

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
NORTHEAST NUCLEAR ENERGY COMPANY
MILLSTONE NUCLEAR POWER STATION UNIT 1
DOCKET NO. 50-245

ENVIRONMENTAL QUALIFICATION OF ELECTRIC EQUIPMENT IMPORTANT TO SAFETY

1.0 INTRODUCTION

Equipment which is used to perform a necessary safety function must be demonstrated to be capable of maintaining functional operability under all service conditions postulated to occur during its installed life for the time it is required to operate. This requirement, which is embodied in General Design Criteria 1 and 4 of Appendix A and Sections III, XI, and XVII of Appendix B to 10 CFR 50, is applicable to equipment located inside as well as outside containment. More detailed requirements and guidance relating to the methods and procedures for demonstrating this capability for electrical equipment have been set forth in 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants," NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment" (which supplements IEEE Standard 323 and various NRC Regulatory Guides and industry standards), and "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors" (DOR Guidelines).

2.0 BACKGROUND

On February 8, 1979, the NRC Office of Inspection and Enforcement (IE) issued to all licensees of operating plants (except those included in the systematic evaluation program (SEP)) IE Bulletin (IEB) 79-01, "Environmental qualification of Class 1E Equipment." This Bulletin, together with IE Circular 78-08 (issued on May 31, 1978), required the licensees to perform reviews to assess the adequacy of their environmental qualification programs.

On January 14, 1980, NRC issued IEB 79-01B which included the DOR Guidelines and NUREG-0588 as attachments 4 and 5, respectively. Subsequently, on May 23, 1980, Commission Memorandum and Order CLI-80-21 was issued and stated that the DOR Guidelines and portions of NUREG-0588 form the requirements that licensees must meet regarding environmental qualification of safety-related electrical equipment in order to satisfy those aspects of 10 CFR 50, Appendix A, General Design Criterion (GDC) 4. Supplements to IEB 79-01B were issued for further clarification and definition of the staff's needs. These supplements were issued on February 29, September 30, and October 24, 1980.

In addition, the staff issued orders dated August 29, 1980 (amended in September 1980) and October 24, 1980 to all licensees. The August order required that the licensees provide a report, by November 1, 1980, documenting the qualification of safety-related electrical equipment. The October order required the establishment of a central file location for the maintenance of all equipment qualification records. The central file was mandated to be established by December 1, 1980. The staff subsequently issued a Safety Evaluation Report (SER) on environmental qualification of safety-related electrical equipment to the licensee on June 10, 1981. This SER directed the licensee 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 (requalification, replacement (etc.))." The licensee was required to respond to NRC within 90 days of receipt of the SER. In response to the staff SER issued in 1981, 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) in order to: 1) identify all cases where the licensee's response did not resolve the significant qualification issues, 2) evaluate the licensee's qualification documentation in accordance with established criteria to determine which equipment had adequate documentation and which did not, and 3) evaluate the licensee's qualification documentation for safety-related electrical equipment located in harsh environments required for TMI Lessons Learned Implementation. A Technical Evaluation Report (TER) was issued by FRC on May 28, 1982. A Safety Evaluation Report was subsequently issued to the Northeast Nuclear Energy Company (NNECO) for its Millstone Unit 1 on December 13, 1982, with the FRC TER as an attachment.

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 of electrical equipment important to safety located in a harsh environment. In accordance with this rule, equipment for Millstone Unit 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.

A meeting was held with each licensee of plants for which a TER had been prepared for the staff by FRC in order to discuss all remaining open issues regarding environmental qualification, including acceptability of the environmental conditions for equipment qualification purposes, if this issue had not yet been resolved. On April 10, 1984, a meeting was held to discuss NNECO's Millstone Unit 1 proposed method to resolve the environmental qualification deficiencies identified in the December 13, 1982 SER and May 29, 1982 FRC TER. Discussions also included NNECO's general methodology for compliance with 10 CFR 50.49, and justification for continued operation for those equipment items for which environmental qualification is not yet completed. The minutes of the meeting and proposed method of resolution for each of the environmental qualification deficiencies are documented in a February 11, 1985 submittal from the licensee.

3.0 EVALUATION

The evaluation of the acceptability of the licensee's electrical equipment environmental qualification program is based on the results of an audit review performed by the staff of: (1) the licensee's proposed resolutions of the environmental qualification deficiencies identified in the December 13, 1982 SER and May 28, 1982 FRC TER; (2) compliance with the requirements of 10 CFR 50.49; and (3) justification for continued operation (JCO) for those equipment items for which the environmental qualification is not yet completed.

