

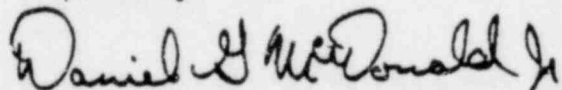
ENVIRONMENTAL QUALIFICATION OF SAFETY-RELATED
ELECTRICAL EQUIPMENT
IEB 79-01B

TECHNICAL EVALUATION REPORT
ARKANSAS NUCLEAR ONE-UNIT 1
DOCKET NO. 50-313

Dated: December 9, 1980

Licensee: Arkansas Power and Light Company
Type Reactor: Babcock and Wilcox
Size: 850 MWe

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8106300 089

CONTENTS

| | <u>Page</u> |
|---|-------------|
| 1. Introduction - - - - - | 1 |
| 1.1 General - - - - - | 1 |
| 1.2 Specific - - - - - | 1 |
| 1.3 Criteria - - - - - | 2 |
| 2. Technical Evaluation Report - - - - - | 3 |
| 2.1 Purpose - - - - - | 3 |
| 2.2 Scope - - - - - | 3 |
| 2.3 Procedure - - - - - | 4 |
| 3. Technical Evaluation - Arkansas Nuclear One-Unit 1 - - | 5 |
| 3.1 Identification of Safety-Related Equipment - - - | 6 |
| 3.2 Master List - - - - - | 7 |
| 3.3 Service Conditions - - - - - | 8 |
| 3.3.1 Inside Containment - LOCA - - - - - | 8 |
| 3.3.1.1 Radiation - - - - - | 8 |
| 3.3.1.2 Submergence - - - - - | 8 |
| 3.3.1.3 Spray - - - - - | 8 |
| 3.4 High Energy Line Breaks (HELB) - - - - - | 8 |
| 3.4.1 HELB Inside Containment - - - - - | 9 |
| 3.4.2 HELB Outside Containment - - - - - | 9 |
| 3.4.3 Recirculated Fluids - - - - - | 10 |
| 3.5 Margin - - - - - | 10 |
| 3.6 Aging - - - - - | 10 |
| 3.7 Documentation - - - - - | 11 |
| 3.8 Site Inspection - - - - - | 11 |

| | <u>Page</u> |
|--|-------------|
| 3.9 Equipment Data Review - - - - - | 12 |
| 3.9.1 Qualification Status - - - - - | 12 |
| 3.9.2 Equipment Located In Containment - - - - - | 13 |
| 3.9.3 Equipment Located Outside Containment(HELB) | 15 |
| 3.9.4 Justification For Continued Operation- - - | 18 |
| 4. Licensee Event Reports (LERs)- - - - - | 19 |
| 5. Summary and Conclusions- - - - - | 19 |
| 6. References - - - - - | 21 |
| Appendix A - Category Definitions and Required Actions | 22 |
| Appendix B - Summary Audit of Installed Systems- - - - | 25 |
| Appendix C - Test Report and Analysis List - - - - - | 26 |

1. Introduction

1.1 General

Equipment that is used to perform a necessary safety function must be capable of maintaining functional operability under all service conditions postulated to occur during its installed life and for the time it is required to operate. This requirement, which is embodied in General Design Criteria 1, 2, 4 and 23 of Appendix A and Sections III and XI of Appendix B to 10 CFR Part 50, is applicable to equipment located inside as well as outside of containment.

The staff evaluates the applicant's equipment qualification program by reviewing the qualification documentation of selected safety-related equipment as part of the operating license review for each plant. The objective of this review is to provide reasonable assurance that the equipment can perform its intended function in the most limiting environment in which it is expected to be exposed.

The staff has used a variety of methods to assure that these general requirements are met for electrical safety-related equipment. In the oldest plants, qualification was based on the fact that electrical components were of high industrial quality. For the newer plants after 1971, qualification was judged on the basis of IEEE 323-1971. No regulatory guide was issued adopting the IEEE 323-1971 standard. For the newest plants whose Safety Evaluation Reports were issued after July 1, 1974, the Commission issued Regulatory Guide 1.89 which in most respects adopted the most recent standard, IEEE 323-1974.

To promote more orderly and systematic implementation of equipment qualification programs in industry and to provide guidance to be used by the NRC staff for use in the ongoing licensing reviews, the staff has developed a number of positions on selected areas of equipment qualification. These positions are presented in NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Equipment," and the Division of Operating Reactors (DOR), "Guidelines For Evaluating Environmental Qualification of Class IE Electrical Equipment in Operating Reactors."

1.2 Specific

On May 31, 1978, the NRC Office of Inspection and Enforcement issued IE Circular 78-08, "Environmental Qualification of Safety-Related Electrical Equipment at Nuclear Power Plants," which required all licensees to examine their installed safety-related electrical equipment and ensure appropriate documentation of its qualification to function under postulated accident conditions. Subsequently, February 8, 1979, the NRC Office of Inspection and Enforcement issued IE Bulletin 79-01 which was intended to raise the threshold of IE Circular 78-08 to the level of a Bulletin; i.e., action requiring a licensee

response. This bulletin required a complete re-review of the environmental qualification of safety-related electrical equipment as described in IE Circular 78-08.

On January 14, 1980, the NRC Office of Inspection and Enforcement, issued IE Bulletin 79-01B which expanded the scope of IE Bulletin 79-01 and requested additional information on environmental qualification of safety-related electrical equipment at operating facilities, excluding the 15 facilities undergoing the Systematic Evaluation Program (SEP) review. This bulletin stated that the guidelines and criteria to be used in evaluating the adequacy of the safety-related electrical equipment qualification are the DOR guidelines and any problems arising from this review will be resolved using NUREG-0588 as a guide.

