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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

COOPER NUCLEAR STATION

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ENVIRONMENTAL QUALIFICATION OF ELECTRIC EQUIPMENT IMPORTANT TO SAFETY

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 IE Electrical Equipment in Operating Reactors" (DOR Guidelines).

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 IE 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 Safety Evaluation Report (SER) on environmental qualification of safety-related electrical equipment to the licensees on June 8, 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 November 24, 1982. A Safety Evaluation Report was subsequently issued to the Nebraska Public Power District on December 20, 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 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 Cooper 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 March 29, 1984, a meeting was held to discuss Nebraska Public Power's proposed method to resolve the environmental qualification deficiencies identified in the December 20, 1982 SER and November 24, 1982 FRC TER. Discussions also included Nebraska Public Power'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 April 24, 1984 submittal from the licensee.

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 20, 1982 SER and November 24, 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.

Proposed Resolutions of Identified Deficiencies

The proposed resolutions for the equipment environmental qualification deficiencies, identified in the December 20, 1982 SER, and the FRC TER enclosed with it, are described in the licensee's April 24, 1984 submittal. During the March 29, 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 20, 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, installing radiation shielding, and exempting some equipment from qualification, e.g., located in the mild environment. We discussed the proposed resolutions in detail on an item by item basis with the licensee during the March 29, 1984 meeting. Replacing, shielding 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 and 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 IV, 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 environmental 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 action, e.g., regarding replacement of equipment, will also be verified.

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

Compliance With 10 CFR 50.49

In its April 24, 1984 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 all design-basis events at Cooper Nuclear Station which could result in a potentially harsh environment, including flooding outside containment, were addressed in identifying safety-related electrical equipment at Cooper Nuclear Station which was to be environmentally qualified. The flooding and environmental effects resulting from all postulated design-basis accidents documented in Chapter 14 of the Cooper Nuclear Station Updated Safety Analysis Report, including

the Loss-of-Coolant Accident and the Steam Line Break Accident inside containment, 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 outside containment, as documented in Appendix C of the Updated Safety Analysis Report, were also considered in the identification of this equipment. Therefore, all design-basis events for Cooper Nuclear Station, 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 . . . relied upon to remain functional during and following design basis events . . .").

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 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/HELB 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. This list was based on reviews of the Piping and Instrument Diagrams (P&ID's), Electrical Elementary Diagrams, and Electrical Distribution Diagrams.
2. The elementary wiring diagrams of the safety-related electrical equipment identified in Step 1 were then 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 the required operation of the safety-related equipment.

3. Next, 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).
4. Finally, the 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 original Cooper Station electrical design.

The systems and equipment generated in Steps 2; 3, and 4 above were then compared to the "Master List of Electrical Equipment at Cooper Nuclear Station for 10 CFR 50.49" dated May 20, 1983. Components have been added and removed as a result of internal reviews by CNS Plant Engineering, consultants, and further engineering studies. All of the added equipment was determined to meet the classification of paragraph (b)(1) of 10 CFR 50.49. No additional equipment was found to be applicable to (b)(2) of 10 CFR 50.49.

We find the methodology 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 March 1, 1984 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. However, the method used to identify electrical equipment within the scope of paragraph (b)(3) of 10 CFR 50.49 (i.e., "Certain post accident monitoring equipment") involved a variable-by-variable comparison of the specific requirements of Regulatory Guide 1.97, "Instrumentation . . . to Assess Plant and Environs Conditions During and Following and an Accident", to the design of Cooper Nuclear Station. An evaluation of this comparison was then conducted to determine which instrumentation and sampling equipment at Cooper Nuclear Station required environmental qualification. The results of this evaluation are described in the March 1, 1984, letter regarding "NUREG-0737, Supplement 1 - Regulatory Guide 1.97". Instrumentation and sampling equipment identified as performing both a IE and Regulatory Guide 1.97 function are denoted in the "Master Equipment List" contained in the April 24, 1984 letter. The continuing 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.

Justification for Continued Operation

The licensee has provided, in its April 24, 1984 submittal, justification for continued operation addressing each item of equipment for which the environmental qualification is not yet completed (see enclosure for JCO equipment items) and a previous JCO was not submitted.

We have reviewed each JCO provided by the licensee in its April 24, 1984 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.

By letter dated December 26, 1984, the licensee noted that the plant is currently shut down for an extended outage. The licensee plans to complete the EQ program during the outage which is expected to end in May 1985. Prior to startup, the licensee will provide JCOs in accordance with the requirements of 10 CFR 50.49(i) for any equipment still unqualified at the end of the outage. We find this approach acceptable and will review any additional JCOs as a separate matter.

