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

March 16, 1981

Docket No. 50- 313

Mr. William Cavanaugh, III
Vice President, Generation
and Construction
Arkansas Power & Light Company
P. O. Box 551
Little Rock, Arkansas 72203

Dear Mr. Cavanaugh:

SUBJECT: ENVIRONMENTAL QUALIFICATION OF SAFETY-RELATED ELECTRICAL EQUIPMENT

RE: ARKANSAS NUCLEAR ONE, UNIT NO. 1, FACILITY OPERATING LICENSE NO. DPR-51

Reference: Order for Modification of License Concerning the Environmental Qualification of Safety-Related Electrical Equipment, October 24, 1980.

This letter transmits the preliminary results of our review of environmental qualifications of safety-related electrical equipment at your facility. This evaluation was based on your submittals received over the past months.

The facility license was modified by the referenced Order of October 24, 1980, to require that all safety-related electrical equipment be qualified to specified requirements not later than June 30, 1982. In addition, the Order noted that a licensee is obligated to modify or replace inadequate equipment promptly.

The staff's review of your submittals has resulted in our identifying a number of potential equipment deficiencies involving a lack of proper documentation, inadequate justification of assumed environmental conditions following an accident, and/or inadequate environmental testing of equipment, such that conformance to the DOR guidelines, as required by the Order, cannot be demonstrated. You are requested to review our identified deficiencies, and their ramifications, and provide us your overall finding regarding continued safe operation of your facility. Accordingly, in order to determine whether your license should be modified or suspended, you are required pursuant to 10 CFR 50.54(f), to provide within 10 days of receipt of this letter, a written statement, signed under oath or affirmation supporting the safe operation of your facility, that takes into account the NRC staff's preliminary list of deficiencies.

The purpose of this statement is to provide the NRC with needed assurance, by the licensee, regarding the continued safety of the facility until you can provide an item-by-item reevaluation in a detailed documented manner at a later date. A negative finding on your part concerning the safety of continued operation would result in a unit shutdown, and should be reported as a Licensee Event Report (LER) within twenty-four (24) hours of the determination to the appropriate NRC Regional Office. Include in the LER the actions you have taken for the immediate resolution of the matter. A copy of any such LER should be sent to the Director, Division of Licensing, Office of Nuclear Reactor Regulation.

Please submit a copy of your reply to us via telecopy.

Sincerely,

Thomas M. Novak, Assistant Director
for Operating Reactors
Division of Licensing

Enclosure:
Evaluation Report

cc w/enclosure:
See next page

Arkansas Power & Light Compa

cc w/enclosure(s):

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PARTIAL

EQUIPMENT EVALUATION REPORT BY THE
OFFICE OF NUCLEAR REACTOR REGULATION

FOR ARKANSAS POWER AND LIGHT COMPANY
ARKANSAS NUCLEAR ONE - UNIT 1
DOCKET NO. 50-313

3 STAFF EQUIPMENT EVALUATION

The staff evaluation of the licensee's response included an onsite inspection of selected Class IE equipment and an examination of the licensee's report for completeness and acceptability. The criteria described in the DOR guidelines and in NUREG-0588, in part, were used as a basis for the staff evaluation of the adequacy of the licensee's qualification program.

The NRC Office of Inspection and Enforcement performed a preliminary evaluation of the licensee's response, documented in a technical evaluation report (TER). An onsite verification inspection of equipment in the reactor building spray and core flood system will be performed during the week of February 15, 1981. This inspection will be performed to verify proper installation of equipment, overall interface integrity, and manufacturers' nameplate data. The manufacturer's name and model number from the nameplate data will be compared to information given in the Component Evaluation Work Sheets (CES) of the licensee's report. Results of the site inspection will be documented in an IE report. For this review, the licensee's October 31, 1980 submittal and the TER referenced above have been factored into the overall staff evaluation.

3.1 Completeness of Safety-Related Equipment

In accordance with IEB 79-01B, the licensee was directed to (1) establish a list of systems and equipment that are required to mitigate a LOCA and an HELB and (2) identify components needed to perform the function of safety-related display information, post-accident sampling and monitoring, and radiation monitoring.