The requirements of IEB 79-01B were requested under provisions of 10 CFR 50.54(f), "Conditions of Licenses," which requires the licensee to submit written statements, signed under oath or affirmation, to enable the Commission to determine whether or not a license should be modified, suspended or revoked.

The Office of Inspection and Enforcement formed a task force including a principal reviewer in each region and a task leader from headquarters. The regional members are responsible for the technical review of the licensee's responses to IE Bulletin 79-01B and the task leader is responsible for the overall coordination of the review effort with NRR to assure overall consistency.

1.3 Criteria

The Nuclear Regulatory Commission ordered, in a memorandum and order dated May 23, 1980, that the DOR Guidelines and NUREG-0588 form the requirements which licensees and applicants must meet in order to satisfy those aspects of 10 CFR 50, Appendix A, General Design Criteria (GDC) - 4, which relates to environmental qualification of safety-related electrical equipment. Licensees of operating reactors were to comply with these requirements so that the applicable equipment in all operating plants shall meet the DOR guidelines or NUREG-0588. The NRC staff was directed to complete its review of environmental qualification based on licensee responses to IE Bulletin 79-01B and publish a safety evaluation report for each operating facility by February 1, 1981. By June 30, 1982, all safety-related electrical equipment in all operating plants shall be qualified to the DOR guidelines or NUREG-0588.

The regional reviewers held meetings with the licensees in their respective regions which resulted in staff positions being issued in a first supplement to IE Bulletin 79-01B dated February 29, 1980. Subsequently, the staff held meetings in various locations with the

licensees and interested parties during the week of June 13, 1980. These meetings resulted in a second supplement, dated September 30, 1980, which expanded the initial scope and highlighted staff positions affecting the licensee's responses to IE Bulletin 79-01B.

An order was issued to the licensees, dated August 29, 1980, which requires the licensees to complete the tasks identified in IE Bulletin 79-01B on or before November 1, 1980. However, due to concerns relating to the inclusion of TMI lessons learned and Cold Shutdown Condition, the staff issued a third supplement, dated October 29, 1980 to IE Bulletin 79-01B. This supplement provided schedule relief under certain conditions for these items until February 1, 1981.

A second order was issued to all licensees, dated October 24, 1980, which required the facility license be modified to codify the documentation requirements of safety-related electrical equipment in the plant Technical Specification.

2. Technical Evaluation Report

2.1 Purpose

The objective of this technical evaluation is to review the licensee's submittals to verify that the licensee reviewed their safety-related electrical equipment for environmental qualification against the DOR guidelines and NUREG-0588 as required by IE Bulletin 79-01B and its supplements. This review is to identify equipment whose qualification program substantiates that it is capable of providing the performance and function required when exposed to harsh environments, and to identify equipment whose qualification program is deficient or inadequate. For equipment with deficiencies, the course of action detailed by the licensee to remedy the deficiency or definitive recommendations are to be provided which include a schedule for completion and the basis for continued operation.

2.2 Scope

IE Bulletin 79-01B requires that all safety-related electrical equipment exposed to a harsh environment be in accordance with the DOR guidelines or NUREG-0588. The harsh environments include the limiting conditions resulting from the entire spectrum of Loss of Coolant Accidents (LOCAs), High Energy Line Breaks (HELBs) inside and outside of containment, and fluids, which are recirculated from inside containment to accomplish long-term cooling subsequent to an accident.

To provide assurance that the licensee implemented the requirements of IE Bulletin 79-01B and provide input for a Safety Evaluation Report (SER), the principle reviewers developed a Technical Evaluation Report (TER) by:

- . Assessing the licensee's responses in relation to the requirements of the DOR guidelines as augmented by the supplements to the bulletin.
- . Using NUREG 0588 to resolve any open issues.
- . Performing and documenting an as-installed audit of equipment within a system identified in the master list.
- . Documenting and maintaining a current list of each outstanding item identified by either the reviewer or the licensee.
- . Identifying and documenting all Licensee Event Reports (LERs) submitted by the licensee.
- . Identifying all test reports, analysis and other basis referenced by the licensee which are considered to be supporting qualification data.
- . Identifying and documenting the plans, schedules and basis for continued operation for each outstanding item or LER.
- . Determining the acceptability of the plans, schedules and basis for continued operation or; forward for resolution during the safety evaluation review.

The results and conclusions contained in the TERs are valid assuming that the analysis and test reports referenced by the licensee in their submittal are acceptable. The principle reviewers, in most cases, have not audited the analysis and test reports due to the time constraints imposed by the Commission Memorandum and Order which requires that the SERs for all operating facilities be completed by February 1, 1981. However, the staff will audit selected analysis and test reports incorporating the results of their reviews with the TERs when developing the plant specific SER. The staff will also utilize the as-installed audit of equipment provided in Appendix B when evaluating the selected analysis and test reports.

The results of the TERs in conjunction with the staff's effort in developing the SERs will provide a level of assurance necessary to meet the requirements and goals identified in the Commission's Memorandum and Order dated May 23, 1980.

2.3 Procedure

The basis for this technical evaluation is the information provided by the licensee, Arkansas Power and Light Company, for Arkansas Nuclear One Unit 1. ^{11, 14, 15 & 17} The staff's inspection of the as-installed equipment in the Reactor Building Spray and Core Flood System, which is located in the containment, will be conducted during the first

outage which is scheduled for January 1981. This TER or the plant specific SER will be supplemented to incorporate the detailed identification of the components, interfaces and other observations during the inspection.