3.1 Proposed Resolutions of Identified Deficiencies

The proposed resolutions for the equipment environmental qualification deficiencies, identified in the December 13, 1982 SER, and the FRC TER enclosed with it, are described in the licensee's February 11, 1985 submittal. During the April 10, 1984 meeting with the licensee, the staff discussed the proposed resolution of each deficiency for each equipment item identified in the FRC TER and found the licensee's approach for resolving the identified environmental qualification deficiencies acceptable. The majority of deficiencies identified were documentation, similarity, aging, qualified life and replacement schedule. All open items identified in the SER dated December 13, 1982 were also discussed and the resolution of these items has been found acceptable by the staff.

The approach described by the licensee for addressing and resolving the identified deficiencies includes replacing equipment, performing additional analyses, utilizing additional qualification documentation beyond that reviewed by FRC, obtaining additional qualification documentation and determining that some equipment is outside the scope of 10 CFR 50.49, and therefore not required to be environmentally qualified, e.g., located in a mild environment. We discussed the proposed resolutions in detail on an item by item basis with the licensee during the April 10, 1984 meeting. Replacing or exempting equipment, for an acceptable reason, are clearly acceptable methods for resolving environmental qualification deficiencies. The more lengthy discussions with the licensee concerned the use of additional analyses or documentation. Although we did not review the additional analyses or documentation, we discussed how analysis was being used to resolve deficiencies identified in the FRC TER, and the content of the additional documentation in order to determine the acceptability of these methods. The licensee's equipment environmental qualification files will be audited by the staff during follow-up inspections to be performed by Region I, with assistance from IE Headquarters and NRR staff as necessary.

Since a significant amount of documentation has already been reviewed by the staff and Franklin Research Center, the primary objective of the file audit will be to verify that they contain the appropriate analyses and other necessary documentation to support the licensee's conclusion that the equipment is qualified. The inspections will verify that the licensee's program for surveillance and maintenance of environmentally qualified equipment is adequate to assure that this equipment is maintained in the as analyzed or tested condition. The method used for tracking periodic replacement parts, and implementation of the licensee's commitments and actions, e.g., regarding replacement of equipment, will also be verified.

Based on our discussions with the licensee and our review of its submittal, we find the licensee's approach for resolving the identified environmental qualification deficiencies acceptable.

3.2 Compliance With 10 CFR 50.49

In its February 11, 1985 submittal, the licensee has described the approach used to identify equipment within the scope of paragraph (b)(1) of 10 CFR 50.49, equipment relied upon to remain functional during and following design basis events. The licensee states that the flooding and environmental effects resulting from all postulated design-basis accidents documented in the Millstone Unit 1 Final Safety Analysis Report (FSAR), including the Loss-of-Coolant Accident (LOCA) and the High Energy Line Break (HELB) Accidents, were considered in the identification of safety-related electrical equipment which was to be environmentally qualified. The flooding and environmental effects resulting from High-Energy Line Breaks (HELBs) outside containment were also considered in the identification of this equipment. Therefore, all design-basis events including required accident scenarios at Millstone Unit 1 were considered in the identification of electrical equipment within the scope of paragraph (b)(1) of 10 CFR 50.49 (i.e., "Safety-related electric equipment. . .").

The licensee's approach for identifying equipment within the scope of paragraph (b)(1) is in accordance with the requirements of that paragraph, and therefore acceptable.

The method used by the licensee for identification of electrical equipment within the scope of paragraph (b)(2) of 10 CFR 50.49, nonsafety-related electric equipment whose failure under postulated environmental conditions could prevent satisfactory accomplishment of safety functions, is summarized below:

1. A list of safety-related electrical equipment as defined in paragraph (b)(1) of 10 CFR 50.49 was generated. This list was supplemented by a list of non-safety-related electrical equipment which could be used in response to a design basis Loss of Coolant Accident (LOCA) or High Energy Line Break (HELB) accident. This non-safety-related electrical equipment was determined by reviewing the emergency operating procedures for LOCA and HELB. The LOCA/HELB accidents are the only design basis accidents which result in significantly harsh environments to electrical equipment which is required for safe shutdown or accident mitigation. This list was based on review of the Final Safety Analysis Report (FSAR), Technical Specifications, Emergency Operating Procedures, Appendix A to the DOR Guidelines, Piping and Instrumentation Diagrams (P&ID), and Electrical Distribution Diagrams.
2. The elementary diagrams of the electrical equipment identified above were reviewed to identify all auxiliary devices electrically connected into the control or power circuitry of the equipment identified in Item 1. This list is commonly referred to as the Phase 1 List or Master List.

This list was used to develop another list, System Component Evaluation Work Sheets (SCEWS), which represents the equipment which must remain functional during or following LOCA or HELB accidents. This includes equipment whose failure due to these postulated environmental conditions could prevent required operation of safety-related equipment.

3. Operation of the safety-related system and equipment was reviewed, as stated in Item 1, to identify any directly mechanically connected auxiliary systems with electrical components which are necessary for the required operation of safety-related equipment. This involved the review of P&IDs, FSAR, system descriptions and instruction manuals.

