidelines permit the use of a dose of 2×10^7 rads integrated dose for gamma radiation in lieu of a detailed plant specific calculation. We have elected, for convenience, to use this conservative integrated dose for TMI-1. We have not included the integrated dose associated with beta radiation since the safety related equipment in the TMI-1 containment is in metal enclosures or conduit. The conduit and enclosures while not necessarily gas tight do shield the sensitive materials from essentially all of the beta source term which is external to the conduit/enclosures. The insignificant beta dose from gases potentially within the enclosures/conduit was considered too trivial to affect equipment qualification (i.e. several orders of magnitude lower than 2×10^7 rads used for equipment qualification.)

Justification for use of an integrated dose at one hour was previously provided; however, it was not presented in the format suggested in Section 4.2 of the SER. Our July 20, 1981 submittal will restate the justification in the suggested format.

Appendix C of the DOR guidelines did not indicate the specific source reference or criteria associated with the values listed. Other source documents were used to determine radiation values and included a review of the criteria used to determine that value and the properties required in the specific application.

In determining the post accident radiation qualification of safety-related electrical equipment, the calculated post accident integrated exposures were compared to the radiation tolerance values found in the literature for each of the component's constituent materials. The documents reviewed were:

1. 'The Use of Plastics and Elastomers in Nuclear Radiation', by W. W. Parkinson and O. Sisman, Oak Ridge National Laboratory, October 19, 1970, appearing in 'Nuclear Engineering and Design 17', (1971), pp. 247-280.
2. 'Effects of Radiation on Materials and Components', M. E. Van de Voorde, CERN 70-5, European Organization for Nuclear Research, February 26, 1970.
3. 'Nuclear Engineering Handbook', Harold Etherington - editor, McGraw-Hill, Inc., First Edition, Section 10, 1958.

4. 'A Review of Equipment Aging Theory and Technology', Franklin Research Center, EPRI Report NP-1558, September, 1980.
5. 'Radiation Stability of Plastics and Elastomers,' by C. D. Bopp and O. Sisman, Oak Ridge National Laboratory, appearing in 'Nucleonics', Volume 13, No. 7, July 1955, pp. 28-33.

In addition to providing documentable references, many of these reports are based on actual tests conducted by the sponsoring organization. The Parkinson-Sisman study (Item 1), the most detailed and complete reference work available, including substantiating tests, was utilized as the basis for radiation tolerance values whenever the equipment manufacturers did not provide an adequately referenced value. In addition to supplying limiting values for onset of degradation (threshold values), this report provided the range of degradation as a function of total exposure for several material properties (i.e.; elongation, tensile strength, compression set). This allows one to choose not only the material property most critical for continued operation of the component in question, but also to assess the allowable degradation prior to failure."

It is concluded that the Licensee has provided a satisfactory response to the NRC concern.

4.3.4 Chemical Spray

Section 3.6 of the NRC SER [5] identified the following concern:

"The licensee's PSAR value for the chemical concentration is 2270 ppm boron and sodium hydroxide (NaOH) to raise the pH to 9.5. Only the work sheet for Raychem heat shrink tubing provides enough information to show qualification for chemical spray. Therefore, for the purpose of this review, the effects of chemical spray will be considered unresolved. The staff will review the licensee's response when it is submitted and discuss the resolution in a supplemental report."

In response to this concern, the Licensee stated [6]:

"Justification for the pH values used for equipment qualification will be provided on the component evaluation sheets to be provided with our July 20, 1981 submittal. It should be noted that ability of a component to withstand the effects of chemical spray depends on more than pH alone. Temperature, time, material, thickness, and material properties are among some of the more important considerations. Research and testing, such as that reported in ORNL Report TN1-24-12 show the significance of some of these factors."

It is concluded that the Licensee has provided a satisfactory response to the NRC concern.

4.3.5 Submergence

Section 3.5 of the NRC SER [5] identified the following concern:

"The maximum submergence levels have been established and assessed by the licensee. Unless otherwise noted, the staff assumed for this review that the methodology employed by the licensee is in accordance with the appropriate criteria as established by Commission Memorandum and Order CLI-80-21.

The licensee's value for maximum submergence is 5.94 ft. The licensee identified Raychem heat shrink tubing and four Bailey Meter level transmitters as having the potential for becoming submerged after a postulated event. The work sheet for the Raychem heat shrink tubing indicates that this material is qualified for submergence. The licensee states that the four level transmitters are not required following a large-break LOCA which results in the maximum flood level. The licensee states that flood levels associated with breaks where steam generator water level is needed will not subject the level transmitters to submergence. However, the staff does not agree with the licensee, because the flood level should be the same across the spectrum of postulated events. Therefore, the licensee should provide information that shows these level transmitters are qualified for submergence or take corrective action by either relocating them or replacing them with qualified level transmitters. Additionally, the licensee may justify an exemption for qualification of these components by providing the information discussed in Section 4.2 of this report.

Although not identified on the work sheets, the onsite inspection report indicates that Limitorque motor operators MU-V-2A and MU-V-2B in the make-up and purification system are below the calculated flood level. Therefore, before plant restart, the licensee should either verify that these motor operators are in fact not subject to submergence or provide documentation showing that the motor operators and associated cables are qualified for submergence. If qualification documentation does not exist, the licensee may provide an acceptable basis to exempt this equipment from qualification by providing the information discussed in Section 4.2 of this SER.

The onsite inspection of a very limited number of components indicated that the valve operators discussed above are below the calculated flood level. Because the submittal does not indicate the elevation of equipment, before plant restart the licensee should verify that, other than the equipment discussed above, no equipment has the potential for becoming submerged."

