



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING DIRECTOR'S DECISION

UNDER 10 CFR 2.206 (ENVIRONMENTAL QUALIFICATION OF EMERGENCY FEEDWATER)

METROPOLITAN EDISON COMPANY
JERSEY CENTRAL POWER COMPANY
PENNSYLVANIA ELECTRIC COMPANY
GPU NUCLEAR CORPORATION

THREE MILE ISLAND UNIT NO. 1

FACILITY OPERATING LICENSE NO. DPR-50

DOCKET NO. 50-289

INTRODUCTION

The Union of Concerned Scientists (UCS) filed a petition, dated January 20, 1984, pursuant to 10 CFR 2.206 requesting that the NRC suspend the operating license for Three Mile Island Unit 1 (TMI-1) unless and until the plant's emergency feedwater (EFW) system complies with the NRC rules applicable to systems important to safety. One of the issues addressed in the UCS petition concerns the environmental qualification of the EFW system. The UCS states that the TMI-1 EFW system is not environmentally qualified as required by NRC regulations. To support this statement, the UCS cites 1) the enclosure to an August 23, 1983 letter from GPU which states that EFW system equipment shall either be upgraded to be qualified, replaced or relocated, 2) a December 10, 1982 staff SER addressing environmental qualification and the November 5, 1982 Franklin Research Center (FRC) Technical

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Evaluation Report (TER) attached to that SER which identifies certain deficiencies regarding the qualification of EFW system equipment, 3) an October 5, 1983 meeting between the licensee and staff during which the licensee was unable to resolve the deficiencies identified in the FRC TER, and 4) a December 16, 1983 meeting between GPU and the staff during which environmental qualification was briefly discussed.

BACKGROUND/DISCUSSION

The staff issued to GPU an SER, dated March 24, 1981, addressing the environmental qualification of safety-related electrical equipment for TMI-1. In response to that SER, the licensee submitted additional information regarding the qualification of safety-related electrical equipment. This information was evaluated for the staff by the Franklin Research Center (FRC) and a Technical Evaluation Report (TER) for TMI-1, dated November 5, 1982, was prepared by FRC to document the results of that evaluation. A safety evaluation report was subsequently issued to GPU on December 10, 1982, with the FRC TER as an attachment. As with equipment associated with other systems, the FRC TER identifies qualification deficiencies for EFW system equipment. Shortly after the TMI-1 SER cited above was issued, a final rule on environmental qualification of electric equipment important to safety for nuclear power plants became effective on February 22, 1983. This rule, Section 50.49 of 10 CFR 50, specifies the requirements to be met for demonstrating the environmental qualification of electrical equipment important to safety located in a harsh environment. In accordance with this rule, equipment for TMI-1 may be qualified to the criteria specified in either the DOR Guidelines or NUREG-0588, except for replacement equipment. Replacement equipment

installed subsequent to February 22, 1983 must be qualified in accordance with the provisions of 10 CFR 50.49, using the guidance of Regulatory Guide 1.89, unless there are sound reasons to the contrary.

The staff met with GPU on October 5, 1983. The staff intended to discuss with the licensee its proposed resolutions for the deficiencies identified for all the equipment evaluated in the FRC TER. However, the licensee was not prepared at that time to discuss resolution of the deficiencies. The staff subsequently requested the licensee to meet with the staff again to discuss, among other EQ issues, the licensee's resolution of the deficiencies identified in the TER. That meeting took place on March 8, 1984.

By letters dated February 10 and 22, 1984, GPU provided its proposed resolutions for the qualification deficiencies identified in the FRC TER, and a justification for continued operation (JCO) for equipment whose qualification is not yet complete. The attachments to those letters indicated that, in the licensee's opinion, all electrical equipment evaluated in the FRC TER was either environmentally qualified, with the exception of the Bailey E/P converters for the EFW control valves, or was not required to be qualified. Therefore, except for the Bailey E/P converters all electrical equipment associated with the EFW system that was evaluated in the FRC TER was, in the licensee opinion, either qualified or was not required to be qualified. In its February 24, 1984 response to the subject petition, the licensee stated that the TMI-1 EFW system would be environmentally qualified by June, 1984, except for the E/P converters. For the Bailey E/P converters, the licensee provided a JCO in the attachment to its February 22, 1984 letter and in its petition response.

The staff reviewed the attachments to the licensee's February 10 and 22, 1984 letters and could not conclude, solely on the basis of the information in these submittals, that the EFW equipment was environmentally qualified. In the staff's opinion a meeting with GPU was necessary to discuss these submittals, and a staff review of the EFW equipment qualification documentation would also be required. As a result of a March 7, 1984 meeting of NRC staff members, it was also concluded that more information was needed from the licensee and that significant staff review effort would be required before the staff could determine the acceptability of the licensee's JCO for the Bailey E/P converters. This would be one of the items discussed at the meeting with GPU.

The staff met with GPU on March 8, 1984 to discuss the TMI-1 environmental qualification program, including qualification of the EFW equipment and the JCO for the Bailey E/P converters. At the meeting the staff informed GPU of the information that would be required to be provided before the acceptability of the JCO for the Bailey E/P converters could be determined. GPU was also requested to provide the staff as soon as possible with a complete list of all EFW equipment required to be environmentally qualified.

GPU subsequently provided the staff with a list of EFW equipment within the scope of 10 CFR 50.49 and required to be environmentally qualified.

On March 20 and 21, 1984, the staff and a consultant from EG&G, Idaho, performed an audit of the TMI-1 electrical equipment environmental qualification (EQ) files. During that audit, the staff and its consultant reviewed the documentation in the EQ files for all EFW system electrical equipment that had been identified by GPU as required to be environmentally qualified.

