

ENVIRONMENTAL QUALIFICATION OF SAFETY-RELATED
ELECTRICAL EQUIPMENT

IEB 79-018

TECHNICAL EVALUATION REPORT
VERMONT YANKEE ATOMIC POWER STATION

DOCKET NO. 50-271

DATED:

Licensee: Vermont Yankee Atomic Power Company
Reactor: BWR, General Electric
Rating: 1593 MW Thermal

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Rec'd OS6 fr Reg I JU
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1. INTRODUCTION

1.1 General

The NRC Office of Inspection and Enforcement (I/E) issued Bulletin 79-01B, "Environmental Qualification of Class 1E Equipment" in January 1980. This bulletin required the licensee to perform a detailed evaluation of the environmental qualification on Class 1E electrical equipment required to function under postulated accident conditions and to submit a report on this action.

This document is a report on the evaluation of the licensee's response to this bulletin.

2. BACKGROUND AND DISCUSSION

2.1 General

The evaluation of the licensee's response was accomplished by performing an on-site inspection of selected class 1E equipment and by examining the licensee's report for completeness and technical accuracy. The licensee's report used in this evaluation is dated October, 1980, and therefore, does not include the response to the bulletin supplement which was issued on 9/30/80 in the form of Generic Questions and Answers.

2.2 On-Site Verification Inspections

The on-site inspection, made on selected IE equipment, verified proper installation of equipment, overall interface integrity, and manufacturers nameplate data. The manufacturer and model number from the nameplate data was compared to information given in the Environmental Qualification Worksheets of the licensee's report.

If any discrepancies were noted between the installed equipment and the correspondence equipment addressed in the licensee's report, they are referenced in Section 4.8 of this report. The site inspection is documented by Report Number IE 50-271/80-13.

2.3 Evaluation of Licensee's Report

Each component as addressed on the Environmental Qualification Worksheets of the licensee's report was examined for completeness and accuracy to the criteria given in the bulletin. This examination assumed qualification documents (analysis, test reports, etc.) referenced by the licensee in their submittal are acceptable.

The results of this examination are documented in Appendix B.

3. GENERAL INFORMATION

3.1 Identification of Class 1E Electrical Equipment

The licensee's list of systems was compared to the systems list issued by the Equipment Qualification Branch (EQB) and discussed in Section 4.1 of this report.

It is recognized that there are differences in nomenclature of systems because of plant vintage and engineering design, therefore, many of these systems may not exist or have different titles. These differences will be addressed in the Safety Evaluation Report (SER) that will be prepared for this site.

3.2 Service Conditions

The service condition accident environment, HELB/LOCA inside containment and HELB outside containment are indicated or discussed in the licensee's report and are based on the FSAR accident analysis and Section 4.3 of this report.

3.3 Qualification Documentation

Appendix A is a list of documents (test reports, analysis, letters, etc.) used by the licensee in determining the environmental qualification of plant equipment for Vermont Yankee Atomic Power Station. These references have been tabulated by the licensee and are indicated on the applicable Environmental Qualification Worksheets of their report.

4. TECHNICAL EVALUATION

The basis for the technical evaluation is the information provided by Yankee Atomic Electric Company (YAEC) in their submittal³ YAEC-1228, dated October 1980, for the Vermont Yankee Atomic Power Company and the verification inspection of the as-installed equipment of the Main Steam System and High Pressure Coolant Injection System. The installation verification consisted of an inspection of components located inside primary containment that could be exposed to a harsh environment and documented by IE Inspection Report 50-271/80-13.

Utilizing the information identified above, the reviewer assessed its adequacy in relation to the DOR guidelines⁶, NUREG 05887, and supplements⁴ to IEB-01B which provides the Commission's requirements and staff positions.

4.1 Identification of Safety-Related Equipment

The licensee reviewed his documentation to establish the systems required to achieve a safe shutdown or provide isolation for the events identified in IEB 79-01B. These systems were then evaluated against the DOR Guidelines⁶. The systems identified by the licensee and included in his submittal are:

1. Automatic Depressurization System
2. Circulating, Service and Cooling Water Systems
3. Containment Atmosphere Dilution System
4. Core Spray System
5. Emergency Power System
6. Heating and Ventilating System
7. High Pressure Coolant Injection System
8. Low Pressure Coolant Injection System
9. Main Steam System
10. Neutron Monitoring System
11. Nuclear Boiler Vessel Instrumentation
12. Post-Accident Monitoring System
13. Post-Accident Sampling System
14. Primary Containment and Atmospheric Control System
15. Process Radiation Monitoring System
16. Reactor Core Isolation Coolant System
17. Reactor Protection System
18. Reactor Recirculation System
19. Reactor Water Cleanup System
20. Residual Heat Removal System
21. Standby Gas Treatment System
22. Standby Liquid Control System

The list of systems including those that were excluded was provided to the Equipment Qualification Branch (EQB). The EQB compared the list to a "Q" list developed by the staff and the lists provided by similar facilities to determine the completeness of the licensee's response.