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.

- o Nebraska Public Power District's electrical equipment environmental qualification program complies with the requirements of 10 CFR 50.49.
- o The proposed resolutions for each of the environmental qualification deficiencies identified in the December 20, 1982 SER and FRC TER are acceptable.
- o Continued operation until completion of the licensee's environmental qualification program will not present undue risk to the public health and safety.

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Dated: January 30, 1985

JUSTIFICATION FOR CONTINUED OPERATION EQUIPMENT ITEMS

<u>Component</u> <u>Identification</u> <u>Code</u>	<u>NRC</u> <u>TER</u> <u>No.</u>	<u>Description</u>
CS-MO-M05A,B	33	Limitorque Motorized Valve Actuators
CS-MO-M07B	33	Limitorque Motorized Valve Actuator
EE-MCC-CB	None	Motor Control Center
CS-MO-M012B	192	Limitorque Motorized Valve Actuator
CS-MO-M011A	31	Limitorque Motorized Valve Actuator
RCIC-MO-M015	191, 8	Limitorque Motorized Valve Actuators
MS-LMS-A086, A,B C,D,A-8A,B,C,D	129, 130	NAMCO Limit Switches
HPCI-MO-M019	10	Limitorque Motorized Valve Actuator
HPCI-MO-M058	2	Limitorque Motorized Valve Actuator
RHR-MO-M015A	12,17	Limitorque Motorized Valve Actuators
RHR-MO-M026B	21	Limitorque Motorized Valve Actuator
RHR-MO-M017	34	Limitorque Motorized Valve Actuator

<u>Component</u> <u>Identification</u> <u>Code</u>	<u>NRC</u> <u>TER</u> <u>No.</u>	<u>Description</u>
HPCI-PS-84-1 HPCI-PS-95 HPCI-PS-97A,B HPCI-PS-68A,B,C,D HPCI-DPIS-76,77 HPCI-FT-82	None	Terminal Blocks GE Model CR151D3
RHR-MO-MO21A	22	Limatorque Motorized Valve Actuator
RHR-MO-MO27A,B	20	Limatorque Motorized Valve Actuator
SW-MO-MO89A,B	22	Limatorque Motorized Valve Actuator
PC-PT-513	None	Terminal Block Model Buchanan 0241
PC-PT-512A,B PC-PS-12A,B,C,D PC-PS-16	None	Terminal Blocks Model GE CR151D3
RHR-FT-109A,B RHR-PS-105A,B,C,D RHR-PS-120A,B,C,D	None	Terminal Blocks Model GE CR 151D3
RHR-MO-MO15B	None	Terminal Block Model GE CR151A6
RWCU-DPIS-170A,B	None	Terminal Blocks Model GE EB25
CS-PS-44A,B CS-PS-37A,B	None	Terminal Blocks Model GE CR151D3

<u>Component</u> <u>Identification</u> <u>Code</u>	<u>NRC</u> <u>TER</u> <u>No.</u>	<u>Description</u>
RCIC-DPIS-83,84 SW-FT-97A,B MS-DPIS-116A,B,C,D MS-DPIS-117A,B,C,D MS-DPIS-118A,B,C,D MS-DPIS-119a,B,C,D	None	Terminal Blocks Model GE CR151D3
NBI-LIS-101A,B,C,D	None	Terminal Blocks Model GE CR151B
NBI-DPIS-52B,D NBI-LIS-57A,B NBI-LIS-58A,B NBI-LIS-83A,B NBI-LITS-73A,B NBI-LIS-72A,B,C,D	None	Terminal Blocks Model GE CR151D3
EE-JTR-1302, 1308, 1310, 1311	None	Motor Starters
EE-STR-1303, 1305	None	Motor Starters
REC-PS-452	None	RCS Pressure Switch
SGT-TS-540A,B SGT-TS-541A,B	None	Temperature Switches
HPCI-PS-68A,B,C,D	88	Barksdale Pressure Switch

<u>Component</u> <u>Identification</u> <u>Code</u>	<u>NRC</u> <u>TER</u> <u>No.</u>	<u>Description</u>
HPCI-LS-91A,B	119	Robertshaw Level Switch
NBI-PS-52A,C	92	Static-O-Ring Pressure Switch -
SGT-SOV-SPV 249	38	ASCO Solenoid Valves
SGT-SOV-SPV 251		
SGT-SOV-SPV 250		
SGT-SOV-SPV 252		