At the time of the audit cited above, the licensee identified to the staff seven items of EFW system electrical equipment that, in the licensee's opinion, were not within the scope of 10 CFR 50.49, i.e., the equipment was not required to be environmentally qualified. Justification for not requiring qualification of NAMCO limit switches, some ASCO solenoid valves and Barton D/P switches had been documented in the licensee's February 10, 1984 submittal. For the remaining ASCO solenoid valves associated with the EFW system, justification for not requiring qualification had previously been submitted by the licensee in response to the staff's March 24, 1981 SER. Justification for not requiring qualification of the Fisher limit switches had not been formally submitted.

The licensee next submitted a March 26, 1984 amended response to the UCS petition. In this revised response, it is stated that replacement of the Bailey E/P converters for the EFW control valves would be completed by June, 1984. GPU also submitted additional information regarding the environmental qualification of EFW system electrical equipment by letter dated March 29, 1984. In that letter, the licensee provided justification for not requiring qualification of the Fisher limit switches. That letter also stated that the information supplemented the visit to the GPUN corporate office on March 20 and 21, 1984 at which time this information was reviewed.

By letter dated April 25, 1984, the staff provided GPU with the results of its electrical equipment EQ file audit performed on March 20, and 21, 1984. The enclosure to that letter identified comments regarding the EQ files that were

made by the staff and its consultant during the audit. That letter requested the licensee to update the EQ files in accordance with those comments.

In an April 26, 1984 amended response to the UCS petition, the licensee stated it will complete structural modifications prior to restart that will extend the time available to the operator for terminating flooding in the Intermediate Building following a main feedwater line break. Such a break would then not result in submergence of EFW system equipment not demonstrated qualified for submergence.

By letter dated May 3, 1984, the staff requested GPU to identify and provide a complete list of all EFW system electrical equipment located in the Intermediate Building, and therefore subject to a harsh environment resulting from a high energy line break (HELB) in that building. That letter also requested additional information with respect to the items of EFW system electrical equipment, cited above, that were determined by the licensee as not requiring qualification.

On May 7 and 8, 1984, the staff and a consultant from EG&G, Idaho, again met with GPU at their corporate offices to discuss EFW system EQ. The staff discussed with GPU the broader issue of what electrical equipment, in addition to equipment which is part of the EFW system itself, is associated with the function of the EFW system. The licensee was requested to address this issue when it responded to the staff's letter of May 3, 1984, and to include justification for not requiring qualification of any additional equipment that is not part of the EFW system, but that is located in a harsh environment area and is associated with the function of the EFW system.

During the May 7 and 8, 1984 trip to GPU's corporate offices, the staff and its consultant also reviewed EQ documentation for three additional items of EFW system electrical equipment. One of the equipment items, BIW cable, had been identified by the licensee as EFW system equipment subsequent to the staff's previous audit on March 20 and 21, 1984. The other two items required to be qualified, Conoflow I/P converters and the Anaconda cable associated with it, resulted from the replacement of the Bailey E/P converter. The staff provided a copy of its comments on these files to GPU, and requested that they be addressed as part of the licensee's response to the staff's April 25, 1984 letter. These and all other audit comments were subsequently also provided to UCS by letter dated August 7, 1984.

A supplemental petition, dated May 9, 1984, was filed by the UCS pursuant to 10 CFR 2.206. In its supplemental petition, the UCS requests three additional items of relief from the Commission based essentially on the results of the staff's March 20 and 21, 1984 EQ file audit. The three additional items of relief requested are:

1. As a precondition to restart, the staff should be directed to independently verify that documentation exists and that it is technically sufficient to demonstrate environmental qualification of each and every electrical component in the emergency feedwater system and in every other system required for proper operation of the emergency feedwater system.

2. The Office of Investigations should be directed to immediately investigate whether GPU has made material false statements to NRC in connection with the environmental qualification program. Because this issue bears directly on GPU's competence and integrity, the investigation should be completed before a vote on restart.
3. The Office of Inspector and Auditor should be directed to investigate and determine whether the NRC staff has provided false or misleading information to the Boards or to the Commission, or has been derelict in its duty in connection with the issue of environmental qualification in TMI-1.

By letter dated May 10, 1984, GPU provided its response to the staff's letter of May 3, 1984. In a May 16, 1984 amendment to its response to the UCS petition, the licensee cites this letter and other references as documenting its resolution of outstanding qualification items.

On May 24, 1984, the staff and a consultant from EG&G, Idaho, once again met with GPU at their corporate offices. At that meeting the licensee informed the staff that it had obtained the assistance of a consulting firm to revise the format of GPU's EQ files. Following an explanation of the new format by one of the licensee's consultants, the staff and its consultant examined several of the restructured EQ files associated with EFW system electrical equipment. The staff provided GPU with a copy of comments the staff and its consultant wrote down while reviewing the files. The staff also verbally provided GPU with comments concerning the new format of the files and requested some changes be made to that format. One of the licensee's consultants later responded to some of the staff's comments provided to the licensee earlier in the day.

Also during the May 24, 1984 meeting, the staff and its consultant provided verbal comments to GPU on a draft response to the staff's letter of April 25, 1984. Included in that discussion were the licensee's draft responses to the staff's comments resulting from the EQ file audit performed on May 7 and 8, 1984, which would be included in GPU's response to the staff's April 25, 1984 letter. The staff informed the licensee during that meeting that following receipt of GPU's formal response to the April 25, 1984 letter and a determination by GPU that restructuring of the EQ files for the EFW system and associated equipment was completed and that the files documented full qualification of the equipment, the staff would perform a review of those files.