Based on the information provided by the licensee and the reviewers' comparison, it was determined that the systems identified are within the guidance provided in Section 3.0 and Appendix A of the DOR Guidelines⁶ with the exception of the following:

1. CRD Hydraulic System

The licensee did not address the CRD System in his submittal³.

The omission will be evaluated by the EQB and addressed, if applicable, in the Safety Evaluation Report (SER) to be written for this facility.

The above examples identified by the reviewer will be evaluated by the EQB and addressed, if applicable, in the SER to be written for this plant.

4.2 Master List

The licensee developed a master list based on their system evaluation as required by IEB 79-01B. The licensee's submittal provided the basis for including specific component/equipment detailed data work sheets as required by IEB 79-01B.

We have reviewed the master list for the inclusion of equipment and have the following comment:

1. The licensee's submittal does not identify terminal lugs, cable splices, splice insulation, instrument and terminal box sealant material, terminal boxes, penetration connection boxes, rigid conduit, flexible conduit, and MSIV position status limit switches.

The above components identified by the reviewer will be evaluated by the EQB and addressed, if applicable, in the SER to be written for this facility.

4.3 Service Conditions

4.3.1 Inside Containment - LOCA

The licensee provided temperature and pressure profiles for the Vermont Yankee containment resulting from a LOCA. The reactor containment temperature and pressure profiles are shown on Figures III.1-1 and III.1-2 of the submittal. These curves were obtained from Vermont Yankee FSAR Figures 14.6-10 and 14.6-11. The maximum environments identified are:

Temperature:	325 ⁰ F
Pressure:	44 psig
Relative Humidity:	100%
Chemical Spray	NA
Radiation	Maximum not stated

The analysis of the design basis accident (LOCA) is indicated in FSAR Section 14.6.3. Figures 14.6-10 and 14.6-11 indicates that the service conditions in the containment will return to the levels that existed prior to the event in less than 1 hour.

The profiles, Figures III.1-1 and III.1-2 of the submittal do not contain units for time along the x-axis. In discussions with the licensee it was determined that the time for these curves along the x-axis was in hours. The licensee has indicated that the profiles will be revised and re-submitted. This item is considered Category IV, Unresolved.

The licensee has provided a Master List of all safety-related electrical equipment located within the primary containment, steam tunnel, and reactor building, and normally available for accident mitigation and bringing the plant to cold shutdown status. The Master List is based on the systems included in Table I.1 of his submittal³ shown above, and identifies the electrical equipment which is required to function under postulated accident conditions. Equipment is identified as such by a reference to Appendix II of his submittal³, environmental qualification worksheet. The licensee has identified electrical equipment not being required to function under postulated accident conditions and has referenced a note instead of an environmental qualification worksheet. The notes are defined as:

- (1) Required to function under non-harsh environmental conditions.
- (2) Not required to function for any accident.
- (3) Not required to function for the accident producing the harsh environmental conditions.

The reviewer has identified safety-related electrical equipment that the licensee has indicated are not required to function under postulated accident conditions and has referenced note 1 above, "Require to function under non-harsh environmental conditions."

Examples of safety-related electrical equipment that the licensee has identified as not requiring environmental qualification are the following:

1. Reactor Protection System

Appendix I of the submittal³ identifies 62 devices.

2. Nuclear Boiler Vessel Instrumentation System

Appendix I of the submittal³ identifies 16 differential pressure switches. Appendix IV.2 describes these devices as steam flow differential pressure switches for sensing high steamline flow from a HELB and automatically shutting MSIV's.

3. Reactor Core Isolation Cooling System

Appendix I of the submittal³ identifies 13 motor operated valves as not requiring environmental qualification. While Appendix IV.2 indicates the system must be available for up to two hours after post-accident, except for RCIC line breaks.

4.3.1.1 Radiation

The licensee does not state a maximum radiation dose in the submittal³. The radiation dose values for the equipment to be qualified have been identified in the environmental qualification worksheets, Appendix II of the submittal³. In Appendix III of the submittal³ the licensee indicates "the radiation doses to equipment required to function during and after a LOCA have been calculated in accordance with Supplement #2 of the IEB 79-01B and the DOR Guidelines⁶."