The staff developed a generic master list based upon a review of plant safety analyses and emergency procedures. The instrumentation selected includes parameters to monitor overall plant performance as well as to monitor the performance of the systems on the list. The systems list was established on the basis of the functions that must be performed for accident mitigation (without regard to location of equipment relative to hostile environments).

The list of safety-related systems provided by the licensee was reviewed against the staff-developed master list.

Based upon information in the licensee's submittal, the equipment location references, and in some cases subsequent conversations with the licensee, the staff has verified and determined that the systems included in the licensee's submittal are those required to achieve or support: (1) emergency reactor shutdown, (2) containment isolation, (3) reactor core cooling, (4) containment heat removal, (5) core residual heat removal, and (6) prevention of significant release of radioactive material to the environment. The staff therefore

concludes that the systems identified by the licensee (listed in Appendix D) are acceptable, with the exception of those items discussed in Section 5 of this report.

Display instrumentation which provides information for the reactor operators to aid them in the safe handling of the plant was not specifically identified by the licensee. A complete list of all display instrumentation mentioned in the LOCA and HELB emergency procedures must be provided. Equipment qualification information in the form of summary sheets should be provided for all components of the display instrumentation exposed to harsh environments. Instrumentation which is not considered to be safety related but which is mentioned in the emergency procedure should appear on the list. For these instruments, (1) justification should be provided for not considering the instrument safety related and (2) assurance should be provided that its subsequent failure will not mislead the operator or adversely affect the mitigation of the consequences of the accident. The environmental qualification of post-accident sampling and monitoring and radiation monitoring equipment is closely related to the review of the TMI Lessons-Learned modifications and will be performed in conjunction with that review.

The licensee identified 322 items of equipment which were assessed by the staff. Many component work sheets, however, do not indicate the manufacturer's name or model number. Some do not indicate whether the component is above or below the flood level, and many limit switches are not listed separately. The licensee should revise the CES accordingly and bring to the staff's attention any additional equipment subject to submergence which is not included in Appendix B to this ER (with the exception of Rotork valve motor operators CV-1050 and CV-4446).

3.2 Service Conditions

Commission Memorandum and Order CLI-80-21 requires that the DOR guidelines and the "For Comment" NUREG-0588 are to be used as the criteria for establishing the adequacy of the safety-related electrical equipment environmental qualification program. These documents provide the option of establishing a bounding pressure and temperature condition based on plant-specific analysis identified in the licensee's Final Safety Analysis Report (FSAR) or based on generic profiles using the methods identified in these documents.

On this basis, the staff has assumed, unless otherwise noted, that the analysis for developing the environmental envelopes for Arkansas Nuclear One - Unit 1, relative to the temperature, pressure, and the containment spray caustics, has been performed in accordance with the requirements stated above. The staff has reviewed the qualification documentation to ensure that the qualification specifications envelope the conditions established by the licensee. During this review, the staff assumed that for plants designed and equipped with an automatic containment spray system which satisfies the single-failure criterion, the main-steam-line-break (MSLB) environmental conditions are enveloped by the large-break-LOCA environmental conditions. The staff assumed, and requires the licensee to verify, that the containment spray system is not subjected to a disabling single-component failure and therefore satisfies the requirements of Section 4.2.1 of the DOR guidelines.

Equipment submergence has also been addressed where the possibility exists that flooding of equipment may result from HELBs.

3.3 Temperature, Pressure, and Humidity Conditions Inside Containment

The licensee has provided the results of accident analyses as follows:

	Max Temp (°F)	Max Press (psig)	Humidity (%)
LOCA	280	53.82	100

The staff has concluded that the minimum temperature profile for equipment qualification purposes should include a margin to account for higher-than-average temperatures in the upper regions of the containment that can exist due to stratification, especially following a postulated MSLB. Use of the steam saturation temperature corresponding to the total building pressure (partial pressure of steam plus partial pressure of air) versus time will provide an acceptable margin for either a postulated LOCA or MSLB, whichever is controlling, as to potential adverse environmental effects on equipment.