By letter dated May 31, 1984, the licensee submitted its response to the staff's April 25, 1984 letter. In another amended response to the UCS petition, also dated May 31, 1984, the licensee stated that based on its further review the terminations on the EFW pump motors have not been documented as qualified. In this amended response the licensee stated that these terminations would be replaced with qualified terminations in June, 1984.

The licensee then submitted a response, dated June 11, 1984, to the UCS supplemental petition of May 9, 1984. The response concludes that the supplemental petition should be denied as unnecessary (Relief Item 1) and without basis (Relief Item 2).

After being informed by the licensee that the EQ files for the EFW system and associated electrical equipment were ready to be audited, the staff and a consultant from EG&G, Idaho, performed that audit on June 25, 1984. The staff and its consultant found that there were still deficiencies remaining in the EQ files. These remaining deficiencies, discussed below, were identified to the licensee prior to the staff's departure from the GPU office.

By letter dated June 25, 1984, the staff informed GPU that four motorized valve actuators that the licensee identified in its May 10, 1984 letter as not requiring environmental qualification should be included in its EQ program and demonstrated to be environmentally qualified.

The UCS filed a reply to GPU's June 11, 1984 response to the May 9, 1984 UCS supplemental petition. In its reply, dated July 31, 1984, the UCS reiterates its request that the Office of Investigations immediately investigate whether GPU has made material false statements to NRC in connection with the environmental qualification program.

The staff performed a final audit on August 6, 1984, shortly after being informed by the licensee that the EQ files for all EFW system electrical equipment, and electrical equipment associated with the function of the EFW system, were complete and that all deficiencies identified during the June 25, 1984 audit had been corrected. The results of that audit are presented later in this evaluation.

By letter dated August 6, 1984, the licensee provided its response to the staff's June 25, 1984 letter. In its response, the licensee stated its intention to include in its EQ program the four valve actuators the staff identified as requiring environmental qualification. GPU also stated its intention to replace the motors in two of these four actuators. Qualification of the four actuators is discussed later in this evaluation.

EVALUATION

In its petition, UCS states that the TMI-1 EFW system is not environmentally qualified as required by NRC regulations. Specifically, the UCS contends that EFW system electrical equipment is not qualified for the environment resulting from a high energy line break in the Intermediate Building. The UCS' supplemental petition cites the results of the staff's March 20 and 21, 1984 EQ file audit as a further basis to support the original petition.

NRC's Environmental Qualification Requirements

The Commission's requirements regarding environmental qualification of electrical equipment important to safety located in areas subject to harsh environmental conditions resulting from Design Basis Accidents are contained in Section 50.49 of 10 CFR Part 50. However, plants are allowed to operate prior to the deadline for qualification specified in 10 CFR 50.49, or any extension to that deadline granted by the staff or the Commission, with

equipment whose qualification has not been completed if it can be shown that such operation will not present undue risk to the public health and safety pending complete qualification. An analysis is required to be performed, called a justification for continued operation (JCO) in the case of an operating plant, that demonstrates the plant can be operated in a safe manner with the equipment not yet qualified.

Scope of Electrical Equipment

Some items of EFW system electrical equipment are identified in the petition. In order for the staff to determine the qualification status of all EFW system electrical equipment, GPU was requested to identify all EFW system electrical equipment located in a potentially harsh environment area, ie., the Intermediate Building. GPU was also requested to identify all electrical equipment, located in a harsh environment, associated with the function of the EFW System. Following is a list, provided by letter dated May 10, 1984 from GPU, that includes both EFW system electrical equipment, and electrical equipment associated with the function of the EFW system. (The May 10, 1984 letter incorrectly identified the model number of the Conoflow I/P converters. The correct model number, given below, is identified in the EQ file for this item of equipment and in the licensee's August 6, 1984 letter).

<u>Equipment</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Tag No(s).</u>	<u>TER Item No.</u>
Motorized Valve Actuators	Limitorque	SMB0	EFV-2A&B	11
Motorized Valve Actuators	Limitorque	SMB000	EFV-1A&B	15
Pump Motors	Westinghouse	HP 450	EFP-2A&B	51
Cable	Continental Wire and Cable Co.			107
Cable	Kerite			106
Terminal Block	States	NT		110
Flow Transmitters	Foxboro	NE 13DM	FT-791, 779, 782 & 788	None
Cable	Anaconda			None
Cable	Boston Insulated Wire			None
Motorized Valve Actuators	Limitorque	SMB1	MSV-2A&B	None
I/P Converters	Conoflow	GT45CA1826		Replaced 60
Diodes	Square D	JTXIN6071A		Replaced 116
Limit Switches	NAMCO	D2 J0X2	LSA/MSV-6 LSB/MSV-6	66
Limit Switches	NAMCO	D1200G2	LSA/MSV-13A&B LSB/MSV-13A&B	67
Limit Switches	Fisher		LS/EFV-30A&B	None
Solenoid Valves	ASCO	L38210C94	SV3/EFV-30A&B SV4/EFV-30A&B	26