In response to this concern, the Licensee stated [6]:

"The maximum containment sump level has been recalculated using a more realistic but still conservative model of the steam generator exterior surface (for determination of non-floodable volume). The revised flood level is 5.66 ft above the containment floor. For MSLB a lower flood level was calculated. The LOCA flood level was nevertheless conservatively used to determine equipment qualification. The Steam Generator level transmitters have been relocated such that the lowest instrument is greater than 5.80 ft above the containment floor."

It is concluded that the Licensee has provided a satisfactory response to the NRC concern.

4.3.6 Aging and Qualified Life

Section 3.7 of the NRC SER [5] identified the following concern:

"The DOR Guidelines, section 7, does not require a qualified life to be established for all safety related electrical equipment, however the following actions are required:

1. Detailed comparison of existing equipment to the materials identified in Appendix C of the DOR guidelines. The first supplement to IEB-79-01B requires the licensees to utilize the table and identify any additional materials as a result of their effort.
2. Establish an ongoing program to review surveillance and maintenance records to identify potential age related degradations.
3. Establish component maintenance and replacement schedules which include considerations of aging characteristics of the installed components.

The licensee identified a number of equipment items for which a specified qualified life was established (for examples, 5 years, 15 years, or 40 years). In its assessment of these submittals, the staff did not review the adequacy of the methodology nor the basis used to arrive at these values; the staff has assumed that the established values are based on state-of-the-art technology and are acceptable.

For this review, however, the staff requires that the licensee submit supplemental information to verify and identify the degree of conformance to the above requirements. For equipment for which a materials evaluation has already been performed, items (2) and (3) above should be addressed. The response should include all the equipment identified as required to maintain functional operability in harsh environments.

The licensee indicated that this phase of the response is outstanding and that the review is in progress. The staff will review the licensee's response when it is submitted and discuss its evaluation in a supplemental report."

In response to this concern, the Licensee stated [6]:

"As described in our letter dated June 12, 1981, we have improved our preventative maintenance program (procedures) to require replacement of items in accordance with established replacement schedules. All items with a qualified life less than the life of the plant will be replaced according to the established schedules. These procedures will be in place prior to restart criticality. Any item with a known qualified life which has been exceeded will be replaced before criticality. The only such components which have exceeded that qualified life identified to date are neoprene cover gaskets on certain pressure switches and transmitters. A program has been established to capture for evaluation the surveillance maintenance history for all safety related equipment. The collected information will be periodically reviewed to determine and identify age-related degradation. (The offsite engineering resources of GPU Nuclear will conduct these reviews.) The reviews will be ongoing but may be at distinct intervals in lieu of continuous reviews."

It is concluded that the Licensee has provided a satisfactory response to the NRC concern.

4.4 EQUIPMENT ENVIRONMENTAL QUALIFICATION EVALUATION

The evaluation presented in this section of the report includes, for each equipment item, completed equipment environmental qualification review checksheets (partially handwritten) which present both the technical information necessary to conduct the review and the results of the evaluation.

 I EQUIPMENT ENVIRONMENTAL QUALIFICATION I
 I EQUIPMENT ITEM CHECKSHEET INDEX I
 I THE I

FAC ITEM NO.	COMPONENT	MANUFACTURER	MODEL NUMBER	LOCATION
1	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M8	CONTAINMENT
2	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M83	CONTAINMENT
3	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M83	CONTAINMENT
4	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M84	CONTAINMENT
5	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
6	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
7	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
8	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
9	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
10	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
11	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
12	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
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14	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
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22	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
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29	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
30	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
31	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
32	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
33	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
34	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
35	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
36	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
37	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
38	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
39	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
40	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
41	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
42	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
43	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
44	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
45	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
46	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
47	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
48	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT
49	MOTORIZED VALVE ACTUATOR	LIMITORQUE	8M88	CONTAINMENT