The licensee's specified temperature (service condition) of 280°F does not satisfy the above requirement. A saturation temperature corresponding to the peak profile (301°F peak temperature at 53.82 psig) should be used instead. The licensee should update his equipment summary tables to reflect this change. If there is any equipment that does not meet the staff position, the licensee must provide either justification that the equipment will perform its intended function under the specified conditions or propose corrective action.

3.4 Temperature, Pressure, and Humidity Conditions Outside Containment

The licensee has provided, on the component work sheets, the temperature, pressure, humidity and applicable environment associated with HELBs outside containment. However, the licensee should provide more explicit information relative to (1) the areas in the auxiliary building where the breaks are postulated, (2) in which piping systems the breaks are postulated to occur, and (3) the temperature and pressure associated with the postulated breaks.

The staff will verify the adequacy of the licensee's specified environment outside containment when the above information has been submitted.

3.5 Submergence

The maximum submergence levels have been established and assessed by the licensee. Unless otherwise noted, the staff assumed for this review that the methodology employed by the licensee is in accordance with the appropriate criteria as established by Commission Memorandum and Order CLI-80-21.

The licensee's value for the maximum submergence level is elevation 345 ft. Equipment below this level has been identified by the licensee. The licensee identified seven safety-related electrical components--four Limitorque and two Rotork motor operated valves, and Okonite cable--as having the potential for becoming submerged after a postulated event. The Rotork motor operated valves have been qualified for submergence; the licensee states that the

Limitorque motor operated valves perform their function before becoming submerged. In these cases, the licensee should provide an assessment of the failure modes associated with the submergence of the Limitorque motor operated valves and associated cable. The licensee should also provide assurance that the subsequent failure of these components will not adversely affect any other safety functions or mislead an operator. Additionally, the licensee should discuss operating time, across the spectrum of events, in relation to the time of submergence. If the results of the licensee's assessment are acceptable, then the components may be exempt from the submergence parameter of qualification.

3.6 Chemical Spray

The licensee's FSAR value for the chemical concentration is 2270 ppm boric acid solution. However, the licensee has not provided the specified pH or the exact chemical concentration and pH of the qualification environment. Therefore, for the purpose of this review, the effects of chemical spray will be considered unresolved. The staff will review the licensee's response when it is submitted and discuss the resolution in a supplemental report.

3.7 Aging

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

(1) Make a detailed comparison of existing equipment and the materials identified in Appendix C of the DOR guidelines. The first supplement to IEB-79-01B requires licensees to utilize the table in Appendix C 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.

The licensee identified a number of equipment items for which a specified qualified life was established (for examples, 5 years, 15 years, or 40 years). In its assessment of these submittals, the staff did not review the adequacy of the methodology nor the basis used to arrive at these values; the staff has assumed that the established values are based on state-of-the-art technology and are acceptable.

For this review, however, the staff requires that the licensee submit supplemental information to verify and identify the degree of conformance to the above requirements. Thermal and radiation aging should be addressed in the licensee's response. The response should include all the equipment identified as required to maintain functional operability in harsh environments.

The licensee indicated that this phase of the response is outstanding and that the review is in progress. The staff will review the licensee's response when it is submitted and discuss its evaluation in a supplemental report.

3.8 Radiation (Inside and Outside Containment)

The licensee has provided values for the radiation levels postulated to exist following a LOCA. The application and methodology employed to determine these values were presented to the licensee as part of the NRC staff criteria contained in the DOR guidelines, in NUREG-0588, and in the guidance provided in IEB-79-01B, Supplement 2. Therefore, for this review, the staff has assumed that, unless otherwise noted, the values provided have been determined in accordance with the prescribed criteria. The staff review determined that the values to which equipment was qualified enveloped the requirements identified by the licensee.

The value required by the licensee inside containment is an integrated dose ranging between 8.5×10^6 and 3×10^7 rads gamma and 1.1×10^8 rads beta. These values envelope the DOR guideline requirements and are therefore acceptable.