IE Bulletin 79-01B required the licensees to:

- . Provide a Master List which identifies the systems and electrical equipment required to function during and subsequent to an event and maintain the plant in a safe shutdown condition.
- . Provide written evidence of the qualification of the equipment identified.
- . Provide the service condition profiles.
- . Identify the flood levels.
- . Evaluate the qualification against the DOR guidelines and NUREG-0588.
- . Submit a Licensee Event Report LER for any electrical equipment determined as not being environmentally qualified.

Utilizing the information identified above, the staff assessed its adequacy in relation to the DOR guidelines², NUREG 0588³ and the supplements^{5,6&7} to IED 79-01B which provides the Commission's requirements and staff positions. The Technical Evaluation section of this report contains the details identified in the scope. In addition, the safety-related equipment is grouped and identified by equipment numbers. The equipment items are then assigned into categories based on the results of this effort as defined in the scope.

The five category designations define in general terms the degree of compliance to the qualification criteria and defines subsequent actions required by the staff or licensee during the SER portion of the staffs overall effort. The categories and actions required are included in Appendix A of this report.

3. Technical Evaluation - Arkansas Nuclear Co. Unit 1

The staff requested that the licensee identify the procedures utilized in responding to the requirements of IE Bulletin 79-01B. Supplement Number 2, dated September 29, 1980,⁸ provides the details and requirements for quality assurance programs relative to the environmental qualification of safety-related electrical equipment. The requirements for QA Programs are provided in Part 50, Appendix B, of the Code of Federal Regulations.

Appendix B of the licensee's response¹⁷ indicates that all activities associated with responding to IE Bulletin 79-01B is being performed in accordance with the applicable portions of Appendix B to 10 CFR 50. The

licensee utilized the following organizations to assist in their response:

Bechtel Power Corporation
 Babcox and Wilcox Corporation
 NUS Corporation
 Protopower, Incorporation

The detailed procedures used by the licensee identified in their response¹⁷ and the QA programs for future efforts relative to environmental qualification of electrical equipment should be documented and available for staff review upon request as indicated in Supplement Number 2⁶ to IE Bulletin 79-01B.

3.1 Identification of Safety-Related Equipment

The licensee identified the systems required to detect events, initiate protective actions, mitigate the consequences of events, bring the reactor to safe shutdown and supporting systems required for the events (e.g. cooling water, HVAC, etc.) identified in IEB 79-01B. The facility FSAR, drawings and emergency operating procedures were utilized. Tabulations of the systems which have equipment exposed to the harsh environments are provided in the licensee's second submittal¹⁷ as follows:

Table 3-1 LOCA/HELB Inside Containment

Table 3-2 HELB Outside Containment

Table 3-3 Recirculated Fluids Outside Containment

The systems lists were compared to the "Q" list of systems developed by the staff.¹³ The licensee's second submittal¹⁷ added the following systems:

| <u>Q List</u> | <u>ANO-1</u> |
|--------------------------------------|---------------------------------------|
| Main & Auxiliary Stear Isolation | Main Steam |
| Low Pressure Injection | Decay Heat Removal (LPSI) |
| Control Room Habitability | HVAC |
| Component Cooling Water | Service Water (provides satisfactory) |
| Containment Air Purification/Closeup | Not in ANO-1 design |

The following "Q" list systems will be addressed in the licensee's subsequent submittal which will provide information relative to achieving cold shutdown and NUREG 0578-TMI Lessons Learned:

Pressurizer Spray
 Power Operated Relief Valves
 Steam Dump
 Containment Radiation Monitor
 Containment Sump

Based on the information identified above, we have determined that the systems identified are within the guidance provided in Section 3.0 and Appendix A of the DOR Guidelines and are acceptable. Our requirements for the systems and equipment included in the licensee's effort to implement the requirements of NUREG 0578 and achieve cold shutdown are included in Section 3.2 of this report.

3.2 Master List

The licensee developed a master list based on their system evaluation as required by IEB 79-01B. Section 3 (Table 3-4, 3-5 and 3-6) of the licensee's response includes master lists for the equipment and components exposed to harsh environments.

The licensee has indicated in their IEB 79-01B status report¹⁶ that the information requested for equipment required to achieve cold shutdown and TMI lessons learned will be provided by January 1, 1981.

The information requested in IEB 79-01B Supplement 3⁷ includes:

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

The licensee's commitment to provide the information requested in supplement 3⁷ by January 1, 1980, meets the implementation schedule identified in the supplement and is therefore, acceptable.

3.3 Service Conditions

3.3.1 Inside Containment - LOCA

The licensee provided temperature and pressure profiles for the ANO-1 containment resulting from a LOCA. The curves are provided in attachments 1A and 1B of the licensee's submittal.¹⁷ The maximum environments identified are:

Temperature: 280⁰f

Pressure: 53.82 psig

Humidity: 100% R. H.

Chemical Spray: 2270 ppm boric acid solution with NaOH additive

The profiles provided are based on the analysis in Section 14 of the FSAR. This meets Section 4.1 of the DOR Guidelines² and is, therefore, acceptable.