<u>Equipment</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Tag No(s).</u>	<u>TER Item No.</u>
Solenoid Valves	ASCO	8300C68G	SV1/EFV-30A&B SV2/EFV-30A&B	28
Solenoid Valves	ASCO	LB83146	SV/EFV-8A,B&C	31
D/P Switches	Barton	277A	FIS-77,78&79	77
Motorized Valve Actuators			COV-14A&B	None
Motorized Valve Actuators	Limitorque	SMB1	MSV-2A&B	None
Motorized Valve Actuators			COV-111A&B	None
Motorized Valve Actuator			ASV-4	None
Turbine Driven Pump			EFP-1	None
Motorized Valve Actuators			EFV-4&5	None
Pneumatic Valve Actuators			MSV-4A&B	None
Pneumatic Valve Actuator			MSV-6	None
Motorized Valve Actuators			MSV-1A,B,C&D	None
Motorized Valve Actuators			MSV-10A&B	None

<u>Equipment</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Tag No(s).</u>	<u>TER Item No.</u>
Pneumatic Valve Actuators			MSV-13A&B	None
Pressure Transmitters			PT-65,71&75	None
Temperature Element			TE-230	None
Pneumatic Valve Actuators			EFV-15A&B	None
Speed Indicating Transmitter			ST-8	None
Motorized Valve Actuators			MSV-8A&B	None

The staff discussed with GPU the scope of equipment, both EFW system equipment and equipment associated with the function of the EFW system, i.e., interfacing equipment, in detail during the meeting at GPU's corporate offices on May 7 and 8, 1984. During that meeting, a flow diagram that identified all such equipment, both located inside and outside the Intermediate Building, was used for discussion purposes.

Subsequent to receipt of the licensee's May 10, 1984 letter and the meeting cited above, two additional items of equipment were added to the scope of this review, namely Kerite 5 kV cable splices and Raychem WCSF200N low voltage splices (1kV). Both of these equipment items are components of equipment listed above. The Kerite splices are replacements for the EFW pump motor terminations whose qualification could not be documented, as stated by the licensee in its May 31, 1984 amended petition response. The Raychem splices are being installed in Limitorque motorized valve actuators EFV-1A&B and COV-111A&B to replace splices found in them during an examination of these actuators in the plant.

Based on its review, the staff concurs that the above list of equipment together with the Kerite and Raychem splices includes all EFW system equipment and interfacing equipment located in the Intermediate Building, and therefore defines the proper scope of equipment for the purposes of this evaluation.

Qualification Status of the Equipment

Equipment Required to Be Qualified

The above equipment could be subjected to, and therefore must be qualified for, harsh environmental conditions resulting from high energy line breaks in the Intermediate Building. The most severe temperatures, pressures and relative humidity that the equipment could experience results from an envelope of the conditions created by a main steam line break and a steam supply to EFWP turbine line break. Additionally, some cable will become submerged as a result of a break in the main feedwater piping. The staff had previously verified that the environmental parameters identified by the licensee for the main steam line break are acceptable, as documented in the staff's March 24, 1981 SER for TMI-1.

In its May 10, 1984 letter, the licensee identified the first 11 items of equipment listed above as required to be environmentally qualified in accordance with the requirements of 10 CFR 50.49. For 23 of the remaining items above, the licensee provided justification for not requiring that the equipment be demonstrated to be environmentally qualified. The Square D diodes had been identified prior to the staff's March 20 and 21, 1984 EQ file audit as requiring qualification. The licensee subsequently provided justification for not requiring qualification of the diodes, discussed later in this evaluation.

The staff reviewed the list of equipment required to be qualified as identified by the licensee, and the justification provided for not requiring qualification of the remaining equipment within the scope of this review.

Based on that review, the staff determined that four additional Limitorque motorized valve actuators, COV-14A&B and COV-111A&B, required qualification and informed the licensee of this by letter dated June 25, 1984, as cited above. Therefore, the electrical equipment within the scope of this review that is required to be environmentally qualified consists of the 11 items of electrical equipment identified by the licensee in its May 10, 1984 submittal as required to be qualified, the four additional valve actuators identified above, and the Kerite and Raychem splices discussed above.

As stated previously, the staff met with GPU to discuss the environmental qualification of TMI-1 electrical equipment and their proposed resolutions for the deficiencies identified in the FRC TER. The staff then performed audits of the licensee's EQ files at the GPU corporate offices on March 20 and 21, May 7 and 8, May 24, June 25, and August 6, 1984. The audits involved a review by the staff and a consultant from EG&G, Idaho, of the EQ documentation relied upon by GPU to demonstrate environmental qualification of all electrical equipment required to be environmentally qualified. The staff's comments on the EQ documentation it reviewed during its March 20 and 21, 1984 audit are contained in the enclosure of the April 25, 1984 letter from the staff to GPU. The staff's comments on the documentation it reviewed on May 7 and 8, 1984 were provided to the licensee prior to the staff's departure from GPU's corporate offices on May 8, 1984. The staff provided written and verbal comments to the licensee at the time the staff reviewed the EQ files on May 24, and provided verbal comments to the licensee at the June 25, 1984 audit. Audit comments were also subsequently provided to UCS by letter dated August 7, 1984.

As indicated by the comments resulting from the staff's first two audits of EQ documentation, a significant amount of effort remained on the part of the licensee in order to document in a complete manner that the equipment is environmentally qualified. In that regard, the licensee was requested by the staff's April 25, 1984 letter to update the EQ files the staff audited in accordance with the comments identified in the letter's attachment. GPU was also requested to address the staff's comments resulting from the audit performed on May 7 and 8.