A required value outside containment of 6×10^6 rads has been used by the licensee to specify limiting radiation levels within room 10 of the auxiliary building. This value considers the radiation levels influenced by the source term methodology associated with post-LOCA recirculation fluid lines and is acceptable.

4 QUALIFICATION OF EQUIPMENT

The following subsections present the staff's assessment, based on the licensee's submittal, of the qualification status of safety-related electrical equipment.

The staff has separated the safety-related equipment into three categories: (1) equipment requiring immediate corrective action, (2) equipment requiring additional qualification information and/or corrective action, and (3) equipment considered acceptable if the staff's concern identified in Section 3.7 is satisfactorily resolved.

In its assessment of the licensee's submittal, the NRC staff did not review the methodology employed to determine the values established by the licensee. However, in reviewing the data sheets, the staff made a determination as to the stated conditions presented by the licensee. Additionally, the staff has not completed its review of supporting documentation referenced by the licensee (for example, test reports). It is expected that when the review of test reports is complete, the environmental qualification data bank established by the staff will provide the means to cross reference each supporting document to the referencing licensee.

If supporting documents are found to be unacceptable, the licensee will be required to take additional corrective actions to either establish qualification or replace the item(s) of concern. This effort will begin in early 1981.

An appendix for each subsection of this report provides a list of equipment for which additional information and/or corrective action is required. Where appropriate, a reference is provided in the appendices to identify deficiencies. It should be noted, as in the Commission Memorandum and Order, that the deficiencies identified do not necessarily mean that equipment is unqualified. However, they are cause for concern and may require further case-by-case evaluation.

4.1 Equipment Requiring Immediate Corrective Action

4.2 Equipment Requiring Additional Information and/or Corrective Action

Appendix B identifies equipment in this category, including a tabulation of deficiencies. The deficiencies are noted by a letter relating to the legend (identified below), indicating that the information provided is not sufficient for the qualification parameter or condition.

Legend

R - radiation
T - temperature
QT - qualification time
RT - required time
P - pressure
H - humidity
CS - chemical spray
A - material-aging evaluation; replacement schedule; ongoing equipment surveillance
S - submergence
M - margin
I - HELB evaluation outside containment not completed
QM - qualification method
RPN - equipment relocation or replacement; adequate schedule not provided
EXN - exempted equipment justification inadequate
SEN - separate-effects qualification justification inadequate
QI - qualification information being developed
RPS - equipment relocation or replacement schedule provided

As noted in Section 4, these deficiencies do not necessarily mean that the equipment is unqualified. However, the deficiencies are cause for concern and require further case-by-case evaluation. The staff has determined that an acceptable basis to exempt equipment from qualification, in whole or part, can be established provided the following can be established and verified by the licensee:

(1) Equipment does not perform essential safety functions in the harsh environment, and equipment failure in the harsh environment will not impact safety-related functions or mislead an operator.

(2a) Equipment performs its function before its exposure to the harsh environment, and the adequacy for the time margin provided is adequately justified, and

(2b) Subsequent failure of the equipment as a result of the harsh environment does not degrade other safety functions or mislead the operator.

(3) The safety-related function can be accomplished by some other designated equipment that has been adequately qualified and satisfies the single-failure criterion.

(4) Equipment will not be subjected to a harsh environment as a result of the postulated accident.

The licensee is, therefore, required to supplement the information presented by providing resolutions to the deficiencies identified; these resolutions should include a description of the corrective action, schedules for its completion (as applicable), and so forth. The staff will review the licensee's response, when it is submitted, and discuss the resolution in a supplemental report.

It should be noted that in cases where testing is being conducted, a condition may arise which results in a determination by the licensee that the equipment does not satisfy the qualification test requirements. For that equipment, the licensee will be required to provide the proposed corrective action, on a timely basis, to ensure that qualification can be established by June 30, 1982.

4.3 Equipment Considered Acceptable or Conditionally Acceptable

Based on the staff review of the licensee's submittal, the staff identified the equipment in Appendix C as (1) acceptable on the basis that the qualification program adequately enveloped the specific environmental plant parameters, or (2) conditionally acceptable subject to the satisfactory resolution of the staff concern identified in Section 3.7.