3.3.1.1 Radiation

The licensee performed calculations using the methods described in Section 4.1.3 and 4.2.2 of their submittal¹⁷ for inside and outside of containment. The equipment data sheets included in Appendix A of the submittal¹⁷ includes values of 8.5×10^6 to 3×10^7 Rads gamma and 1.1×10^8 Rads beta for inside containment. The values for outside of containment due to recirculating fluids are 4.9×10^2 Rads to 5.9×10^8 Rads.

The acceptability of the methodology and codes identified in Section 4.1.3 and 4.2.2 of the licensee's submittal¹⁷ will be resolved during the SER portion of the staffs review effort.

3.3.1.2 Submergence

The licensee identified the flood level as 344' - 11" which included the limiting LOCA conditions identified in the FSAR. The acceptability of the licensee's basis for specific equipment subjected to submergence is included in Section 3.9 of this report.

3.3.1.3 Sprays

The licensee identified the requirement for the containment sprays to be 2270 ppm boric acid solution with NaOH additive. The consideration of sprays is included in Section 3.9 of this report.

3.4 High Energy Line Breaks (HELB)

3.4.1 HELB Inside Containment

The ANO-1 facility has an automatic containment spray system. The DOR guidelines, Section 4.2.1, indicates that LOCA qualified equipment inside containment is acceptable for HELBs if the automatic spray system is not subject to disabling single component failures. The licensee indicated the ANO-1 facility meets this requirement.

The staff performed a single failure evaluation of the containment spray system. We conclude that the system is not subjected to a disabling single component failure in accordance to the requirements of the DOR guidelines, Section 4.2.1, and that the LOCA qualified equipment inside containment is acceptable for HELBs.

3.4.2 HELB Outside Containment

The licensee indicated that FSAR Appendix A, Amendment 38, dated June 1973, provides the results of their review of high energy line breaks. Additional analysis was performed where necessary to provide the required service conditions for the IEB 79-01B effort. The licensee's submittal¹⁷, Section 4.2 and Figures 4-1 and 4-2, provide the details of the methodology and results of the analysis. The systems included in the evaluation were those with a design temperature in excess of 200^of or design pressure in excess of 275 psig. The break size was assumed to be one-half ($\frac{1}{2}$) the pipe diameter in length and one-half ($\frac{1}{2}$) the wall thickness. The equipment considered in the evaluation was that required to place and maintain the plant in a cold shutdown condition.

The information provided in the licensee's submittal and FSAR included the following considerations and actions:

- A. Modifications to allow for adequate vent area
- B. Protective enclosures or barriers
- C. Deflectors
- D. Considerations of flooding
- E. Consideration of separation of equipment and single active component failure.
- F. Consideration loss-of-offsite power
- G. Consideration of control room environment.

We have concluded, based on the considerations, information and actions taken, that the licensee meets the requirements of the DOR guidelines,

Section 4.3.1. The acceptability of the licensee's basis for specific equipment subjected to HELBs outside of containment is included in Section 3.9 of this report.

3.4.3 Recirculated Fluids

The licensee indicated that the areas where fluids are recirculated from inside containment to accomplish long-term cooling were included as a service condition. Section 3.3.1.1 of this report, indicates the acceptability of the methodology and codes identified in the licensee's submittal¹⁷ will be resolved during the SER portion of the staff's review effort.

3.5 Margin

The DOR Guidelines indicate that special consideration was given to the time required to remain functional when establishing the criteria in Section 4.0 and the functional testing and failure criteria in Section 5.2 of the guidelines.

The normal operating temperature inside containment is approximately 110°f and the profiles indicate that the temperature returns to 160°f and recirculation is initiated within 1 hour 15 minutes of the event assuming minimum engineered safeguards. NUREG 0588, Section 3(4), requires that a type test be for a minimum of 1 hour in duration when the functional requirement is within the first seconds or minutes of an event and the DOR guidelines, Section 5.2, requires that the test duration be at least as long as the period from initiation until the service conditions return to the level that existed prior to the event.

The licensee has taken exception to the 1 hour requirement in Section 2 of their submittal¹⁷. The adequacy of the test duration to assure margin will be addressed in the Safety Evaluation Report (SER) which will incorporate an audit of selected analysis and test reports identified in Appendix C.

3.6 Aging

The licensee indicated that actions have been initiated to address aging including a schedule for implementation. However, the schedule is dependent on adequate responses from vendors and suppliers. The overall effort include implementation of a program which:

1. Identification of materials of construction of each component.
2. Evaluation of materials of construction to identify materials known to be susceptible to thermal aging.

3. Based on available data, an expected life will be determined for each component.
4. Development of a periodic replacement program for certain components (or subcomponents) identified as having an expected life less than the design life of the facilities.

Section 7 of the DOR guidelines² indicate that the susceptibility of materials to thermal and radiation aging should be considered. In addition the guidelines indicate that an ongoing program should exist to review surveillance and maintenance records to identify any age related degradations.

We require that the licensee's program be modified to address the aging effects of radiation and the inclusion of inservice inspection and failure analysis to identify potential age related degradations and establish the necessary corrective actions.

We conclude that the overall program and schedule will be acceptable if the program is modified to include the items identified above. The basis for continued operation is the extent of the licensee's effort to date, the continuing effort and that aging generally a long time-frame parameter.

3.7 Documentation

The second supplement⁶ to IEP 79-01B and the order,⁹ dated October 24, 1980, requires the licensee have the documentation and data identified in the detailed worksheets which supports the qualification of the safety-related electrical equipment available for NRC audit. The second supplement⁶ identifies the type of information required and the locations where the records are to be maintained.