The comments the staff made on the EQ files it reviewed during the first two audits can be characterized as absence of complete documentation to demonstrate the equipment was environmentally qualified. The EQ documentation provided to the staff for review consisted essentially of reports documenting the results of testing that had been performed on the equipment. A test report, in and of itself, does not completely support a determination that the equipment is qualified. The user of the equipment, i.e., licensee or applicant, is required to review the report and document such things as required post-accident operating time compared to the duration of time the equipment has been demonstrated to be qualified, similarity of tested equipment to that installed in the plant (e.g., insulation class, materials of components of the equipment, tested configuration compared to installed configuration), evaluation of adequacy of test conditions, aging calculations for qualified life and replacement interval determination, effects of decreases in insulation resistance on equipment performance, adequacy of demonstrated accuracy, evaluation of test anomalies, and applicability of EQ problems reported in IE Information Notices and their resolution. The staff's comments concerned the lack of documentation to address these issues.

During the staff's third audit on May 24, 1984, the licensee was in the process of restructuring the EQ files. The staff reviewed some of these files containing EQ documentation for several of the same equipment items that it had reviewed documentation for during the first two audits. The written and verbal comments the staff provided the licensee consisted of questions regarding clarification of some of the documentation in the files and suggestions regarding the format of the restructured files.

The staff performed its fourth audit of the EQ files on June 25, 1984. At that audit the staff reviewed a total of 10 EQ files. Nine of these files contained EQ documentation for all 11 items of electrical equipment identified by the licensee in its May 10, 1984 submittal as required to be environmentally qualified. The remaining file contained the EQ documentation for the replacement EFW pump motor terminations, Kerite splices. The staff found one deficiency applicable to almost all of the files, i.e., the basis for the demonstrated post-accident operating time. For most of the equipment, the files showed that the basis for the length of time the equipment was qualified to operate post-accident was that the environmental conditions returned to normal approximately two hours following a high energy line break, and therefore the equipment would be operating in a mild environment and not subject to failure as a result of environmental conditions. The staff informed the licensee that this basis was technically inadequate and not acceptable. For one item of equipment, the Conoflow I/P converters, the licensee performed an Arrhenius calculation while the staff was reviewing the files that documented, in an acceptable manner, the demonstrated post-accident operating time. For all remaining affected files the staff requested the licensee to resolve this deficiency and document that resolution in the files.

The 10 files the staff reviewed and its findings as a result of the June 25, 1984 audit, in addition to the deficiency discussed above, were as follows:

1. GPU File EQ TM 104

Limatorque Motorized Valve Actuators

EFV-2A&B, Model SMBO, TER Item No. 11

EFV-1A&B, Model SMB000, TER Item No. 15

MSV-2A&B, Model SMB1, No TER Item No.

The documentation in the file was adequate to show that this equipment is environmentally qualified, with one exception. This exception concerned the disposition of IE Information Notice 83-72. Reference No. 10409 in the file stated that Limatorque informed GPU during a telecon that only one nuclear plant (not TMI-1) contained the valve motor operators with the underrated terminal blocks identified in the Information Notice. This document further stated that GPU will get a letter from Limatorque to confirm the telecon information. The staff informed the licensee that the terminal block in question had been found at another plant besides the one identified by Limatorque, and that this issue remained to be resolved for TMI-1. There was no other documentation in the file to address the other information concerning Limatorque Motorized Valve actuators in the IE Information Notice.

The UCS' May 9, 1984 supplemental petition cites certain findings from the staff's March 20 and 21, 1984 audit. One of the findings cited is that the file did not document the motor manufacturer, the insulation class and the current type for the valve actuators. These deficiencies had been resolved. The file contained a listing, generated using maintenance records, of valve actuators and motor manufacturers, insulation class and current type. Another of the staff's audit findings cited by UCS is that the temperature profile used by GPU to claim qualification was less severe than would result from a break of the pipe which supplies steam to the turbine driven pump. This deficiency had been addressed by an analysis contained in the file that shows the equipment is qualified for the more severe environments. The staff reviewed that analysis and found it acceptable to resolve this deficiency. Further, the file contained documentation that resolves all deficiencies identified in the 1982 FRC TER, including those cited by the UCS. It should be noted that TER deficiency C.3, cited by UCS, concerned the main steam line break (MSLB) temperature spike and not the temperature resulting from a steam supply to EFWP turbine line break. -

2. GPU File EQ TM 107

Westinghouse Pump Motors

EFP-2A&B, Model HP 450, TER Item No. 51

The documentation in this file supported a finding that this equipment is environmentally qualified, with the exception of the pump motor terminations. Qualification of the pump motor terminations is addressed later in this evaluation.

One of the staff's March 20 and 21, 1984 audit findings cited by UCS in its supplemental petition is that the file did not contain information to establish similarity between these motors and the motor, lead wires and insulation tested. The file contained a document, WCAP 10575, Rev. 0, "Evaluation of the Operation of Emergency Feedwater Pump Motors in a High Energy Line Break Environment for GPU's TMI Unit 1 Nuclear Power Plant," dated June 19, 1984, and other documentation that established similarity of the TMI-1 motors and motors, lead wire and insulation tested. Documentation describing these tests and the results were also included in this file.

3. GPU File EQ TM 108

Anaconda Cable

No TER Item No.

The documentation in this file provided adequate evidence that the cable is environmentally qualified, with one exception. The documentation did not completely establish similarity between the cable installed in TMI-1 and the cable tested. The licensee was requested to resolve this deficiency.