For the equipment identified as conditionally acceptable, the staff determined that the licensee did not clearly

(1) state that an equipment material evaluation was conducted to ensure that no known materials susceptible to degradation because of aging have been used,

(2) establish an ongoing program to review the plant surveillance and maintenance records in order to identify equipment degradation which may be age related, and/or

(3) propose a maintenance program and replacement schedule for equipment identified in item 1 or equipment that is qualified for less than the life of the plant.

The licensee is, therefore, required to supplement the information presented for equipment in this category before full acceptance of this equipment can be established. The staff will review the licensee's response when it is submitted and discuss the resolution in a supplemental report.

5 DEFERRED REQUIREMENTS

IEB 79-01B, Supplement 3 has relaxed the time constraints for the submission of the information associated with cold shutdown equipment and TMI lessons-learned modifications. The staff has required that this information be provided by February 1, 1981. The staff will provide a supplemental safety evaluation addressing these concerns.

APPENDIX B

Equipment Requiring Additional Information
and/or Corrective Action
(Category 4.2)

LEGEND:

Designation for Deficiency

R - Radiation
T - Temperature
QT - Qualification time
RT - Required time
P - Pressure
H - Humidity
CS - Chemical spray
A - Material aging evaluation, replacement schedule, ongoing equipment surveillance
S - Submergence
M - Margin
I - HELB evaluation outside containment not completed
QM - Qualification method
RPN - Equipment relocation or replacement, adequate schedule not provided
EXN - Exempted equipment justification inadequate
SEN - Separate effects qualification justification inadequate
QI - Qualification information being developed
RPS - Equipment relocation or replacement schedule provided

Equipment Description	Manufacturer	Plant ID No.	Deficiency
Electrical Penetration	Conax	Type 2325-8205-01	CS,R,A
Electrical Penetration	Conax	Type 2325-8076-01	T,CS,R,A
Electrical Penetration	Conax	Type 2325-8077-01	CS,R,A
600 V Power and Control Cable	Okonite	Generic	CS,R,A,S
Triaxial Cable	Boston Insulated Wire	Type RG11/u	QT,T,CS,R,A
Signal Cable	Boston Insulated Wire	Type 8374-H-002	QT,T,CS,R,A
Cable Seal for PDTs	Conax	Type PL-16-B4	T,P,CS,R,A

APPENDIX B (continued)

Equipment Description	Manufacturer	Plant ID No.	Deficiency
Junction Box Assembly With Cable Seal	Foxboro	Part No. 3 - XIB-I/2	CS,R,A
Pressure Transmitter	Foxboro	PT-1020	RT,CS,R,A
Pressure Transmitter	Rosemount	PT-1021	RT,CS,R,A
Pressure Transmitter	Foxboro	PT-1022	RT,CS,R,A
Pressure Transmitter	Rosemount	PT-1023	RT,CS,R,A
Pressure Transmitter	Rosemount	PT-1038	RT,CS,R,A
Pressure Transmitter	Rosemount	PT-1039	RT,CS,R,A
Pressure Transmitter	Foxboro	PT-1040	RT,CS,R,A
Pressure Transmitter	Foxboro	PT-1041	RT,CS,R,A
Differential Press. Transmitter	Bailey Controls	PDT-1028	T,P,CS,R,A
Differential Press. Transmitter	Bailey Controls	PDT-1029	T,P,CS,R,A
Differential Press. Transmitter	Bailey Controls	PDT-1030	T,P,CS,R,A
Differential Press. Transmitter	Bailey Controls	PDT-1031	T,P,CS,R,A
Differential Press. Transmitter	Bailey Controls	PDT-1034	T,P,CS,R,A
Differential Press. Transmitter	Bailey Controls	PDT-1035	T,P,CS,R,A
Differential Press. Transmitter	Bailey Controls	PDT-1036	T,P,CS,R,A
Differential Press. Transmitter	Bailey Controls	PDT-1037	T,P,CS,R,A
Resistance Temp. Element	Rosemount	TE-1012	QT,T,P,H,CS,R,A
Resistance Temp. Element	Rosemount	TE-1013	QT,T,P,H,CS,R,A