The reviewer will identify equipment, in Section 4.9 of this report, that does not meet the radiation doses required by the guidelines. (Category IV, Qualification of Equipment Unresolved)

4.3.1.2 Submergence

The licensee identified the flood level as 239 feet. The submittal³ indicated that all safety-related electrical equipment was located above the flood level.

4.3.1.3 Chemical Spray

The licensee's submittal³ indicated that chemical spray was not applicable to the facility.

4.4 High Energy Line Breaks (HELB)

4.4.1 HELB Inside Containment

The Vermont Yankee facility has a manually initiated containment spray system. The licensee has indicated in his submittal¹⁰ that no credit is taken for operation of containment spray. The system is manually initiated approximately 1/2 hour after a LOCA/HELB. The effect of containment spray is to immediately reduce post-accident temperature and pressure on the drywell, as indicated in Figures III.1-1 and III.1-2 of the submittal³. A further discussion of environmental conditions in the primary containment is contained in Reference #001 of Appendix A.

The HELB profiles are within the LOCA profile envelopes, therefore, electrical equipment qualified for a LOCA is acceptable for a HELB inside containment.

4.4.2 HELB Outside Containment

The licensee's May 1980, submittal¹⁰ indicated that the results of their review of HELB is contained in "Supplemental Report on Effects of Postulated Break in a High Energy Piping System Outside the Containment", September 1973. The submittal¹⁰ indicated that the environmental conditions had no adverse effect on safe shutdown of the plant in all cases analyzed.

The licensees October 1980, submittal3 Appendix III notes:

"Because of preliminary results from recent HELB and Heat-UP studies many areas previously believed to be non-harsh have now been determined to be harsh. The impact on equipment qualification has yet to be fully analyzed and resolved."

Appendix III of the submittal contains the environmental service conditions under which certain safety-related electrical equipment is required to function. The following Appendix III sections address the various HELB environmental parameters for the:

- (1) Steam Tunnel
- (2) Torus Area
- (3) Reactor Building
- (4) HPCI Pump Room
- (5) RCIC Pump Room

Section 4.9 of this report identifies the specific equipment that is Category IV, Qualification of Equipment Unresolved.

4.4.3 Recirculated Fluids

Appendix III of the submittal3 contains the environmental service conditions under which certain safety-related electrical equipment is required to function. The following Appendix III sections address the various recirculated fluids environmental parameters for the:

- (1) RHR Corner Rooms
- (2) Torus Area
- (3) Reactor Building
- (4) HPCI Pump Room
- (5) RCIC Pump Room

Section 4.9 of this report identifies the specific equipment that is Category IV, Qualification of Equipment Unresolved.

4.5 Margins

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

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.

Therefore, any type test that exceeds the functional operability time by 1 hour or longer meets the requirements defined in NUREG-0588 and the DOR guidelines for margin in relation to test duration for this facility.

The other consideration identified in the DOR guidelines in relation to the methods of qualification, other than identified specifically in this report will be addressed in the Safety Evaluation Report (SER) which will incorporate an audit of selected analysis and test reports identified in Appendix A.

The considerations of margins is included in Section 4.9 of this report and identified as Category IV, Qualification of Equipment Unresolved.

4.6 Aging

The licensee indicated that a study of the components subjected to harsh environments is still an outstanding item. Details of the licensee's effort is included in their final submittal³.

The licensee has identified the components which are still listed as requiring data.

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

1. Detailed comparison of existing equipment to the materials identified in Appendix C of the DOR guidelines⁶. The first supplement⁴ to IEB 79-01B requires the licensees to utilize the table and identify any additional materials as the result of their effort.
2. Establish an ongoing program to review surveillance and maintenance records to identify potential age related degradations.
3. Establish component maintenance and replacement schedules which include considerations of aging characteristics of the installed components.

We, therefore, require that the licensee provide the details of a program which will include a continuing effort to obtain data on existing materials and address the actions identified above. In addition, we require the licensee provide a schedule for implementation of the program that identifies problem components.

The considerations of aging is included in Section 4.9 of this report. Equipment with questions is classified Category IV, Qualification of Equipment Unresolved.

4.7 Documentation

The second supplement⁴ to IEB 79-01B and the order⁵, No. CLI-80-21, 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 supplement⁴ identifies the type of information required and the locations where the records are to be maintained.

The licensee's response in the area of documentation appears to be acceptable. A central file containing all the available documentation for environmental qualification is located at the engineering offices of the Yankee Atomic Electric Company.

4.8 Site Verification Inspection

An inspection of the installed components associated with the Main Steam System and High Pressure Coolant Injection System was conducted on September 29-October 2, 1980, at the Vermont Yankee facility. The details of this inspection are included in IE Inspection Report 50-271/80-13.