The staff requests the licensee provide a response to the order and supplement which discusses their compliance and identifies any deviations.

3.8 Site Inspection - Reactor Building Spray and Core Flood System

An inspection of the installed components associated with the Reactor Building spray and core flood system will be conducted during the refueling outage scheduled for January 1981.

The detailed identification of the components and the observations recorded will be addressed in the SER or a supplement. The information will be incorporated in an audit of selected analysis and test reports identified in Appendix C.

3.9 Equipment Data Review

3.9.1 Qualification Status

The licensee provided the general status of the qualification and documentation of the safety-related electrical equipment in Section 5 of their submittal.¹⁷ The summary indicated the following:

A. Qualified by Type Test

The Okonite cable referencing Engineering² Test Report No. 110E meets all requirements of DOR guidelines.²

B. Qualified by Evaluation and Analysis

This approach being in the licensee's continuing effort.

C. Lack of Sufficient Qualification Documentation

The licensee identified specific examples including vendors out of business or old models no longer manufactured. The licensee identified the following actions being taken:

- . The safety-related need of component
- . Obtain additional documentation
- . Applicability of available documentation
- . Use of supporting analysis and evaluations
- . Implement additional tests
- . Modify, relocate or protect
- . Replace with qualified device

D. Equipment Not Qualified

The licensee indicated that no components have been identified, in their judgement, as not being qualified. However, the licensee identified ASCO valves and NAMCO limit switches which are being evaluated and will be replaced with qualified devices.

The licensee has taken exception to the staff's position on replacement and spare parts identified in Supplement 2⁰ questions 17. In addition the Commission Order⁹ modifying the licensee states in part. The Commission directed, for replacement parts in operating plants, "unless there are sound reasons to the contrary, the 1974 standard in NUREG 0588 shall apply."

The resolution of this item will be included in the Safety Evaluation Report.

Justification for continued operation of the safety related equipment not meeting all the applicable requirements of IEB 79-01B is provided in Section 3.9.4 of this report.

3.9.2 Equipment Located In Containment

Equipment Item: 1 pg 001, 007, 008
Penetration: Conax Type WR8, 23, 25-8076-01 and 2325-8077-01
Outstanding Items: Aging and Radiation-WR8
Category: IVb

Equipment Item: 2 pg 002
Cable: Okonite 600V Power and Control
Outstanding Items: Radiation (submergence-no test report)
Category: IVb

Equipment Item: 3 pg 003
Seals: Type PL-16-B4 (used Baily transmitters)
Outstanding Items: Aging and Radiation
Category: IVb

Equipment Item: 4 pg 004
Junction Boxes: Foxboro with Cable Seals
Outstanding Items: Aging and Radiation
Category: IVb

Equipment Item: 5 pg 005
Neutron Detector: Connector
Outstanding Items: Aging and Radiation
Category: IVb

Equipment Item: 6 pg 006, 009
Cable: Boston Insulated Wire Co.
Outstanding Items: Aging, Radiation and Documentation
Category: IVb

Equipment Item: 7 pg 010, 011, 027
RTD's: Rosemont 177GY
Outstanding Items: Aging and Seals
Category: IVb

Equipment Item: 8 pg 012, 014, 026, 028, 029
Pressure Transmitter: Foxboro E11GH
Outstanding Items: Aging and Seals
Category: IVb

Equipment Item: 9 pg 013, 015, 024, 025
 Pressure Transmitter: Rosemont 1152GP9A92
 Outstanding Items: Aging and Radiation
 Category: IVb

Equipment Item: 10 pg 016 through 023
 Differential Pressure: Bailey Controls BY3X41A
 Outstanding Items: Aging and Radiation
 Category: IVb

Equipment Item: 11 pg 030, 256, 260
 Motor Operated Valve: Rotork 90NAI, 7NAI, 2NAI SYN11
 Outstanding Items: Aging and Operating Time
 Category: IVb

Equipment Item: 12 pg 033, 034, 257, 266, 271, 272, 304
 Motor Operated Valve: Limitorque SMB-000-2, SMB-000-5 SMB-00-2, SMB-3-80
 Outstanding Items: Aging-all and Submergence-033, 034, 304
 Category: IVb

Equipment Item: 13 pg 041, 053-056, 151
 Motor Operated Valves: Limitorque 3MB-00-10, SMB-000
 Outstanding Items: Submergence (Aging 149, 151 only)
 Category: IIb Ia (pg 074-080, 171, 172)

Equipment Item: 14 pg 162-164
 Pressure Switch: Boston Instrument Co Mod 289A
 Outstanding Items: Aging, Documentation and Seals
 Category: IVb

Equipment Item: 15 pg 165, 166, 167
 Pressure Transmitter: Fisher Porter Mod 50 EN
 Outstanding Items: Aging and Seals
 Category: IVb

Equipment Item: 16 pg 273-277
 Motor: GE Mod 5BCD56BAY
 Outstanding Item: Documentation
 Category: IVb

Equipment Item: 17 pg 325-328
 Fan Motor: Reliance Mod EAO 150/75 HP
 Outstanding Item: None
 Category: Ia

Equipment Item: 17A pg 159
 Pressure Switch: Barton 287A
 Outstanding Items: Documentation and Aging
 Category: IVb

3.9.3 Equipment Located Outside of Containment

Equipment Item: 18 pg 031, 082, 084, 086, 088, 090, 092, 094, 096,
098, 100, 102, 104, 106, 108, 110, 112, 146, 148, 153,
155, 259, 261, 263, 265, 268, 278, 279, 286