Equipment Description	Manufacturer	Plant ID No.	Deficiency
Resistance Temp. Element	Rosemount	TE-1040	QT,T,P,H,CS,R,A
Resistance Temp. Element	Rosemount	TE-1041	QT,T,P,H,CS,R,A
Motor Operated Valve	Rotork	CV-1050	RT,QT,T,P,CS,A
Motor Operated Valve	Limitorque	CV-1054	QT,T,P,H,CS,R,A,S
Limit Switch	Honeywell	ZS-1052	RT,QT,R,A
Solenoid Valve	ASCO	SV-1052	RT,QT,R,A
Motor Operated Valve	Limitorque	CV-1053	QT,T,P,H,CS,R,A,S
Limit Switch	?	ZS-1065	RT,QT,R,A
Solenoid Valve	ASCO	SV-1065	RT,QT,R,A
Solenoid Valve	?	SV-1066	RT,QT,R,A
Valve Actuator	?	CV-1206	RT,QT,R,A
Press. Diff. Transmitter	Bailey Controls	PDT-1209	RT,QT,A
Press. Diff. Transmitter	Bailey Controls	PDT-1210	RT,QT,A
Press. Diff. Transmitter	Bailey Controls	PDT-1228	RT,QT,A
Press. Diff. Transmitter	Bailey Controls	PDT-1230	RT,QT,A
Motor Operated Valve	Limitorque	CV-1214	RT,T,P,CS,A,S
Motor Operated Valve	Limitorque	CV-1216	RT,T,P,CS,A,S
Motor Operated Valve	Limitorque	CV-1219	RT,QT,R,A
Motor Operated Valve	Limitorque	CV-1220	RT,QT,R,A
Motor Operated Valve	Limitorque	CV-1221	RT,QT,R,A
Motor Operated Valve	Limitorque	CV-1227	RT,QT,A
Motor Operated Valve	Limitorque	CV-1228	RT,QT,A
Motor Operated Valve	Limitorque	CV-1234	RT,QT,A
Motor Operated Valve	Limitorque	CV-1270	RT,T,P,CS,A

APPENDIX B (continued)

Equipment Description	Manufacturer	Plant ID No.	Deficiency
Motor Operated Valve	Limitorque	CV-1271	RT,T,P,CS,A
Motor Operated Valve	Limitorque	CV-1272	RT,T,P,CS,A
Motor Operated Valve	Limitorque	CV-1273	RT,T,P,CS,A
Motor Operated Valve	Limitorque	CV-1274	RT,QT,A
Motor Operated Valve	Limitorque	CV-1300	RT,QT,R,A
Motor Operated Valve	Limitorque	CV-1301	RT,QT,R,A
Solenoid Valve	ASCO	SV-1252	RT,QT,T,P,H,R,A
Temp. Switch	United Electric	TS-1221	RT,QT,T,P,H,R,A
Valve Operator	Limitorque	CV-1400	RT,QT,R,A
Valve Operator	Limitorque	CV-1401	RT,QT,A
Valve Operator	Limitorque	CV-1404	RT,QT,R,A
Valve Operator	Limitorque	CV-1405	RT,QT,A
Valve Operator	Limitorque	CV-1406	RT,QT,A
Valve Operator	Limitorque	CV-1407	RT,QT,A
Valve Operator	Limitorque	CV-1408	RT,QT,A
Valve Operator	?	CV-1429	RT,QT,R,A
Press. Diff. Trans.	Bailey Controls	PDT-1401	RT,QT,A
Press. Diff. Trans.	Bailey Controls	PDT-1402	RT,QT,A
Signal Converter	Bailey	E/H-1428	QT,R,A
Signal Converter	?	E/H-1429	RT,QT,R,A
Signal Converter	Bailey	E/P-1432	RT,QT,R,A
Signal Converter	Bailey	E/P-1433	RT,QT,R,A
Motor Operated Valve	Limitorque	CV-1814	RT,T,P,CS,A
Motor Operated Valve	Limitorque	CV-1816	RT,T,P,CS,A