EQUIPMENT ENVIRONMENTAL QUALIFICATION
EQUIPMENT ITEM CHECKSHEET INDEX
TMI 1

ERC ITEM NO.	COMPONENT	MANUFACTURER	MODEL NUMBER	LOCATION
50	ELECTRIC MOTOR	WESTINGHOUSE	NP350	AUXILIARY BUILDING
51	ELECTRIC MOTOR	WESTINGHOUSE	NP450	INTERMEDIATE BUILDING
52	NEUTRON DETECTOR	WESTINGHOUSE	WL23434	CONTAINMENT
53	RADIATION MONITOR	VICTORFER	ND	TURBINE BUILDING
54	FLUX TRANSMITTER, ULTRASONIC	CONTROLATRON	SERIES 240	AUXILIARY BUILDING
55	PROPORTIONAL FLUX COUNTER ASSEMBLY	WESTINGHOUSE	WL33602A	CONTAINMENT
56	PRESSURE SWITCH	STATIC-O-RING	12NR45CHRR	AUXILIARY BUILDING
57	PRESSURE SWITCH	STATIC-O-RING	9N03RR	CONTAINMENT
58	PRESSURE SWITCH	SQUARE D	TYPE 9013AHGS	AUXILIARY BUILDING
59	PRESSURE SWITCH	SQUARE D	TYPE 9013AHGS	AUXILIARY BUILDING
60	TRANSDUCER, E/P	BAILEY METER	RP1211C	INTERMEDIATE BUILDING
61	LIMIT SWITCH	NAMCO	M02	INTERMEDIATE BUILDING
62	LIMIT SWITCH	NAMCO	SNAP LOCK M02A	AUXILIARY BUILDING
63	LIMIT SWITCH	NAMCO	SNAP LOCK M02A	AUXILIARY BUILDING
64	LIMIT SWITCH	NAMCO	SNAP LOCK S1307L0L160	AUXILIARY BUILDING
65	LIMIT SWITCH	NAMCO	5L202	FUEL HANDLING BUILDING
66	LIMIT SWITCH	NAMCO	D1400K2	INTERMEDIATE BUILDING
67	LIMIT SWITCH	NAMCO	D1200G2	INTERMEDIATE BUILDING
68	LIMIT SWITCH	NAMCO	M0	INTERMEDIATE BUILDING
69	LIMIT SWITCH	MICRO SWITCH	DTE62RN	AUXILIARY BUILDING
70	LIMIT SWITCH	MICRO SWITCH	BZE62RU	INTERMEDIATE BUILDING
71	LIMIT SWITCH	FISHER GOVERNOR	TYPE 304	INTERMEDIATE BUILDING
72	LIMIT SWITCH	MICRO SWITCH	BZE62RN	AUXILIARY BUILDING
73	LIMIT SWITCH	NAMCO	SNAP LOCK TYPE M0300	TURBINE BUILDING
74	D/P TRANSMITTER	BAILEY METER	BY3421A	CONTAINMENT
75	PRESSURE TRANSMITTER	BAILEY METER	RP1250B	AUXILIARY BUILDING
76	PRESSURE TRANSMITTER	ROBFROUNT	1182	CONTAINMENT
77	D/P TRANSMITTER	NANTON	277A	INTERMEDIATE BUILDING
78	PRESSURE TRANSMITTER	FOXBORO	E11GMM2	CONTAINMENT
79	PRESSURE TRANSMITTER	FOXBORO	E11AM	AUXILIARY BUILDING
80	PRESSURE TRANSMITTER	FOXBORO	E11GMSK1	CONTAINMENT
81	PRESSURE TRANSMITTER	FOXBORO	E11GMSAE1	CONTAINMENT
82	PRESSURE TRANSMITTER	FOXBORO	E11GMSAE	CONTAINMENT
83	PRESSURE TRANSMITTER	FOXBORO	E11GMC61	TURBINE BUILDING
84	PRESSURE TRANSMITTER	FOXBORO	E110N	CONTAINMENT
85	LEVEL TRANSMITTER	BAILEY METER	BY30401A	CONTAINMENT
86	LEVEL TRANSMITTER	BAILEY METER	BY0230A	AUXILIARY BUILDING
87	LEVEL TRANSMITTER	BAILEY METER	BY0240A	AUXILIARY BUILDING
88	LEVEL TRANSMITTER	BAILEY METER	BY0041XA	CONTAINMENT
89	LEVEL TRANSMITTER	ROSEMOUNT	1151	CONTAINMENT
90	TEMPERATURE TRANSMITTER	ROSEMOUNT	177HW2	CONTAINMENT
91	TEMPERATURE TRANSMITTER	ROSEMOUNT	177GT	CONTAINMENT
92	TEMPERATURE TRANSMITTER	FOXBORO	494A	AUXILIARY BUILDING
93	FLUX TRANSMITTER	FOXBORO	E11DNR	INTERMEDIATE BUILDING
94	ALARM UNIT	FOXBORO	430FT	INTERMEDIATE BUILDING
95	FLUX COMPARTOR	FOXBORO	47HDSRG12	INTERMEDIATE BUILDING
96	TEMPERATURE COMPENSATOR	FOXBORO	440TOM1	INTERMEDIATE BUILDING
97	LEVEL TRANSMITTER	FOXBORO	E130H	CONTAINMENT
98	LEVEL SWITCH	GEN	LS800	CONTAINMENT

=====

1 EQUIPMENT ENVIRONMENTAL QUALIFICATION 1

1 EQUIPMENT ITEM CHECKSHEET 3P073 1

98 1

=====

FAC	ITEM	COMPONENT	MANUFACTURER	MODEL NUMBER	LOCATION
99	FLOW ELEMENT	PFM			INTERMEDIATE BUILDING
100	RTD	TECH		551	CONTAINMENT
101	TEMPERATURE ELEMENT	TECH		551	CONTAINMENT
102	TEMPERATURE ELEMENT	ROSENBLUM		104877	CONTAINMENT
103	RTD	ROSENBLUM		104877	CONTAINMENT
104	RTD	ROSENBLUM		104877	CONTAINMENT
105	RTD	ROSENBLUM		104877	CONTAINMENT
106	RTD	ROSENBLUM		104877	CONTAINMENT
107	RTD	ROSENBLUM		104877	CONTAINMENT
108	RTD	ROSENBLUM		104877	CONTAINMENT
109	RTD	ROSENBLUM		104877	CONTAINMENT
110	RTD	ROSENBLUM		104877	CONTAINMENT
111	RTD	ROSENBLUM		104877	CONTAINMENT
112	RTD	ROSENBLUM		104877	CONTAINMENT
113	RTD	ROSENBLUM		104877	CONTAINMENT
114	RTD	ROSENBLUM		104877	CONTAINMENT
115	RTD	ROSENBLUM		104877	CONTAINMENT
116	RTD	ROSENBLUM		104877	CONTAINMENT
117	RTD	ROSENBLUM		104877	CONTAINMENT
118	RTD	ROSENBLUM		104877	CONTAINMENT
119	RTD	ROSENBLUM		104877	CONTAINMENT
120	RTD	ROSENBLUM		104877	CONTAINMENT



GP&N Nuclear

P.O. Box 487

McKeesport, Pennsylvania 15136

412-644-7621

Writer's Direct Dial Number

March 1, 1983
5211-83-034

Office of Nuclear Reactor Regulation
Attn: J. F. Stolz, Chief
Operating Reactor Branch No. 4
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555


Dear Sir:

Three Mile Island Nuclear Station, Unit 1 (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
SER - Environmental Qualification

In response to your letter of December 10, 1982, GP&N has reviewed your SER and the attached TER by Franklin Research Center with particular attention to NRC categories 1.B., 11.A and 11.B. As discussed in a telephone conversation between L. W. Harding (GP&N) and J. Van Vliet (NRC) on February 2, 1983 and V. Noonan (NRC) on February 6, GP&N requests a meeting with the NRC and VRC to discuss, in detail, misunderstandings we have noted in the T.R.