Solenoid Valve: ASCO 8321A1, 8321A2, S6077B, 8320A8, 8320A108, 8324,
8347A2, 80173, 916775

Outstanding Items: Time, Aging and Radiation (Recirc only)

Category: IVb

Equipment Item: 19 pg 032, 081, 147, 152, 154, 177, 258

Limit Switch: Honeywell Mod DTE6-2R062, BZE6ZRN, W-140-31, JC CV2233,
OP-AR30-7030, BZE6-2RN, 51ML17

Outstanding Items: Time, Aging and Radiation (Recirc only)

Category: IVb

Equipment Item: 20 pg 039, 040, 049, 050, 062, 063, 158, 161

Pressure Transmitter: Bailey Controls BY 3240XA, BY 8240XA

Outstanding Items: Time and Aging-all, Radiation-158, 161 (Recirc only)

Category: IVb

Equipment Item: 21 pg 043-045, 047, 048, 051, 057-061, 065-068, 173,
182, 183, 188, 189, 200, 203, 204, 213-216, 219, 220,
234, 243-247, 253, 298, 301, 305

Motor Operated Valve: Limitorque SNB-00-25, SMB-00-10, SBM-00, SMB-00-15,
SMB-2-40, SMB-3-100, SMB-000, SMB-000-5, SMB1-60,
SBM-4-200, SMB-000-2-HOBC

Outstanding Items: Aging-all, radiation-043-045, 058, 060

Category: IVb

Equipment Item: 22 pg 046

Temperature Switch: United Electric Mod 30(EL900)

Outstanding Items: Documentation, Aging and Radiation

Category: IVb

Equipment Item: 23

Solenoid Valve: ASCO HTX82C87

Outstanding Items: Documentation, Aging and Radiation

Category: IVb

Equipment Item: 24 pg 064

Motor Operated Valves: Limitorque SMB-0-25

Outstanding Items: Time, Aging and Radiation (Recirc only)

Category: IVb

Equipment Item: 25 pg 069, 072, 073

Signal Converter: Bailey Controls Mod RP12

Outstanding Items: Aging and Radiation (Recirc only)

Category: IVb

Equipment Item: 26 pg 083, 085, 087, 089, 091, 093, 095, 097, 099, 101,
103, 105, 107, 109, 111, 121, 125, 136, 140, 262, 264

Limit Switch: NAMCO D2400X

Outstanding Items: Time, Aging and Radiation (Recirc only)

Category: IVb

Equipment: 27 pg 113, 114, 118, 130, 131, 134, 201, 217, 218, 280, 287,
299, 302

Transmitter: Fisher Porter Mod 10B2494BB, 10B2496PB, 10B2491JC,
50EP1041-BCXB-N5

Outstanding Items: Time, Radiation and Aging (Recirc only)

Category: IVb

Equipment Item: 28 pg 115

Flow Switch: RIS Mode E215

Outstanding Items: Line, Aging and Radiation (Recirc only)

Category: IVb

Equipment Item: 29 pg 116, 132, 283, 289

Radiation Element: TRAPCO Div of LFE Corp (no model given)

Outstanding Items: Time, Aging and Radiation (Recirc only)

Category: IVb

Equipment Item: 30 pg 120, 135, 139

Valve Actuator: Operator - ITT Gen Controls AH92

Outstanding Items: Time, Aging and Radiation (Recirc only)

Category: IVb

Equipment Item: 31 pg 122, 123, 126-129, 137, 138, 141-144

D/P Switch: Magnehlic/Ryer Mod 16275

Outstanding Items: Time, Aging and Radiation (Recirc only)

Category: IVb

Equipment Item: 32 pg 150, 156, 186, 187, 221-224

Valve Actuator: Rotork Mod 6A, 16A, 12A, 54887, 14A5-4886

Outstanding Items: Time, Aging and Radiation all Documentation-186,
187, 221-224, 229-231

Category: IVb

Equipment Item: 33 pg 157, 160, 168, 170

Valve Actuator: Limitorque SMB-0-40, SMB-000-2

Outstanding Items: Time, Aging and Radiation (Recirc only)

Category: IVb

Equipment Item: 34 pg 169

Level Transmitter: Foxboro E-17-DM 3147069

Outstanding Items: Time, Aging and Radiation (Recirc only)

Category: IVb

Equipment Item: 35 pg 174, 175, 197, 199
Pressure Switch: SOR Inc Mod 9NN-ES-CJX8
Outstanding Items: Documentation, Aging and Radiation
Category: IVb

Equipment Item: 37 pg 178, 194
Pneumatic Converter: Bailey Controls RP 1212c
Outstanding Items: Documentation, Aging and Radiation
Category: IVb

Equipment Item: 38 pg 180, 181
Pressure Switch: Barksdale Mod B2T-M12SS
Outstanding Items: Documentation, Aging and Radiation
Category: IVb

Equipment Item: 39 pg 184, 185, 202
Pressure Transmitter: Rosemont 1152-DP-5A-92-PB
Outstanding Items: Aging and Time
Category: IVb

Equipment Item: 40 pg 205, 209, 210
Solenoid: Norgren Mod D00118A
Outstanding Items: Documentation, Aging and Radiation
Category: IVb

Equipment Item: 41 pg 206-208, 211, 212
Limit Switch: NAMCO 700-860-10, SL-3C-11L
Outstanding Items: Documentation, Aging and Radiation
Category: IVb