APPENDIX B (continued)

Equipment Description	Manufacturer	Plant ID No.	Deficiency
Motor Operated Valve	Limitorque	CV-1820	RT,T,P,CS,A
Motor Operated Valve	Limitorque	CV-1826	RT,T,P,CS,A
Valve Operator	?	CV-1818	RT,QT,T,P,H,R,A
Valve Operator	?	CV-1822	RT,QT,T,P,H,R,A
Limit Switch	Honeywell Microswitch	ZS-1845	RT,QT,R,A
Solenoid Valve	ASCO	SV-1845	RT,QT,R,A
Limit Switch	NAMCO	ZS-2100	RT,QT,R,A
Limit Switch	NAMCO	ZS-2101	RT,QT,R,A
Limit Switch	NAMCO	ZS-2102	RT,QT,R,A
Limit Switch	NAMCO	ZS-2103	RT,QT,R,A
Limit Switch	NAMCO	ZS-2104	RT,QT,R,A
Limit Switch	NAMCO	ZS-2105	RT,QT,R,A
Limit Switch	NAMCO	ZS-2106	RT,QT,R,A
Limit Switch	NAMCO	ZS-2107	RT,QT,R,A
Limit Switch	NAMCO	ZS-2108	RT,QT,R,A
Limit Switch	NAMCO	ZS-2111	RT,QT,R,A
Limit Switch	NAMCO	ZS-2112	RT,QT,R,A
Limit Switch	NAMCO	ZS-2113	RT,QT,R,A
Limit Switch	NAMCO	ZS-2114	RT,QT,R,A
Limit Switch	NAMCO	ZS-2115	RT,QT,R,A
Limit Switch	NAMCO	ZS-2116	RT,QT,R,A
Limit Switch	NAMCO	ZS-2123	RT QT,R,A
Limit Switch	NAMCO	ZS-2126	RT,QT,R,A

APPENDIX B (continued)

Equipment Description	Manufacturer	Plant ID No.	Deficiency
Limit Switch	NAMCO	ZS-2133	RT,QT,R,A
Limit Switch	NAMCO	ZS-2136	RT,QT,R,A
Solenoid Valve	ASCO	SV-2100	RT,QT,R,A
Solenoid Valve	ASCO	SV-2101	RT,QT,R,A
Solenoid Valve	ASCO	SV-2102	RT,QT,R,A
Solenoid Valve	ASCO	SV-2103	RT,QT,R,A
Solenoid Valve	ASCO	SV-2104	RT,QT,R,A
Solenoid Valve	ASCO	SV-2105	RT,QT,R,A
Solenoid Valve	ASCO	SV-2106	RT,QT,R,A
Solenoid Valve	ASCO	SV-2107	RT,QT,R,A
Solenoid Valve	ASCO	SV-2108	RT,QT,R,A
Solenoid Valve	ASCO	SV-2111	RT,QT,R,A
Solenoid Valve	ASCO	SV-2112	RT,QT,R,A
Solenoid Valve	ASCO	SV-2113	RT,QT,R,A
Solenoid Valve	ASCO	SV-2114	RT,QT,R,A
Solenoid Valve	ASCO	SV-2115	RT,QT,R,A
Solenoid Valve	ASCO	SV-2116	RT,QT,R,A
Valve Actuator	ITT/Fischer	CV-2123	RT,QT,R,A
Valve Actuator	ITT/Fischer	CV-2126	RT,QT,R,A
Valve Actuator	ITT/Fischer	CV-2133	RT,QT,R,A
Valve Actuator	ITT/Fischer	CV-2136	RT,QT,R,A
D/P Transmitter	Fischer & Porter	PDT-2119	RT,QT,R,A
D/P Transmitter	Fischer & Porter	PDT-2120	RT,QT,R,A

APPENDIX B (continued)