Enclosed for your information and in advance of our meeting is a matrix indicating apparent misunderstandings we have noted in the analysis performed by VRC. Until such time as a meeting is held and these items are resolved, a schedule for corrective action cannot be developed. However, it is our intention to assure environmental qualification of class 1D electrical equipment in harsh environments by March 31, 1985, as required by 10 CFR 50.49. Based on the above, the schedule for our 90 day response will be determined pending the outcome of our meeting.

Sincerely,


R. D. Rukill
Director, TMI-1

HDR:LWH:jrg

Attachment

cc: ☒ Van Vliet
R. C. Haynes
V. Noonan

FOIA-87-696

C/2

8303090189
APP

3-2-83
RA from BAZ
19
Inter-Office Memorandum

March 2, 1983
MX/83-056

GPU Nuclear

Subject: Corporate Quality Assurance
Review Committee (C-QARC) Meeting Minutes
2nd Meeting - February 18, 1983

To: N. C. Kazanas
Director-Quality Assurance

Location: Headquarters

ATTENDEES

- *M. W. Allgaier - NDE Programs Supervisor⁽²⁾
- B. A. Bader - Corp. QA Program Development & Audit Manager⁽²⁾
- R. J. Guimond - QA Engineer
- *J. P. Heil - QA Engineer⁽¹⁾
- *P. B. Magitz - Corp. QA Audit Supervisor
- *K. L. Wayne - Manager, QA Design & Procurement

-
- * Permanent Member
 - (1) Alternate for M. J. Stromberg
 - (2) Part Time Attendance

AGENDA ITEM #1: Lack of control of procurement/installation of Class 1E electrical equipment requiring environmental qualifications.

At the first C-QARC meeting, R. J. Guimond was tasked to further investigate the above item and report to the C-QARC. The results of his investigation were presented to the committee as follows:

ENVIRONMENTAL QUALIFICATION PROGRAM PROBLEMS

1. Lack of a written Corporate policy and guidelines for an overall Environmental Qualification Program (Corporate and sites), describing in detail the responsibilities, activities, and reporting requirements for all divisions.
2. Technical Functions took position that EP-031 covers E.Q. program. It was pointed out to D. Croneberger the inadequacy of this procedure to constitute on its own the Environmental Qualification Program.

FOIA-87-696

C/3

3. There is a central file; however, it does not meet the requirements of Procedure TAP-007, "Technical Functions Engineering Data Files".
4. There is evidence that equipment procured for modifications were commercial grade and does not appear in the submittal nor the E.Q. Test Report Index (see Finding #3 of Audit Report O-TMI-81-12).

The results of Committee deliberations were:

1. Agreement that stated GPUN policy is full compliance with the law.
2. Nonconforming conditions identified to date do not indicate that the entire qualification program is out of control; and, therefore, does not warrant escalation of the broad issue.
3. The lack of a complete file of auditable records should be escalated to the Director-Quality Assurance.
4. All organizations that have responsibilities in the environmental qualification program do not have procedures that clearly define these responsibilities. Examples of these responsibilities include:
 - Preventive maintenance and replacement
 - Control of installation of unqualified items
 - Updating maintenance schedules based on experience

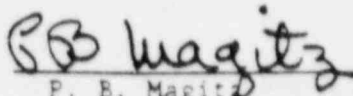
(NOTE: Items 3 and 4, preceding, are considered escalated by virtue of this communication.)

AGENDA ITEM #2: Inadequate implementation of indoctrination and training for Technical Functions personnel; Ref. Finding #2 of Audit O-TMI-80-10.

Attempts to close out this finding have not been successful because of the lack of implementation of corrective action. The Committee agreed that this should be escalated. A memo to R. F. Wilson has been prepared for signature of M. J. Stromberg/N. C. Kazanas/R. L. Long.

NEXT MEETING: The next scheduled C-QARC meeting will be on May 13, 1983, at 1:00 P.M. at Corporate Headquarters.

1a)
cc: Attendees
B. E. Ballard
T. J. Fatterson
M. J. Stromberg
C. E. Long
JC-QARC File


P. B. Magitz
C-QARC Coordinator

RECEIVED 3-13-83
VIA MAIL FILE
Schmidt
Inter-Office Memorandum

Date March 9, 1983
QA/83-060

Subject: 2nd Meeting Minutes
PDA/83-056

GPU Nuclear

To M. W. Allgaier
J. P. Heil - acting for MT Smiley
P. B. Magitz
R. L. Wayne

Location Headquarters

The purpose of the C-QARC should include strong and definitive recommendations on what the next step should be. I do not feel this was done by the issuance of the subject memorandum. I will fight any tendency to make this committee a function which doesn't permit the existing program as being the means of identifying problems, getting satisfactory resolution, implementing effective corrective action and verifying that this is done. The escalation powers are only to be used when it is demonstrated that the existing program does not work.