The detailed identification of the components and the observations recorded will be addressed in the SER which will incorporate an audit of selected analysis and test reports identified in Appendix A.

4.9 Equipment Data Review

The equipment listed in Appendix B was submitted by the licensee in their response to IEB 79-01B. This list contains equipment with unresolved items. Appendix B identifies the licensee's data in a format that allows the reviewer to quickly scan the unresolved items. The component column describes the component and references the system from the equipment qualification worksheet from Appendix II of the submittal³. The next three columns are self explanatory, the following three columns are defined :

- . Environment - This column identifies the environmental parameter that appears to be unresolved.
- . Category - This column addresses the equipment status as follows:
 - I Qualified for Plant Life
 - II Qualified with Restriction

III Exempted from Qualification

IV Qualification of Equipment Unresolved

V Equipment not Qualified

Remarks - This column describes the environmental parameter or other miscellaneous comments.

4.10 Conclusion

This evaluation is based on the on-site inspection, the information supplied by the licensee in their submittal³, their FSAR, and the assumption that the Qualification Documentation (Test Reports, Analysis, Letters, etc.) are acceptable.

The Region I reviewer using the guidance^{6,7} and instructions for the evaluation of licensee's data submittals and the site verification inspections that were performed to verify the IE Bulletin 79-01B, January 1980 data, submittal information, finds the licensee to be in accordance with the NRC direction^{4,5} except as listed in Appendix B and the body of this report.

The results of this evaluation does not necessarily imply that the equipment is unreliable, unsafe or represents a significant safety issue; it does imply that additional information is required and that the unresolved items will be evaluated by the Equipment Qualification Branch (EQB) and addressed in the Safety Evaluation Report (SER) to be written for this facility.

5. Licensee Event Reports (LERs)

No licensee event reports were submitted by the licensee, associated with their evaluation of IEB 79-01B, as of November 10, 1980.

6. References

1. IEB 79-01B, Memo to V. Thomas (NRC) from A. Finkel (NRC) dated August 18, 1980.
2. EQ Branch Comparison of systems and parameters. (Systems List GE-BWR)
3. Yankee Atomic Electric Company, Revised and Updated Response to IF 79-01B, dated October 31, 1980, YAEC-1228.
4. Supplement Information to IEB 79-01B, dated February 29, 1980, and September 30, 1980 and October 24, 1980.

5. Order requiring licensees implement requirements of Commission Memorandum and Order of May 23, 1980 (CLI-80-21).
6. Division of Operating Reactors (DOR), "Guidelines for Evaluating Environmental Qualification of Class IE Electrical Equipment in Operating Reactors", Enclosure 4 to IEB 79-01B.
7. NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety Related Electrical Equipment", dated December 1979.
8. Inspection Requirements for Verifying Reactor Licensee Responses to IE Bulletin No. 79-01B, dated April 25, 1980.
9. IE Support and Review of Environmental Qualification of Electrical Equipment at Operating Reactors, dated October 10, 1980.
10. Yankee Atomic Electric Company, Responses to IEB 79-01B dated May 1980, March 1980 and August 1980.

APPENDIX A

Test Reports and Analysis Lists

APPENDIX A

Test Reports and Analysis Lists

- 001 Memo, B. C. Slifer to S. F. Urbanowski, "Post-Accident Containment Pressure/Temperatures, Vermont Yankee", NED 80-341, dated April 18, 1980.
- 002 Not assigned.
- 003 Not assigned.
- 004 Vermont Yankee FSAR Section 10.12.
- 005 Not assigned.
- 006 Engineering Analysis for Equipment Qualification VY.
- 007 Engineering Analysis #VY-#, "Radiological Dose Calculation".
- 008 Action Report No. 15566-#, Report of "Thermal Aging Analysis of (Specific Equipment Title) for Class 1E Service at Vermont Yankee Nuclear Power Generating Station".
- 009 EDS Report 02-0570-1057, "Environmental Qualification of Class 1E Electrical Equipment", July 1980, Revision 0.
- 010 EDS Report 02-0570-1068, "Environmental Analysis of HELB Outside Containment at Vermont Yankee Atomic Power Station", November 1980.
- 011 Nuclear Power Station Qualification Type Test Report, Limitorque Valve Actuators for BWR Service, Limitorque Project No. 600376A, Reissued May 13, 1976.
- 012 Correspondence between Rome Cable and Vermont Yankee Nuclear Power Station documenting environmental testing.
- 013 Engineering Analysis #VY-302, "Qualification for Radiation Environment".
- 014 Letter dated August 17, 1978, Cyprus Wire and Cable Company to Yankee Atomic Electric Company transmitting Environmental Certification.
- 015 Ebasco Specification, VYNP-IV-C-2B, "600V Auxiliary Power Cable" - Revision 5.
- 016 Ebasco Specification, VYNP-IV-C2C, "600 Control Cable" - Revision 5.
- 017 Ebasco Specification, VYNP-IV-C 2F, "Thermocouple Cable" - Revision 4.