Equipment Item: 42 pg 235, 237, 239, 241, 248, 251
Solenoid Valve: ASCO LB8316B17, LB80173, 8210AZ, 8210A2
Outstanding Items: Documentation, Aging and Radiation
Category: IVb

Equipment Item: 43 pg 236, 238, 240, 242
Limit Switch: NAMCO D2406X-1,2SR
Outstanding Items: Documentation, Aging and Radiation
Category: IVb

Equipment Item: 44 pg 249
Limit Switch: Micro Switch 5M1L17
Outstanding Items: Documentation, Aging and Radiation
Category: IVb

Equipment Item 45 pg 267, 269
Limit Switch: Betteswitch Mod RX-321
Outstanding Items: Time, Aging and Radiation (Recirc only)
Category: IVb

Equipment Item: 45 pg 281, 288
 Temperature Switch: Fimwall 18002-21
 Outstanding Items: Time, Aging and Radiation (Recirc only)
 Category: IVb

Equipment Item: 47 pg 295, 296, 300, 303
 Pressure Switch: Barton Mod 291-A, 2442
 Outstanding Items: Time, Aging and Radiation
 Category: IVb

The following page numbers identify data sheets which do not include the manufacturer or model numbers:

Recirc Fluids Only - pg 036-038, 070, 071, 116, 117, 119, 133, 225-228, 252, 282, 284, 285, 306-324, 329, 330

HELB Outside Containment - pg 076, 078, 140, 179, 191, 196

The manufacturer and model numbers are necessary to be able to include the equipment in the appropriate equipment items in this Section of the staffs TER and designate the Category. This information is required for the SER effort.

3.9.4 Justification For Continued Operation

The licensee provided the justification for continued operation in Section 6 of their submittal.¹⁷ Specific equipment and systems, both inside and outside, are identified and the rationale for the licensee's judgement that the safety related equipment will function when required, significance of failures and alternative functional capabilities was provided. The licensee's judgements were based on:

- . Time required to function
- . External power sources
- . Protective installations
- . Backup functional capability
- . Extent of effort to date and availability of existing data
- . Similar qualified components
- . Diverse function or indication
- . Time dependency of age related failures
- . Accessibility of areas outside of containment and time for corrective actions such as portable air moving equipment

Failures in position indication will not effect functional operability of component

We have concluded, based on the information provided and the referenced material, that the justification is commensurate for the areas identified for the time required to resolve the open items. However, we request the licensee include the considerations identified in Section 4 of this report during their continuing effort to meet the requirements of IEB 79-01B.

4. Licensee Event Reports (LERs)

The licensee has indicated that, in their judgement, they have not identified any equipment which is not capable of meeting environmental qualification requirements for service intended. They have indicated in their submittal¹⁷ that equipment that has been found to fail under test conditions that are less severe than the events for ANO-1 will be identified in an LER as part of their continuing effort to implement.

The staff has identified in Supplement 1⁵ to IEB 79-01B that when a determination has been made that the existing data is inadequate or no data exists to support the judgement that the safety-related equipment will function in specified environments, when required, it is reportable per IEB 79-01B.

Therefore, not only known failures, but inadequate or no documentation maybe a basis for LERs. The staff has further indicated that the time and technical judgements to make the determination should be based on the significance of the specific components, functional requirements and degree of discrepancies. We, therefore, request that the licensee include these consideration in making their technical judgement to assure the continued safe operation of ANO-1.

5. Summary and Conclusion

The licensee's actions in response to the Commission's Memorandum and Order have been detailed in this report. We have concluded, as the result of our evaluation, that the licensee has met the requirements of the order and provided adequate justification for continued operation pending the resolution of the open items in this report.

This evaluation is based on the licensee's submittal, the FSAR and the assumption that the referenced documentation which supplies the basis for the qualification is acceptable. An audit of these referenced documents will be conducted during the SER portion of the review and the results of the on-site inspection will also be included. The staff will identify the plant specific required actions and schedule for completion of the overall tasks related to environmental qualification of safety-related electrical equipment.

The areas requiring additional information, effort or resolution during the SER portion of the overall staff effort are:

| | |
|-----------------------------------|-----------------------------------|
| Radiation | (Sec. 3.3.1.1 & 3.4.3) |
| Lessons Learned and Cold Shutdown | (Sec. 3.2) |
| Test Duration | (Sec. 3.5) |
| Aging | (Sec. 3.6) |
| Replacement and Spare Parts | (Sec. 3.9.1) |
| Manufacturer and Model Numbers | (Sec. 3.9.3) |
| Licensee Event Reports | (Sec. 4) |
| Audit of Installed System | (Sec 3.8) |
| Audit of Test Data and Analysis | (Sec 3.9.2, 3.9.3 and Appendix C) |

The results of this evaluation does not imply that the unresolved items constitute an unsafe condition or that the equipment is unqualified. However, it does identify areas where additional effort, actions or information is needed.