A review of the committee's deliberation reveals that there is concern that a complete file of auditable records does not meet the requirements of TAP-007. I find no discussion on the following:

1. What requirements are not satisfied.
2. What audit finding or QDR identifies this problem to the responsible organization.
3. What alerted condition was not resolved in a timely manner or implemented when it should have been.
4. What escalated action should include / no form presented which would help execute this action.

On Result Item 4, again I don't get the feeling here that although these problems may be real, that they should be addressed here. If there aren't findings which deal with these actions, then they should be pursued and addressed as lower tier findings. Then if it doesn't bear fruit in terms of effective corrective action, it could then be escalated.

Concerning agenda Item 2, and with respect to inadequate implementation of I and T for T.F. personnel, I assume the letter which I have yet to see, includes input on the above questions. This input should have been evaluated before escalation was recommended.

FOIA-87-696

C/4

C-QARC Permanent Members

March 9, 1983

Page two

As you know, I am extremely interested in the success of this committee. I look toward helping you in successful implementation. Please look at these constructive comments in that manner. I also offer my services to address this committee at the next meeting. It is important to the success of this committee that we all do our homework prior to meeting. I would request that you consider meeting earlier to resolve these problems.

N.C. Kazanas/jlm

N. C. Kazanas

NCK: jlm

Inter-Office Memorandum

March 2, 1983

PDW/83-056



Subject: Corporate Quality Assurance
Review Committee (C-QARC) Meeting Minutes
2nd Meeting - February 18, 1983

To: N. C. Kazanas
Director-Quality Assurance

Location: Headquarters

ATTENDEES

- *M. W. Allgaier - NDE Programs Supervisor⁽²⁾
- B. A. Bader - Corp. QA Program Development & Audit Manager⁽²⁾
- R. J. Guimond - QA Engineer
- *J. P. Heil - QA Engineer⁽¹⁾
- *P. B. Magitz - Corp. QA Audit Supervisor
- *K. L. Wayne - Manager, QA Design & Procurement

-
- * Permanent Member
 - (1) Alternate for M. J. Stromberg
 - (2) Part Time Attendance

AGENDA ITEM #1: Lack of control of procurement/installation of Class 1E electrical equipment requiring environmental qualifications.

At the first C-QARC meeting, R. J. Guimond was tasked to further investigate the above item and report to the C-QARC. The results of his investigation were presented to the committee as follows:

ENVIRONMENTAL QUALIFICATION PROGRAM PROBLEMS

- Need to have but what elements are missing that don't cover under the C-QARC Org. Plan for E.Q. program.*
1. Lack of a written Corporate policy and guidelines for an overall Environmental Qualification Program (Corporate and sites), describing in detail the responsibilities, activities, and reporting requirements for all divisions.
 2. Technical Functions took position that EP-031 covers E.Q. program. It was pointed out to D. Croneberger the inadequacy of this procedure to constitute on its own the Environmental Qualification Program.

what is inadequate

3. There is a control file; however, it does not meet the requirements of Procedure TAP-007, "Technical Functions Engineering Data Files".
*what was
not - it
it covered in
an audit finding*
4. There is evidence that equipment procured for modifications were commercial grade and does not appear in the submittal nor the E.Q. Test Report Index (see Finding #3 of Audit Report O-TMI-81-02).

The results of Committee deliberations were:

1. Agreement that stated GPUN policy is full compliance with the law.
2. Nonconforming conditions identified to date do not indicate that the entire qualification program is out of control; and, therefore, does not warrant escalation of the broad issue.
3. The lack of a complete file of auditable records should be escalated to the Director-Quality Assurance.
4. All organizations that have responsibilities in the environmental qualification program do not have procedures that clearly define these responsibilities. Examples of these responsibilities include:
 - Preventive maintenance and replacement
 - Control of installation of unqualified items
 - Updating maintenance schedules based on experience

(NOTE: Items 3 and 4, preceding, are considered escalated by virtue of this communication.)

AGENDA ITEM #3: Inadequate implementation of indoctrination and training for Technical Functions personnel; Ref. Finding #2 of Audit O-TMI-80-10.

Attempts to close out this finding have not been successful because of the lack of implementation of corrective action. The Committee agreed that this should be escalated. A memo to R. F. Wilson has been prepared for signature of M. J. Stromberg/N. C. Kazanas/R. L. Long.

NEXT MEETING: The next scheduled C-QARC meeting will be on May 13, 1983, at 1:00 P.M. at Corporate Headquarters.

lap

cc: Attendees
 B. E. Ballard
 T. J. Patterson
 M. J. Stromberg
 C. R. Tracy
 C-QARC File

PB Magitz
 P. B. Magitz
 C-QARC Coordinator

PACK (cont.)

0980881 88058

87001. COMPLETE

RESOLUTION ESCALATION REQUIRED

RESEARCH ABILITIES

QAYES

INITIATE: 830128.
SUSPENSE: 830218.
RESOLUTION: 830225.

83002. COMPLETE

LACK OF INDUSTRY AND TRAINING OF
TECHNICAL FUNCTIONS PERSONNEL, REFERENCE
FINDING NO 2 OF TMI 80-10

COMPEN: 500.
PARTY: RF WILSON
ACTION: PB MAGITZ

INITIATE: 830218.
SUSPENSE: 830218.
RESOLUTION: 830218.