- 018 Letter dated October 12, 1978, from Galite, Inc., to Franklin Institute Research Laboratories requesting FIRL Test Report #F-C3781.
- 019 Acme-Cleveland Development Company Test Plan dated 8/31/77, "Qualification of Series EA-180 and EA-740 Switches for Class 1E Use in Nuclear Power Plants in Compliance with IEEE Standard 382-1972".
- 020 Test Report No. QAS21678/TR, "Qualification Tests of Solenoid Valves by Environmental Exposure to Elevated Temperature, Radiation, Wear Aging, Seismic Simulation, Vibration Endurance, Accident Radiation and Loss-of-Coolant Accident (LOCA) Simulation", dated March 1978.
- 021 Test Report Document #770831, "Qualification Tests of Thermocouples and RTD Assemblies by Environmental Exposures to Elevated Temperature, Radiation, Seismic Simulation, Vibration Endurance, and Loss-of-Coolant (LOCA) Simulation", dated August, 1977.
- 022 General Electric Qualification Test Report for Electrical Penetration Assemblies.
- 023 Letter dated September 6, 1978, General Electric to Vermont Yankee Nuclear Power Station discussing electrical penetration assembly test report.
- 024 Extract from the Vermont Yankee FSAR, providing a further clarification of penetration qualification with respect to radiation.
- 025 Letter dated February 2, 1978, General Electric to Vermont Yankee Nuclear Power Station discussing electrical terminal block testing and terminal block materials.
- 026 Letter dated January 27, 1978, the States Company to Yankee Atomic Electric Company with enclosures describing terminal block materials.
- 027 Letter dated October 16, 1978, Limitorque Corporation to Yankee Atomic Electric Company discussing environmental testing of Buchanan Terminal Block #524 (see FIRL Test Report #F-C3441).
- 028 Letter dated October 11, 1978, Yankee Atomic Electric Company to Amerace Corporation requesting identification and comparison of Buchanan Terminal Block used at Vermont Yankee to that tested by Limitorque Corporation.
- 029 Letter dated October 25, 1978, Amerace Corporation to Yankee Atomic Electric Company identifying and comparing terminal blocks.
- 030 Rockbestos Company Report - Qualification of Firewall SR Class 1E Electric Cables.

- 031 Rockbestos Company SR Power and Control Cable Specification.
- 032 Kerite letter dated September 16, 1970 from F. N. Rowland to E. A. Cederborg describing testing of 2/0 AWG stranded, High Temperature Kerite insulated and FR jacketed cable.
- 033 Kerite Test Report NPC-4-701, "Report on the Effects of Gamma Radiation and Autoclaving on Kerite Power and Control Cables", April 30, 1970.
- 034 Boston Edison Memo dated February 23, 1973, D. L. Pepi to G. Hierzer releasing surplus Kerite cable from Pilgrim #1 to Vermont Yankee.
- 035 FIRL Test Report #F-C2781, "Test of Electrical Cables Under Simulated Post-Accident Reactor Containment Service", prepared for Lewis Engineering Company, April 1970.
- 036 Engineering Analysis #511, "Evaluation of Environmental Qualifications".
- 037 Limitorque Test Report 600198.
- 038 Limotorque Test Report B0003.
- 039 Limitorque Letter to Acton, dated September 29, 1980.
- 040 Limitorque Test Report F-C3271.
- 041 Not assigned.
- 042 Limitorque Letter to Acton, dated July 24, 1980.
- 043 September 18, 1980, Southern Comp. Letter to EDS Nuclear on States Terminal Block.
- 044 May 22, 1980, Westinghouse Corporation Letter to EDS Nuclear with WCAP 8754, Revision 1 Test Report.
- 045 May 19, 1980, Letter Siemens-Allis to YAEC.
- 046 Letter Siemens-Allis to YAEC, Subject - Radiation Tolerance.
- 047 Target Rock Corp. Report No. 2375B, dated September 26, 1979.
- 048 Target Rock Corp. Report No. 2005C, dated December 13, 1977.
- 049 Qualification Tests for Rosemount Pressure Transmitter Model 1152, RMT Report No. 117415, Rev. B.
- 050 Radiation Qualification Test Report for Pressure Transmitters Model 1152DP4E22T0280, RMT Report No. 10763.