6. References

1. Office of Inspection and Enforcement Bulletin number 79-01B, dated January 14, 1980.
2. Division of Operating Reactors (DOR), "Guidelines for Evaluating Environmental Qualification of Class IE Electrical Equipment in operating Reactors," Enclosure 4 to IEB 79-01B.
3. NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," dated December 1979.
4. Commission Memorandum and Order, "Petition for Emergency and Remedial Action," dated May 23, 1980.
5. Supplement Number One to IEB 79-01B, dated February 29, 1980.
6. Supplement Number Two to IEB 79-01B, dated September 30, 1980.
7. Supplement Number Three to IEB 79-01B, dated October 29, 1980.
8. Order, dated August 29, 1980, requiring licensee submittal by November 1, 1980.
9. Order, dated October 24, 1980, requiring modification of license to codify documentation.
10. Arkansas Power and Light Company, Status of Response to IEB 79-01B, dated February 22, 1980
11. Arkansas Power and Light Company, Response to IEB 79-01B, dated February 28, 1980.
12. Screening Review of Licensees Responses to IEB 79-01B and Summary of Audit of Installed Systems at Arkansas Nuclear One - Units 1 and 2, Memo to V. Thomas (NRC) from D. McDonald (NRC) dated April 8, 1980.
13. IEB 79-01B, Identification of Systems and Parameters Monitored, Memo to V. Thomas (NRC) from D. McDonald (NRC) dated August 27, 1980.
14. Arkansas Power and Light Company, Supplemental Response to IEB 79-01B, dated April 14, 1980.
15. Arkansas Power and Light Company, Additional Information and Schedule, dated June 23, 1980
16. Arkansas Power and Light Company, Status of Response to IEB 79-01B and Request for Schedule Relief, dated October 9, 1980.
17. Arkansas Power and Light Company, Response to IEB 79-01B and Supplements 1, 2 and 3, dated October 31, 1980.

APPENDIX A

CATEGORY DEFINITIONS
AND REQUIRED ACTIONS

ACTION REQUIRED

| CATEGORY | STAFF | LICENSEE |
|---|--|--|
| <p>I. <u>Equipment Is Qualified for Plant Life</u></p> | <p>Audit 20% - If discrepancies are found-continue Audit by 10% increments until either no discrepancies are found or report completed. Discrepancies should be recategorized.</p> | <p>If discrepancies are found - equipment will be requalified or replaced.</p> |
| <p>a.) Equipment meets all applicable requirements of DOR Guidelines or NUREG-0508.</p> | <p>Review each item to determine if sufficient basis is provided. If basis not sufficient recategorize.</p> | <p>Sufficient basis for qualification must be provided. If Basis is not acceptable to Staff Equipment must be requalified or replaced.</p> |
| <p>b.) Qualification by Judgment may be acceptable with sufficient basis</p> | | |
| <p>II. <u>Equipment Is Qualified With Restrictions</u></p> | <p>Audit 20% - Same as Above</p> | |
| <p>Equipment meets all applicable requirements of DOR Guidelines or NUREG-0508 With the following exceptions:</p> | | |
| <p>a.) Equipment Qualification for service life less than plant life</p> | <p>Review program for replacement. Place approved schedules in computer databank.</p> | <p>If program is not acceptable, Licensee must revise. If acceptable, technical specifications should be revised to include schedule.</p> |
| <p>b.) Equipment requires modification to meet qualification requirements, such as relocation or shielding.</p> | <p>Review safety significance, review program for correction.</p> | <p>Licensee will provide schedule and basis for continued operation. If schedule modification is not acceptable licensee must revise.</p> |

POOR ORIGINAL

ACTION REQUIRED

CATEGORY

III. Equipment are Exempted from Qualification

Equipment where safety related function can be accomplished by redundant fully qualified equipment which meets single failure criteria.

IV. Qualification of Equipment Unresolved

a.) Qualification testing scheduled but not complete.

b.) Qualification Records Search still in progress.

V. Equipment Not Qualified

STAFF

Staff will review each item for sufficient basis. If sufficient basis is not provided equipment should be recategorized.

Review schedule for providing qualification information - schedule should allow sufficient time to replace equipment if test is negative. Licensing judgement on operation of plant for interim.

Same as above.

Staff will review basis for continued operation and schedule for equipment replacement.

LICENSEE

Sufficient basis should be provided. If basis is not acceptable to staff then equipment must be qualified or replaced.

Provide schedule for completing qualification testing. Justification for interim operation should be provided.

Same as above.

Licensee will provide LER and Basis for continued operation. If scheduled for equipment replacement is not acceptable, license will revise.

POOR ORIGINAL

APPENDIX B

SUMMARY

AUDIT OF INSTALLED SYSTEM

The staff has indicated in Section 3.8 of this Technical Evaluation Report that the details of the as-installed system for ANO-1 will be conducted during the currently scheduled refueling outage in January 1981. The results of the audit of the reactor building spray and core flood system will be incorporated in the SER or a supplement to the SER.

APPENDIX C

TEST REPORT AND ANALYSIS LIST

ANO-1 REFERENCES

MANUFACTURER

TEST REPORTS

Conax Penetrations

Bechtel 6600-E23-79-5
Conax No. IPS-48
IPS-27
IPS-16

Conax Connectors

B&W No. 58-0081-00
FIRL F-2574-01
BCCO Report 2482

Okonite Cable

Okonite Engr. Report No. 110E

Foxboro

B&W 58-0079-00
B&W 10003A-4
Foxboro RPT T3-1013
FIRL F-C 3635
Wyle Engr. Report 26304

Rosemont

B&W 58-0372-00
B&W 58-0261-00
B&W 58-0220-00
FIRL F-C 4423-6

Rotork

Rotork TR-116
TR-178

Limitorque

Limitorque 600198
600376A
Lockheed 2539A-4723

Bailey

B&W 58-0081-00

Fisher-Porter

FIRL FC 2815
FP Rpt. OP22204-51-B-006
FP Rpt. OP2225-1 Rpt. #002

Reliance

"Qualification Test of a Fan & Motor
Designed for Service in Nuclear Containments"