REVISION: 022403



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555
May 25, 1984

1/E
R L. C. Curry

Docket No. 50-289

Mr. Henry D. Hukill, Vice President
and Director - TMI-1
GPU Nuclear Corporation
P. O. Box 480
Middletown, Pennsylvania 17057

Dear Mr. Hukill:

As you know, staff review of the TMI-1 environmental qualification program has been in progress for some time. Recent review activities have included meetings with members of your staff on October 5, 1983 and March 8, 1984, and review of your recent environmental qualification submittals dated February 10, 1984 and February 22, 1984. The focus of the staff's current review of your environmental qualification program has been to (1) assure resolution of the deficiencies identified in the Technical Evaluation Report previously forwarded to you under letter dated December 10, 1982, and (2) to verify the statement from your February 10, 1984 letter that "TMI-1 is currently in compliance with the Environmental Qualification Rule 10 CFR 50.49 as applicable to TMI-1" and as modified by subsequent submittals dated February 22, 1984 and May 7, 1984 and by Licensees Amended Response to Union of Concerned Scientist's Petition for Show Cause Concerning TMI-1 Emergency Feedwater System, dated March 26, 1984.

As part of our overall program review, the staff has been reviewing the environmental qualification of the TMI-1 emergency feedwater (EFW) system. This review has, to date, encompassed two meetings in Bethesda, MD, about five days of audits at GPU Nuclear corporate headquarters in Parsippany, NJ, and the exchange of numerous letters. The staff is continuing its review of the EFW system. That review has identified a number of deficiencies for the EFW system environmental qualification, as identified in the NRC letters of April 25, and May 3, 1984. We understand that supplemental information relative to the EFW system will be submitted to the NRC shortly and that GPU documentation will be available for audit by mid-June 1984.

Based on our audits of the EFW system to date, we believe that the identified deficiencies raise generic issues requiring resolution. Principally, these questions relate to the methodology used to identify equipment that must be environmentally qualified as well as the adequacy of existing supporting documentation. We have, therefore, been unable to conclude that you are presently in compliance with 10 CFR 50.49, as stated in your letter of February 10, 1984 (as modified).

FOIA-87-696

C/S

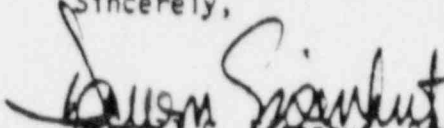
840606 XN35
XA

Accordingly, we request that you submit a response that addresses each of the actions identified in the enclosed request for additional information. In addition, we request your evaluation of this matter, specifically, your reaffirmation of your view regarding whether TMI-1 is presently in compliance with 10 CFR 50.49.

Your response should be provided within 30 days of receipt of this letter.

The reporting and/or recordkeeping requirements of this letter affect fewer than ten respondents; therefore, OMB clearance is not required under P.L. 96-511.

Sincerely,


Barrett G. Eisenhut, Director
Division of Licensing

Enclosure:
Request for Additional
Information

cc w/enclosure:
See next page

Mr. R. J. Toole
O&M Director, TMI-1
GPU Nuclear Corporation
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U.S. Nuclear Regulatory Commission
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Mr. Gustave A. Linenberger, Jr.
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. C. W. Smyth
TMJ-1 Licensing Manager
GPU Nuclear Corporation
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Governor's Office of State Planning
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Washington, D.C. 20036

REQUEST FOR ADDITIONAL INFORMATION

THREE MILE ISLAND, UNIT 1

DOCKET NO. 50-289

1. At the time of restart, all electrical equipment important to safety, as defined in 10 CFR 50.49, is required to be qualified or safe plant operation is required to be demonstrated with equipment not shown to be qualified. Therefore, for any item of equipment that will not be demonstrated to be qualified prior to restart, a justification for continued operation (JCO) must be submitted. An acceptable JCO can be based on one or more of the following criteria:
 - a. The safety function can be accomplished by some other designated equipment that is qualified, and failure of the principal equipment as a result of the harsh environment will not degrade other safety functions or mislead the operator.
 - b. Partial test data that does not demonstrate full qualification, but provides a basis for concluding the equipment will perform its function. If it cannot be concluded from the available data that the equipment will not fail after completion of its safety function, then that failure must not result in significant degradation of any safety function or misleading information to the operator.
 - c. Limited use of administrative controls over equipment that has not been demonstrated to be fully qualified. For any equipment assumed to fail as a result of the accident environment, that failure must not result in significant degradation of any safety function or misleading information to the operator.
2. The licensee should reaffirm that in performing its review of the methodology to identify equipment within the scope of 10 CFR 50.49(b)(2) that the following steps have been addressed:
 1. A list was generated of safety-related electric equipment as defined in paragraph (b)(1) of 10 CFR 50.49 required to remain functional during or following design-basis Loss of Coolant Accident (LOCA) or High Energy Line Break (HELB) Accidents. The LOCA/HELE accidents are the only design-basis accidents which result in significantly adverse environments to electrical equipment which is required for safe shutdown or accident mitigation. The list was based on reviews of the Final Safety Analysis Report (FSAR), Technical Specifications, Emergency Operating Procedures, Piping and Instrumentation Diagrams (P&IDs), and electrical distribution diagrams;