- 051 BWR Equipment Qualification Summary. Report No. QSR 018-A-02.
- 052 AETL Report #596-0398.
- 053 Environmental Qualification Test Summary GE-NSE80036.
- 054 Suntac Nuclear Corporation, Spec. #34980-1500-201.
- 055 ITT Barton Qualification Test Procedure for Barton Models 288A and 289A, Number 9999.1217.2.
- 056 IEEE 344-1975 Seismic and Radiation Qualification Tests for ITT Barton Differential Pressure Indicating Switches, Models 288A and 289A, Report No. R3-288A-1.
- 057 Viking Laboratories, Test Report 30203-2.
- J58 Fenwal Inc., Engineering Laboratory, Data Report No. 6350, Qualification of Fenwal 17023-6 Unit to GE Drawing No. 145C3004.
- 059 Viking Laboratories, Report No. 30203-1.
- 060 Wyle Laboratories, Report No. 43854-1.
- 061 Not assigned.
- 062 Rosemount Product, Bulletin 1011.
- 063 Shaffer to Moody, SEG 321/79, December 11, 1979.
- 064 Product Specification Trip/Calibration System, Rosemount Model 510DU.
- 065 Control Products Division, Document No. EGP, Revision E.
- 066 Control Products Division, Document ETR, Revision
- 067 Lockheed Electronics Co., Test Report No. 3232-3155.
- 068 Not assigned.
- 069 Not assigned.
- 070 Not assigned.
- 071 YAEC Calculation VT-ADH-80-4.
- 072 BWR Equipment Summary Report 015-A-01.
- 073 Radiation Effects Information Center, "Report on Viton", Battelle Columbus Laboratories, April 9, 1975.

- 074 General Electric Purchase Specifications 21A1079AC, Revision 3, Auxiliary Steam Turbine Drives (HPCI).
- 075 General Electric Purchase Specifications 21A5840AJ, Revision 1, Auxiliary Steam Turbine Drives (RCIC).
- 076 UE&C Memorandum H-338-11, October 23, 1980, W. Majkowski to S. Ruben/R. N. Brey.
- 077 VY Calculation #VY-ADH-80-5, Reactor Building LOCA Doses.
- 078 Letter, Target Rock Corp. to Yankee Atomic Electric Company, September 26, 1980, Target Rock Test Report Number 2302C and 2375B.
- 079 "Radiation Effects on Electrical Insulation by P. H. Ware.
- 080 Letter with Enclosure, Collyer Engineering Corporation to Connecticut Yankee Atomic Power Company dated January 13, 1967.
- 081 Cerro Wire Co. Certificate of Conformance for Suntac P.O. 34980-1601-11.252, May 22, 1975.
- 082 Boston Insulated Wire & Cable Co. Certificate of Compliance for Suntac, P.O. 34980-1601-11.1, April 28, 1975.
- 083 Letter, Gerald Tucker, Collyer Insulated Wire Co. to Robert McCoy, Yankee Atomic Electric Company, dated May 23, 1979.
- 084 Letter, Clyde Hatch, Collyer Insulated Wire Co. to George Tsouderos, Yankee Atomic Electric Company, October 4, 1968.

APPENDIX B

EQUIPMENT STATUS TABLES

APPENDIX B

NOTES

1. The licensee is presently working with Limatorque to obtain the qualification data.
2. An aging analysis is being performed by Acton Environmental Testing Laboratory. This information, which is incomplete at the present time, will be available for review when completed.
3. A radiological evaluation is being performed by EDS Nuclear. This evaluation, which is incomplete at the present time, will be available for review when completed.
4. Because of preliminary results from recent HELB and Heat-Up studies, many areas previously believed to be non-harsh have now been determined to be harsh. The impact on equipment qualification has yet to be fully analyzed and resolved; and therefore, the conclusions reached herein are to be considered preliminary.
5. Evaluation of the component for long-term operability cannot be completed until the component's qualifications have been determined for all environmental parameters.
6. The qualified life is less than the specified life, a maintenance program has been established to rework or replace these valves every 4.4 years.
7. The solenoid operated valves currently installed are ASCO 8320 and 8311A31F. Although they have been assured from the vendor that these solenoid operated valves will perform adequately, it is planned to replace them as a precautionary measure, with ASCO NP-1, Series 500's. The ASCO NP-1 Series solenoid operated valves will be installed when available.
8. General Electric is in the process of qualifying this equipment. The qualification will be completed in January 1981.
9. This equipment is included because of NUREG-0578.