4. GPU File EQ TM 111

Kerite Cable

TER Item No. 106

The documentation in this file provided evidence that environmental qualification has been demonstrated. In its supplemental petition, the UCS cited the staff's March 20 and 21, 1984 audit findings at which time the staff found that this file did not contain documentation to establish similarity between the cables tested and those installed, nor did the file contain documentation to establish a qualified life for the cable. These deficiencies had been resolved. The file contained a letter from Kerite, dated May 16, 1984, that establishes the applicability of Kerite Report, "TMI-1 GPU Metropolitan Edison Co. Qualification Documentation for Kerite HTK/FR Power Cables," dated August 21, 1981, for establishing qualification of TMI-1 cables. This Kerite report was not in the file at the time of the staff's March 20 and 21 audit. The file also contained documentation describing the aging performed on the test cables that shows the cables have a qualified life of 40 years at 90°C.

5. GPU File EQ TM 102

States Terminal Blocks

Model NT, TER Item No. 110

The documentation in this file resolved all audit comments and provided adequate evidence that the equipment is environmentally qualified.

6. GPU File EQ TM 110

Foxboro Flow Transmitters

FT-791, 799, 782 & 788, Model NE 13DM, No TER Item No.

Documentation in this file was still deficient in that two anomalies that occurred during testing of these transmitters had not been adequately addressed. The staff reviewed a memorandum dated August 3, 1983 that the licensee, in its May 31, 1984 submittal, identified as documenting its evaluation of the anomalies. The staff did not find the evaluation to be adequate, and requested the licensee to resolve this deficiency.

7. GPU File TM EQ 106

Conoflow I/P Converters

Model GT45CA1826, Replaced TER Item No. 60

These converters are replacements for the Bailey E/P converters. During audit the staff found that the documentation in the file did not establish similarity between the tested equipment and the TMI-1 converters. The

licensee discussed the issue with the equipment manufacturer at the time the staff was conducting its audit in order to confirm that the test documentation was applicable to the TMI-1 equipment. The licensee informed the staff that the manufacturer stated that the tested equipment was a different model than that installed in TMI-1, but that the equipment was identical except for the range of pressure the current is converted to. The licensee committed to get a letter from the manufacturer stating the above and stated that the letter would be placed in the file.

With regard to the post-accident operating time deficiency, cited above as being applicable to almost all the files, the licensee performed an analysis during the time the staff was conducting its audit to justify the post-accident operating time identified in the file for this equipment. The staff reviewed that analysis and found it acceptable.

8. GPU File EQ TM 109

Continental Wire & Cable Co. Cable

TER Item No. 107

The documentation in this file provided adequate evidence that the cable is environmentally qualified, with one exception. The documentation did not completely establish similarity between the cable installed in TMI-1 and the cable tested. The licensee was requested to resolve this deficiency. This

was a deficiency the staff identified as a result of its March 20 and 21, 1984 audit, and is cited by the UCS in its supplemental petition. Another finding from that audit cited by the UCS was that the file did not contain documentation to establish a qualified life for the cable. The file contained a June 4, 1984 letter from Continental Wire and Cable Co. that provided an Arrhenius plot that establishes a qualified life of 40 years at 114°C for the cable tested. This deficiency would therefore be resolved if similarity was established.

9. GPU File EQ TM 101

Boston Insulated Wire Cable

No TER Item No.

The documentation in this file resolved all audit comments and provided adequate evidence that the cable is environmentally qualified.

10. GPU File EQ TM 126

Kerite Splices

No TER Item No.

These splices are the replacement EFW pump motor terminations. The documentation in the file did not support qualification of these splices. The test report identified failures of some cable/splice samples that were not evaluated. The licensee was requested to resolve this.

The staff's final audit of the EQ files took place on August 6, 1984. The staff again reviewed the 10 files it audited on June 25, 1984, plus a file for Raychem splices that had been assembled subsequent to that audit. The purpose of the final audit was to verify that the remaining EQ file deficiencies, i.e., those deficiencies the staff identified during its June 25, 1984 audit, had been corrected. The staff's findings resulting from its final audit are given below. (Note that the files are now identified by the licensee as EQ-T1-XXX, instead of the previous identification of EQ-TM-XXX). Each of the files listed below referenced documentation contained in a generic EQ file, EQ-T1-100. This generic file contained documentation such as the temperature/pressure profile for equipment located in the Intermediate Building. Therefore, the staff's audit findings were based on both the EQ documentation contained in the individual equipment files and documentation contained in the generic EQ file.

1. GPU File EQ T1 104

Limitorque Motorized Valve Actuators

Documentation in the file identified the post-accident operating time for these actuators to be the duration of time for which the specimens were tested in the simulated accident environment. Since the test duration adequately enveloped the required operating time, the deficiency with regard to the demonstrated post-accident operating time had been resolved. The file also

addressed qualification of the four additional actuators, COV-14A&B and COV-111A&B, that the licensee was informed should be included in its EQ program by staff letter of June 25, 1984. Also in the file was an evaluation addressing the disposition of IE Information Notice 83-72. The staff reviewed the evaluation and found it adequate to address the information in the Notice.

As part of its effort regarding disposition of IE Information Notice 83-72, the licensee performed a field walkdown to examine the actuators installed in TMI-1. During that walkdown it was found that actuators EFV-1A&B and COV-111A&B did not contain terminal blocks, but utilized splices for electrical connections. The licensee decided to replace these existing splices with Raychem splices, and prepared a separate EQ file for them. The Raychem EQ file is discussed later in this evaluation. Also during the walkdown it was found that COV-111A&B contained Peerless motors whose qualification was not documented. Therefore, the licensee is replacing these Peerless motors with motors manufactured by Reliance. The Reliance motors have Class B insulation. These replacement motors are documented in this file to be qualified.