2. The elementary wiring diagrams of the safety-related electrical equipment identified in Step 1 were reviewed to identify any auxiliary devices electrically connected directly into the control or power circuitry of the safety-related equipment (e.g., automatic trips) whose failure due to postulated environmental conditions could prevent required operation of the safety-related equipment and;
3. The operation of the safety-related systems and equipment were reviewed to identify any directly mechanically connected auxiliary systems with electrical components which are necessary for the required operation of the safety-related equipment (e.g., cooling water or lubricating systems). This involved the review of P&IDs, component technical manuals, and/or systems descriptions in the FSAR.
4. Nonsafety-related electrical circuits indirectly associated with the electrical equipment identified in Step 1 by common power supply or physical proximity were considered by a review of the electrical design including the use of applicable industry standards (e.g., IEEE, NEMAN, ANSI, UL, and NEC) and the use of properly coordinated protective relays, circuit breakers, and fuses for electrical fault protection.
3. Reaffirm that all design basis events which could potentially result in a harsh environment, including flooding outside containment were addressed in identifying safety-related electrical equipment with the scope of 10 CFR 50.49(b)(1).
4. The level of detail for the proposed resolutions of the equipment environmental qualification deficiencies, identified in the FRC TER dated November 5, 1982, should be similar to the examples that are on the enclosed sample. For each TER equipment item, the deficiencies should be listed and a proposed resolution identified for each deficiency.
5. Verify completeness of the list of equipment required to be environmentally qualified. Electrical equipment important to safety, as defined in 10 CFR 50.49, need not be environmentally qualified if one or more of the following criteria are satisfied:
 - a. Equipment is not required to perform a safety function during or following exposure to the harsh environment created by a design basis accident (DBA), and failure of the equipment will not adversely impact safety functions or mislead the operator.
 - b. Equipment is required to perform a safety function during or following a DBA, but is not subjected to a harsh environment as a result of the DBA.

- c. Equipment performs its function before its exposure to a harsh environment, and the adequacy of the time margin provided is justified; subsequent failure of the equipment as a result of the harsh environment will not degrade other safety functions or mislead the operator.
- d. The safety function can be accomplished by some other designated equipment that is qualified and satisfies the single-failure criterion; failure of the principal equipment as a result of the harsh environment will not degrade other safety functions or mislead the operator.

IV. Specific Equipment EQ Deficiencies (continued)

FRC Item Number	Description (Manufacturer, Model, Etc)	NRC Category	Deficiencies	Proposed Resolution
<u>A. Electrical Cable (continued)</u>				
93 66	General Electric cable; multipair thermocouple extension cable with overall shield	1.B	Documented evidence of qualification inadequate	Testing and analysis had not been performed on this cable at the time of the TER/SER review; therefore, qualification documentation was noted as being inadequate by FRC. Qualification deficiencies for qualification time, material aging, humidity, temperature, pressure, and radiation were identified. A review of the applications for this cable indicated its only use was with originally installed thermocouples. There are no safety-related applications for the thermocouples in the plant; therefore, the cable does not require qualification. Therefore, these components should be in NRC Category III.A, Equipment Exempt from Qualification.
90 64	General Electric cable; cross-linked poly- ethylene insulation with neoprene jacket	1.B	Documented evidence of qualification inadequate	Testing and analysis had not been performed on this cable at the time of the TER/SER review; therefore, qualification documentation was noted as being inadequate by FRC. Qualification deficiencies for qualification time, material aging, humidity, temperature, pressure, and radiation were identified. Review of the applications of this cable indicated its only use was in the radiation monitoring system, which is not a safety-related system. Therefore, all references to this cable were deleted from the qualification program after it was determined the cable is not used in safety-related applications. Therefore, these components should be in NRC Category III.A, Equipment Exempt from Qualification.
91 76	General Electric cable; rubber-insulated with a hypalon jacket	1.B	Documented evidence of qualification inadequate	Testing and analysis had not been performed on this cable at the time of the TER/SER review; therefore, qualification documentation was noted as being inadequate by FRC. Qualification deficiencies for qualification time, material aging, humidity, temperature, pressure, and radiation were identified. Review of the applications of this cable indicated its only use was in the radiation monitoring system, which is not a safety-related system. Therefore, all references to this cable were deleted from the qualification program after it was determined the cable is not used in safety-related applications. Therefore, these components should be in NRC Category III.A, Equipment Exempt from Qualification.

IV. Specific Equipment EQ Deficiencies (continued)

FRC Item Number	Description (Manufacturer, Model, Etc)	NRC Category	Deficiencies	Proposed Resolution
G. FLOW SWITCHES				
	Barton, 289	I.B	Documented evidence of qualification inadequate	These components were scheduled for replacement; however, no qualified replacement was identified at the time of the TER/SER review. Therefore, documented evidence of qualification was indicated as inadequate. They will be replaced by qualified Rosemount Model 1153, Series B transmitters. Qualification is required for post-accident radiation only. Rosemount Test Report 108025, Rev B, dated February 1983, has been evaluated and found to qualify the Rosemount Model 1153, Series B transmitters for the normal service conditions and the postulated post-accident radiation at the operational life of the Model 1153, Series B has been determined by Rosemount to be 20 years; therefore, these components will require replacement at the end of this period. These qualified replacement components should be in NRC Category I.A, Equipment Qualified.
	Mercoild, DA5333	I.B	Documented evidence of qualification inadequate	These components were scheduled for shielding or replacement, and qualification was not available at the time of the TER/SER review. Therefore, the documented evidence of qualification was considered inadequate by FRC. Qualification was required for post-accident radiation only. The shielding design for these components has been completed, and the radiation environment is now mild. Therefore, these components should be in NRC Category III.B, Equipment Not in the Scope of the Review.
H. FLOW TRANSMITTERS				
10,31 10,31	General Electric GE/MAC 553	I.B	Documented evidence of qualification inadequate	At the time of TER/SER review, these components were scheduled for either testing or analysis. The decision was made to test the component for radiation because radiation caused by a design basis accident is the only harsh environment to which these components are ever subjected. Subsequently, the GE/MAC 553 transmitters were tested by Wyle Laboratories. Qualification was provided in Wyle Test Report 45917-1, July 30, 1982. Review and evaluation of the test report revealed that these components are qualified for the required conditions. Therefore, these qualified components should be in NRC Category I.A, Equipment Qualified.
61	Leads And Northrup 000-0300-0300	I.B	Documented evidence of qualification inadequate	This component was originally scheduled for replacement; however, no qualified replacement was identified at the time of TER/SER review. Therefore, documented evidence of qualification was indicated as inadequate. Subsequently, it was determined that this component would perform no safety-related function. It provides only flow indication for the SGTS and does not provide any control function. The required control function for the system is provided by FSL 1/2-7541-BA,B and -33A,B. Therefore, this component should be in NRC Category III.A, Equipment Exempt from Qualification.