Component	Manuf.	Part/ Serial No.	Containment		Environment	Category	Remarks
			IN	OUT			
Solenoid Operated Valve ADS-1	ASCO	206-381-6F	X		Aging	II	Note No. 6. Requires a schedule from the licensee.
Motor Operator CSCW-1 HPSI-2	Limitorque	SMB-1	X		Time Temperature Pressure RH Radiation Aging	IV	Note No. 1.
H ₂ Analyzer CAD-5	Delphi	K1	X		Aging	IV	Note No. 2.
Solenoid Operated Valve CAD-10	Atkomatic	15840- UPI- MOD	X		RH Radiation	IV	Worksheet shows component qualified for 95% RH while Appendix III.4-1 indicates 100% RH for a HELD. Requires licensee to submit a schedule to provide shielding.
Motor CS-1	GE	FEJ604010, FEJ604011	X		Time Radiation Aging	IV	Note No. 2. Note No. 3. Note No. 5.

Component	Manuf.	Part/ Serial No.	Containment		Environment	Category	Remarks
			IN	OUT			
Motor Operator CS-2	Linitorque	SMB-1, SMB-2	X		Time Radiation	IV	Note No. 3. Note No. 5.
Solenoid Operated Valve CAD-1	Target Rock	75E002	X		RH	IV	Worksheet shows component qualified for 90% RH while Appendix III.4-1 indicates 100% RH for a HELB.
Solenoid Operated Valve CAD-2	Automatic	15840- UPI-	X		RH	IV	Worksheet shows component qualified for 90% RH while Appendix III.5-1 indicates 100% RH for a HELB.
Motor Control Center EPS-1 EPS-8 EPS-6 EPS-7	Westing- house	Type W	X		Time Temperature Pressure RH Radiation Aging	IV	Note No. 2. Note No. 3. Note No. 4.
Motor Control Center EPS-2	ITE	5600	X		Time Temperature Pressure RH Radiation Aging	IV	Note No. 2. Note No. 3. Note No. 4.

Component	Manuf.	Part/ Serial No.	Containment		Environment	Category	Remarks
			IN	OUT			
UPS EPS-3	Exide	250 KVA	X		Time Temperature Pressure RH Radiation Aging	IV	Note No. 2. Note No. 3. Note No. 4.
Power Panel EPS-4	GE	Not Shown	X		Time Temperature Pressure RH Radiation Aging	IV	Note No. 2. Note No. 3. Note No. 4.
Motor Generator Set EPS-5 EPS-9	GE	Not Shown	X		Time Temperature Pressure RH Radfation Aging	IV	Note No. 2. Note No. 3. Note No. 4.
Motor HVAC-1	Allis- Chalmers	1-5101- 39529- 2-1, 2-2, 2-3	X		Aging	IV	Note No. 2.
Motor HVAC-2	Allis- Chalmers	51-308- 578	X		Aging	IV	Note No. 2.

Component	Manuf.	Part/ Serial No.	Containment		Environment	Category	Remarks
			IN	OUT			
Motor Operator HPCI-1	Limitorque	SMB-1	X		Time Radiation Aging	IV	Note No. 2. Note No. 3. Note No. 5.
Temperature Switch HPCI-3 RCIC-4	Fenwall	17023-6	X		Aging	IV	Note No. 2.
Pressure Switch RCIC-6 HPCI-10	Barksdale	B2T- M12SS	X		Time Radiation Aging	IV	Note No. 2. Note No. 3. Note No. 5.
Flow Transmitter HPCI-8 RCIC-7	GE/MAC	555	X		Time RH Radiation Aging	IV	Note No. 4.
Pressure Switch HPCI-9	Barksdale	D2H- M12SS	X		Time Radiation Aging	IV	Note No. 2. Note No. 3. Note No. 5.

Component	Manuf.	Part/ Serial No.	Containment		Environment	Category	Remarks
			IN	OUT			
Local Controls HPCI-11 RCIC-8	Terry Turbine	CCS	X		Time Temperature Pressure RH Radiation Aging	IV	Note No. 4.
Motor Operator HPCI-12	Limitorque	SMB-0, SMB-1, SMB-3, SMB-4	X		Time Temperature Pressure RH Radiation Aging	IV	Note No. 1.
Solenoid Valve SBGT-4 HPCI-13 PAS-2 PCA-5	ASCO	8311A31F and 8320	X		Time Temperature Pressure RH Radiation Aging	IV	Note No. 7. Requires the licensee to provide a schedule.
Solenoid Valve MS-1 MS-2	ASCO	NP832- 3A36V	X	X	Aging	IV	Note No. 6. Requires the licensee to provide a schedule.
Motor Operator MS-3 RCIC-1 RWCU-1	Limitorque	SMB-00G	X		Time Radiation	IV	Note No. 1. Note No. 5.