The staff found during this audit that substantial changes had been made by the licensee to the contents of this file since the June 25, 1984 audit. One change that had been made involved removal from the file of a listing, cited previously in this evaluation, of valve actuators, motor manufacturers, insulation class and current type. However, except for identification of the motor manufacturer the file still contained this same information, only it was based on the results of the field walkdown the licensee performed subsequent

to the previous audit. Identification of motor manufacturer was also determined during that walkdown. The results of the field walkdown were then used by the licensee, together with correspondence from Limitorque contained in the file, to establish applicability of the various test reports in the file for TMI-1 actuators. Thus, this deficiency, cited by UCS in its May 9, 1984 supplemental petition, remained resolved.

Based on the above findings that all remaining deficiencies had been resolved, the staff found that the documentation in this file, together with documentation in the Raychem splice file discussed later, provided adequate evidence that valve actuators EFV-2A&B, MSV-2A&B and COV-14A&B are environmentally qualified, actuators EFV-1A&B with replacement Raychem splices are environmentally qualified, and actuators COV-111A&B with replacement Raychem splices and Reliance motors with Class B insulation are environmentally qualified. The staff will verify, prior to restart, that the equipment modifications discussed above have been performed.

2. GPU File EQ T1 107

Westinghouse Pump Motors

Documentation in the file identified the post-accident operating time as the time for which the test motor was tested in the simulated accident environment. Since the test duration adequately enveloped the required operating time, the deficiency with regard to the demonstrated post-accident operating time had been resolved.

Based on the above finding that the remaining deficiency had been resolved, the staff found that the documentation in this file, together with documentation in the Kerite splice file discussed later, provided adequate evidence that this equipment with the replacement Kerite splices is environmentally qualified. The staff has verified that the Kerite splices are installed.

3. GPU File EQ T1 108

Anacnda Cable

Documentation in the file identified the post-accident operating time as the time for which the test cables were tested in the simulated accident environment. Since the test duration adequately enveloped the required operating time, the deficiency with regard to the demonstrated post-accident operating time had been resolved. The file also contained a June 29, 1984 letter from the Anaconda Wire and Cable Company that, together with a May 5, 1984 letter from the same company, established similarity between the cable tested and the cable installed in TMI-1.

Based on the above findings that the remaining deficiencies had been resolved, the staff found that the documentation in this file provided adequate evidence that this equipment is environmentally qualified.

4. GPU File EQ T1 111

Kerite Cable

Documentation in the file identified the post-accident operating time as greater than six months, which adequately enveloped the required operating time. The file contained a calculation, dated July 27, 1984, that shows the cable will operate for a period of time greater than six months after initiation of the high energy line break. Therefore, the deficiency with regard to the demonstrated post-accident operating time had been resolved.

Based on the above finding that the remaining deficiency had been resolved, the staff found that the documentation in this file provided adequate evidence that the cable is environmentally qualified.

5. GPU File EQ T1 102

States Terminal Blocks

Documentation in the file identified the post-accident operating time as greater than six months, which adequately enveloped the required operating time. The file contained a calculation, dated July 23, 1984, that shows the equipment will operate for a period of time greater than six months after start of the accident environment. Therefore, the deficiency with regard to the demonstrated post-accident operating time had been resolved.

Based on the above finding that the remaining deficiency had been resolved, the staff found that the documentation in this file provided adequate evidence that the equipment is environmentally qualified.

6. GPU File EQ T1 110

Foxboro Flow Transmitters

The file contained documentation addressing the two test anomalies that the staff found during its June 25, 1984 audit had not been adequately evaluated. One of the anomalies, an interruption of the test, is addressed by a calculation, dated June 27, 1984, that shows these transmitters were adequately tested even taking no credit for the testing performed following the interruption. For the other anomaly, the licensee reviewed the WYLE (testing organization) evaluation included in the test report in the file, documented its agreement with that evaluation, and concluded the transmitters are qualified for their application in TMI-1. The staff reviewed the WYLE evaluation and found it to be adequate. Also in the file was documentation identifying the post-accident operating time as the time for which the test transmitters were tested in the simulated accident environment. The test duration enveloped the required operating time. Further, the evaluation of the test interruption anomaly showed a much longer post-accident operating time even if credit is not taken for the entire test duration. Therefore, the staff found that the deficiency with regard to the demonstrated post-accident operating time had also been resolved.

Based on the above findings that the remaining deficiencies had been resolved, the staff found that the documentation in the file provided adequate evidence that the equipment is environmentally qualified.

7. GPU File EQ T1 106

Conoflow I/P Converters

The file included a letter from the manufacturer, ITT Conoflow, to GPU which the staff found acceptable to establish similarity between the tested equipment and the TMI-1 converters.

Based on the above finding that the remaining deficiency had been resolved, the staff found that the documentation in the file provided adequate evidence that the equipment is environmentally qualified. The staff has verified that these I/P converters have been installed in place of the previously installed E/P converters (Region I Inspection Report 50-229/84-21).

8. GPU File EQ T1 109

Continental Wire & Cable Co. Cable

The file contained a June 29, 1984 letter from the cable manufacturer which established similarity between the cable tested and the cable installed in TMI-1. Also in the file was documentation identifying the post-accident operating time as greater than six months, which adequately enveloped the required operating time. A calculation, dated July 2, 1984 contained in the file shows the equipment will operate for a period of time post-accident of greater than six months. Therefore, the deficiency with regard to the demonstrated post-accident operating time had been resolved.

Based on the above findings that the remaining deficiencies had been resolved, the staff found that the documentation in this file provided adequate evidence that the equipment is environmentally qualified.