4. Non-safety-related electrical circuits indirectly associated with the electrical equipment identified in Item 1 by common power supply or physical proximity were considered by a review of the generic electrical design including applicable industry standards and the use of properly coordinated protective relays, circuit breakers and fuses for electrical fault protection.

The licensee states that the results of the above review indicated that no additional electrical equipment was identified which was not previously included on that "Master List." Therefore, the list of electrical equipment provided in its February 11, 1985 submittal is judged by the licensee to address all electrical equipment within the scope of paragraph (b)(2) of 10 CFR 50.49.

We find the methodology being used by the licensee is acceptable since it provides reasonable assurance that equipment within the scope of paragraph (b)(2) of 10 CFR 50.49 has been identified.

With regard to paragraph (b)(3) of 10 CFR 50.49, the licensee refers to its February 11, 1985 letter for identification of instrumentation and sampling equipment which requires environmental qualification to meet the intent of Regulatory Guide 1.97. The staff has not yet completed its review for conformance to Regulatory Guide 1.97. In its April 9, 1984 letter the licensee specifies exceptions to the guidance, justifications, proposed modifications and the schedule for the upgrade. The staff will determine the acceptability of these justifications as part of its review for conformance with Regulatory Guide 1.97. This further staff review for Regulatory Guide 1.97 conformance may result in the licensee being required to include additional equipment in its environmental qualification program. However, the licensee has included in its environmental qualification program certain post-accident monitoring equipment using the guidance of Regulatory Guide 1.97.

We find the licensee's approach to identifying equipment within the scope of paragraph (b)(3) of 10 CFR 50.49 acceptable since it is in accordance with the requirements of that paragraph.

3.3 Justification for Continued Operation

The licensee has provided, in its February 11, 1985 submittal, justification for continued operation addressing each item of equipment for which the environmental qualification is not yet completed (see enclosure for the JCO equipment list).

We have reviewed each JCO provided by the licensee in its February 11, 1985 submittal and find them acceptable since they are based on essentially the same criteria that were used by the staff and its contractor to review JCO's previously submitted by licensees. These criteria, listed below, are also essentially the same as those contained in 10 CFR 50.49(i).

- 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 can not 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 provide 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 provide misleading information to the operator.

4.0 CONCLUSIONS

Based on the above evaluation, we conclude the following with regard to the qualification of electric equipment important to safety within the scope of 10 CFR 50.49.

- ° NNECO's Millstone Unit 1 electrical equipment environmental qualification program complies with the requirements of 10 CFR 50.49.
- ° The proposed resolutions for each of the environmental qualification deficiencies identified in the December 13, 1982 SER and FRC TER are acceptable.
- ° Continued operation until completion of the licensee's environmental qualification program will not present undue risk to the public health and safety.
- ° The licensee has documented the basis for its pressure temperature profiles in the June 11, 1985 letter from J. F. Opeka to John A. Zwolinski which indicated that sufficient margins exist to assure safe operation of equipment. The staff has discussed with the licensee the assumptions used to support the existing pressure temperature profiles; and although the staff and licensee are in agreement with the major areas of the profile, limited areas of uncertainty remain. We conclude that the licensee's assumptions with respect to the pressure and temperature profiles provide a reasonable basis for its equipment qualification program. However, because of the unique features of the Millstone 1 containment, the staff has requested, and the licensee has agreed to provide, a confirmatory analysis based on plant-specific conditions. The licensee has agreed to provide the analysis by December 11, 1985.

5.0 ACKNOWLEDGEMENT

This safety evaluation was prepared by P. Shemanski.

Dated:

Millstone Unit 1

Justification for Continued Operation Equipment List

<u>Millstone 1 Tag No.</u>	<u>NRC TER No.</u>	<u>Description</u>
SW-9 (V4-21)	24	Teledyne Valve Motor Operators
RR-2A (V10-38A, 202-5A) -2B (V10-38B, 202-58)	25	
CS-4A (V10-13A) -4B (V10-13B)	32	
LP-7A (V10-27A) -7B (V10-27B)	33	
IC-4 (V16-4) CU-2 (V11-2)	34	
C5-5A (V10-14A) -5B (V10-14B)	36	
CU-28 (V11-30, 1201-B)	37	
MW-96A (V7-143) LP-16A (V10-21A, 1501-26A) -16B (V10-21B, 1501-26B)	38	
CU-3 (V11-3, 1201-5)	39	

CS-2A (V10-10)	41
-2B (V10-11)	
LP-10A (V10-30A)	42
-1B (V10-30B)	
-13A (V10-20A)	
-13B (V10-20B)	
LP-15A (V10-3A)	44
-15B (V10-3B)	
LP-9A (V10-29A)	45
-9B (V10-29B)	
1C-2 (V16-2, 1301-2)	
1C-2 (V16-3, 1301-3)	