Component	Manuf.	Part/ Serial No.	Containment		Environment	Category	Remarks
			IN	OUT			
Pressure Switch NBVI-2	Barksdale	B2T- A12SS	X		Radiation Aging	IV	Note No. 2. Note No. 3.
Pressure Switch NBVI-3 PCAC-7 RCIC-5	Barton	288	X		Aging	IV	Note No. 2.
Safety Relief Valve Position Monitoring NBVI-5	GE	NA	X		Time Temperature Pressure RH Radiation Aging	IV	Note No. 8. Note No. 9.
Pressure Switch NBVI-6	Static- O- Ring	6N-E3- CIA- GGMMR- TTX10	X		Time Temperature Pressure RH Radiation Aging	IV	Note No. 8. Note No. 9.
Thermocouple PAM-1	Thermo- electric	Type T	X		Time Temperature Pressure RH Radiation Aging	IV	Note No. 2. Note No. 3. Note No. 5.

Component	Manuf.	Part/ Serial No.	Containment		Environment	Category	Remarks
			IN	OUT			
Acoustic Transmitter PAM-2	B&W	NA	X		Time Temperature Pressure RH Radiation Aging	IV	Qualification tests are in progress and are scheduled for completion during the summer of 1981. Note No. 9.
Acoustic Accelerometer PAM-3	B&W	NA	X		Time Temperature Pressure RH Radiation Aging	IV	Qualification tests are in progress and are scheduled for completion during the summer of 1981. Note No. 9.
Radiation Detector PAM-4	Victoreen	877	X		Time Temperature Pressure RH Radiation Aging	IV	Qualification tests are in progress and are scheduled for completion before January 1, 1981. Note No. 9.
Level Transmitter PAM-5	GE/MAC	555		X	Time Temperature Pressure RH Radiation Aging	IV	Note No. 4.
Temperature Element PAM-7 PAM-12 PAM-14	Thermo- Electric	Type T		X	Time Temperature Pressure RH Radiation Aging	IV	Note No. 4.

Component	Manuf.	Part/ Serial No.	Containment		Environment	Category	Remarks
			IN	OUT			
Motor Operator	Linitorque	SMB-0, SMB-00, SMB-2, SMB-3, SMB-4, SMB-4T	X	X	Time Radiation	IV	Note No. 1.
RHR-1							Note No. 5.
RHR-2							
RHR-7							
Motor	GE	BEJ- 205002, 212003, 219003, 219003	X		Time Radiation Aging	IV	Note No. 2. Note No. 3. Note No. 5.
RHR-3							
Motor Operator	Linitorque	SMB-2	X		Time Temperature Pressure RH Radiation Aging	IV	Note No. 1.
RHR-6							
Fan Motor	Allis- Chalmers	RG, Frame 215T	X		Time Temperature Pressure RH Radiation Aging	IV	Note No. 4.
SBGT-1							
Limit Switch	NAHCO	EA-740 86700 Rev. D	X	X	Aging	IV	Note No. 2.
ELEC-1							
ELEC-2 (inside)							

Component	Manuf.	Part/ Serial No.	Containment		Environment	Category	Remarks
			IN	OUT			
Sensor PRM-1	GE	194X9- 27G12	X		Time Temperature Pressure RH Radiation Aging	IV	Note No. 2. Note No. 3. Note No. 4.
Motor Operator RCIC-2	Limitorque	SMB-000	X		Time Temperature Pressure Radiation Aging	IV	Note No. 1.
Pressure Switch RCIC-3	Barksdale	D2H-A15055	X		Time Radiation Aging	IV	Note No. 2. Note No. 3. Note No. 5.
Motor Operator RRS-1	Limitorque	SMB-00, SMB-000, SMB-1, SMB-2	X		Time Radiation	IV	Note No. 5. Note No. 1.
Motor Operator RWCU-2	Limitorque	SMB-000	X		Radiation	IV	Note No. 1.

Component	Manuf.	Part/ Serial No.	Containment		Environment	Category	Remarks
			IN	OUT			
Pressure Transmitter PAM-8	GE/MAC	551	X		Time Radiation Aging	IV	Note No. 2. Note No. 3. Note No. 4.
Level Transmitter PAM-9	Rosemount	1152	X		Time Radiation	IV	Note No. 4. Note No. 9.
LITS PAM-10	Yarway	4418CE	X		Aging	IV	Note No. 2.
Pressure Transmitter PAM-11 PAM-13	GE	552	X		Time Temperature Pressure RII Radiation Aging	IV	Note No. 4
Solenoid Valve PAS-1	ASCO	206- B32-3	X		Aging	IV	Note No. 6. Requires the licensee to provide a schedule.