IV. Specific Equipment EQ Deficiencies (continued)

FRC Item Number	Description (Manufacturer, Model, Etc)	MRC Category	Deficiencies	Proposed Resolution
P. MOTOR CONTROL CENTERS				
83 62	General Electric 7700 Series	I.B	Documented evidence of qualification Inadequate	Qualification deficiency was identified as the radiation parameter and was originally to be resolved by analysis and/or testing. This deficiency was applicable because these MCCs had not been qualified to a harsh radiation environment. Later, the qualification was selected to be by the method of testing. A detailed walkdown of the MCCs was completed to identify the specific components of each MCC. An investigative study was undertaken to properly select the components to be included in the test program. These components, which were obtained from the stations with consideration for the vintage, were assembled into a test model designed to be representative of all MCCs. A radiation test was conducted for this model. Wyle Test Report 45917-30 was evaluated. The deficiency is resolved by this test report, and this item is fully qualified to all environmental parameters. Therefore, these qualified components should be in MRC Category I.A, Equipment Qualified.
D. MOTOR-DRIVEN PUMPS				
79	General Electric 5K6538XC23A	I.B	Documented evidence of qualification Inadequate	The qualification of these components was not established at the time of TER/SER review, and the components were slated to be qualified for radiation during a post-DBA operation only. General Electric has provided qualification documentation in its Report NEDC-30066/B3NED024 (February 1983) for the pump motors at Based on the evaluation of the data in these reports, these motors are qualified for the normal and the postulated post-DBA environmental conditions. Therefore, these qualified components should be in MRC Category I.A, Equipment Qualified.
80 45	General Electric 5K6657XC71A	I.B	Documented evidence of qualification Inadequate	The qualification of these components was not established at the time of TER/SER review, and the components were slated to be qualified for radiation during a post-DBA operation only. General Electric has provided qualification documentation in its Report NEDC-30066/B3NED024 (February 1983) for the pump motors at Based on the evaluation of the data in these reports, these motors are qualified for the normal and the postulated post-DBA environmental conditions. Therefore, these qualified components should be in MRC Category I.A, Equipment Qualified.
37	General Electric 5K6538XC23A 5K6657XC71A	II.A	Documented evidence of qualification Inadequate	The qualification of these components was not established at the time of TER/SER review, and the components were slated to be qualified for radiation during a post-DBA operation only. General Electric has provided qualification documentation in its Report NEDC-30066/B3NED024 (February 1983) for the pump motors at Based on the evaluation of the data in these reports, these motors are qualified for the normal and the postulated post-DBA environmental conditions. Therefore, these qualified components should be in MRC Category I.A, Equipment Qualified.

IV. Specific Equipment EQ Deficiencies (continued)

ERC Item Number	Description (Manufacturer, Model, Etc)	NRC Category	Deficiencies	Proposed Resolution
U. Pressure Switches (continued)				
33 33	Static-O-Ring GHL-3	II.A	Documented evidence of qualification is inadequate	Not applicable because these components are not subjected to harsh environmental conditions; therefore, they are deleted from the qualification program. These components should be in NRC Category III.B, Equipment Not in the Scope of the Review.
36 36	Static-O-Ring 12N-AA5-IT	II.A	Documented evidence of qualification is inadequate	Not applicable because these components are not subjected to harsh environmental conditions; therefore, they are deleted from the qualification program. These components should be in NRC Category III.B, Equipment Not in the Scope of the Review.
None None	Barksdale B2T-A1255	NA	None.	These components were located in mild environments at the time of the TER/SER review; therefore, no deficiency was identified. Subsequently, deficiencies were identified for pressure, temperature, and humidity only. Therefore, these Barksdale B2T-A1255 pressure switches will be replaced with qualified Rosemount Model 1153, Series B transmitters. Rosemount has tested its Model 1153, Series B transmitters and provided the qualified documentation in Test Report 108025, Rev B, dated February 1983. The report has been reviewed and evaluated and found to qualify the transmitters for the required conditions. The qualified life of the Model 1153, Series B transmitters has been determined by Rosemount to be 20 years; therefore, these components will require replacement after this period. These qualified replacement components should be placed in NRC Category I.A, Equipment Qualified.
V. PRESSURE TRANSMITTERS				
None None	Ballou, B&W K0556220BAATWFE	NA	None	At the time of the TER/SER review, no deficiency was identified for these Ballou pressure transmitters. However, these transmitters are required to be qualified for post-accident radiation only. Wyle has conducted testing on these transmitters and provided qualification documentation in Test Report 45917-60, September 1983. The report has been reviewed and evaluated, and it has been determined that these transmitters are qualified for the required accident radiation dose. Therefore, these qualified components should be placed in NRC Category I.A, Equipment Qualified.