9. GPU File EQ T1 101

Boston Insulated Wire Cable

Documentation in the file identified the post-accident operating time as the time for which the test cable was tested in the simulated accident environment. Since the test duration adequately enveloped the required operating time, the deficiency with regard to the demonstrated post-accident operating time had been resolved.

Based on the above finding that the remaining deficiency had been resolved, the staff found that the documentation in this file provided adequate evidence that the equipment is environmentally qualified.

10. GPU File EQ T1 126

Kerite Splices

The test report identified failures of some cable/splice samples that were tested. An evaluation, dated July 27, 1984, addressing these failures was contained in the file. The staff reviewed that

evaluation, and together with an August 3, 1984 letter in the file from the Kerite Company stating it had reviewed GPU's evaluation and concurred with it, found it acceptable. Documentation was also in the file that properly identified and justified the post-accident operating time.

Based on the above findings that the remaining deficiencies had been resolved, the staff found that the documentation in this file provided adequate evidence that the equipment is environmentally qualified.

11. GPU File EQ T1 134

Raychem Splices

These splices are being used in Limitorque motorized valve actuators EFV-1A&B and COV-111A&B as replacements for splices found in them during the recently completed field walkdown. The staff will verify that these splices are installed prior to restart. The staff found that the documentation in this file provided adequate evidence that the splice is environmentally qualified.

In its May 9, 1984 supplemental petition, the UCS cites the three deficiencies the staff found applicable to all the files it reviewed during its March 20 and 21, 1984 audit. Subsequent to that first audit, the staff has performed the additional audits discussed above in order to independently verify that documentation exists and is technically sufficient to demonstrate environmental qualification of each and every electrical component in the EFW system and in every other system required for proper operation of the EFW system. The three deficiencies cited by UCS are now resolved, in

that 1) there is positive evidence in the files that GPU has reviewed the EQ documentation and concluded that the equipment is qualified, 2) the material in the files is signed and dated, and shows that the statements/information contained on them has been checked and approved, and 3) the files specify the duration of time for which the equipment has been qualified and the post-accident period of time for which it is required to function.

Based on the results of our audits, the staff finds that all electrical equipment requiring qualification, both EFW system equipment and equipment associated with the proper functioning of the EFW system, has been demonstrated to be environmentally qualified in accordance with the requirements of 10 CFR 50.49.

Equipment Not Requiring Qualification

As cited previously, GPU provided justification for not requiring that certain items of electrical equipment be demonstrated to be environmentally qualified. Prior to increasing the scope of equipment within this evaluation beyond EFW system equipment, information to justify not requiring qualification of certain equipment had been submitted for seven items of equipment involving NAMCO and Fisher limit switches, ASCO solenoid valves and Barton D/P switches. The staff reviewed that information and requested additional information in its letter of May 3, 1984. By letter dated May 10, 1984, the licensee provided that additional information and information to justify not requiring qualification of 16 additional items of equipment. These 16 items were added following the staff's meeting with GPU on May 7 and 8, 1984 to discuss the scope of equipment that should be considered for the purposes of this evaluation.

The staff had identified criteria that could be used to justify not having to demonstrate equipment environmental qualification in its SER for TMI-1 dated March 24, 1981. Essentially the same criteria is currently accepted by the staff. Equipment 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.

The staff reviewed the information provided by the licensee in its letter of May 10, 1984. The staff found that the information provided for four motorized valve actuators, COV-14A&B and COV-111A&B, did not justify not requiring qualification of this equipment. The licensee was informed of this finding by letter dated June 25, 1984. Qualification of these motorized valve actuators was previously discussed in this evaluation. For the other equipment identified by the licensee, the majority satisfy either criterion a. or d. above. The remaining equipment either has no electrical components, is not electrically connected, i.e., is not operational, or in the case of EFV-4&5 are locked closed with their associated breakers locked open. Since only equipment located in the Intermediate Building, and therefore subject to the harsh environmental conditions resulting from a HELB in that building, has been identified, criterion b. has not been relied upon by the licensee. No equipment was identified as not requiring qualification on the basis of satisfying criterion c.

Based on the above, the staff finds that there is adequate justification for not requiring qualification of the items of equipment the licensee has identified as such in its letter of May 10, 1984, except for the four valve actuators cited above. These actuators have now been included in the licensee's EQ program, as discussed previously.

CONCLUSIONS

In the petition, the UCS states that the TMI-1 EFW system is not environmentally qualified. The staff's December 10, 1982 SER and November 5, 1982 FRC TER for

TMI-1, cited by UCS in support of this contention, do indicate environmental qualification deficiencies for EFW system electrical equipment. The deficiencies were identified as a result of the documentation that was reviewed and evaluated at that time. The petition does not identify any EFW system electrical equipment environmental qualification problems that the staff was not already aware of. The UCS' supplemental petition cites the results of an EQ file audit performed by the staff and, therefore, does not identify any EQ problems other than those identified by the staff.

The above evaluation documents the results of the staff's review of the current status of both EFW system electrical equipment and equipment associated with the function of the EFW system. Based on the results of its evaluation, the staff concludes the following:

1. All EFW system electrical equipment and equipment associated with the function of the EFW system located in the Intermediate Building has been properly identified.
2. All such equipment required to be environmentally qualified has been demonstrated to be so in accordance with the NRC's regulations.
3. There is acceptable justification for not requiring that qualification be demonstrated for the remaining equipment.

Dated: September 13, 1984

This Safety Evaluation was prepared by R. LaGrange, Equipment Qualification Branch.