Equipment Description	Manufacturer	Plant ID No.	Deficiency
D/P Transmitter	Fischer & Porter	PDT-2121	RT,QT,R,A
D/P Transmitter	Fischer & Porter	PDT-2129	RT,QT,R,A
D/P Transmitter	Fischer & Porter	PDT-2130	RT,QT,R,A
D/P Transmitter	Fischer & Porter	PDT-2131	RT,QT,R,A
D/P Switch	?	PDS-2125	RT,QT,R,A
D/P Switch	?	PDIS-2125	RT,QT,R,A
D/P Switch	?	PDS-2126	RT,QT,R,A
D/P Switch	?	PDIS-2126	RT,QT,R,A
D/P Switch	?	PDS-2127	RT,QT,R,A
D/P Switch	?	PDIS-2127	RT,QT,R,A
D/P Switch	?	PDS-2135	RT,QT,R,A
D/P Switch	?	PDIS-2135	RT,QT,R,A
D/P Switch	?	PDS-2136	RT,QT,R,A
D/P Switch	?	PDIS-2136	RT,QT,R,A
D/P Switch	?	PDS-2137	RT,QT,R,A
D/P Switch	?	PDIS-2137	RT,QT,R,A
Flow Switch	?	FS-2120	RT,QT,R,A
Radiation Element	?	RE-2120	RT,QT,R,A
Radiation Element	?	RE-2130	RT,QT,R,A
Radiation Indicator	?	RI-2120	RT,QT,R,A
Radiation Indicator	?	RI-2130	RT,QT,R,A
Solenoid Valve	ASCO	SV-2213	RT,QT,R,A

APPENDIX B (continued)

Equipment Description	Manufacturer	Plant ID No.	Deficiency
Solenoid Valve	ASCO	SV-2214	RT,QT,R,A
Solenoid Valve	ASCO	SV-2233	RT,QT,R,A
Solenoid Valve	ASCO	SV-2234	RT,QT,R,A
Limit Switch	Honeywell Microswitch	ZS-2214	RT,QT,R,A
Limit Switch	Honeywell Microswitch	ZS-2233	RT,QT,R,A
Limit Switch	Honeywell Microswitch	ZS-2234	RT,QT,R,A
Valve Actuator	Rotork	CV-2220	RT,QT,R,A
Valve Actuator	Rotork	CV-2235	RT,QT,R,A
Motor Operated Valve	Limitorque	CV-2215	QT,T,P,H,CS,R,A
Motor Operated Valve	Limitorque	CV-2221	QT,T,P,H,CS,R,A
Valve Actuator	Limitorque	CV-2400	RT,QT,R,A
Valve Actuator	Limitorque	CV-2401	RT,QT,R,A
Valve Actuator	Limitorque	CV-2410	RT,QT,R,A
Valve Actuator	Limitorque	CV-2411	RT,QT,R,A
D/P Transmitter	Bailey	PDT-2400	RT,QT,R,A
D/P Transmitter	Bailey	PDT-2401	RT,QT,R,A
Pressure Switch	Barion	PS-2400	RT,QT,T,P,H,CS,R,A
Pressure Switch	Barion	PS-2401	RT,QT,T,P,H,CS,R,A
Pressure Switch	Barion	PS-2402	RT,QT,T,P,H,CS,R,A
Pressure Switch	Barion	PS-2403	RT,QT,T,P,H,CS,R,A
Press. Transmitter	Fischer & Porter	PT-2405	QT,T,P,H,CS,R,A
Press. Transmitter	Fischer & Porter	PT-2406	QT,T,P,H,CS,R,A

Equipment Description	Manufacturer	Plant ID No.	Deficiency
Press. Transmitter	Fischer & Porter	PT-2407	QT,T,P,H,CS,R,A
Level Transmitter	Foxboro	LT-2410	RT,QT,R,A
Motor Operated Valve	Limitorque	CV-2416	RT,T,P,CS,A
Motor Operated Valve	Limitorque	CV-2418	RT,T,P,CS,A
Valve Operator	Limitorque	CV-2617	RT,QT,A
Valve Operator	Limitorque	CV-2619	RT,QT,A
Valve Operator	Limitorque	CV-2620	RT,QT,A
Valve Operator	Limitorque	CV-2630	RT,QT,A
Valve Operator	Limitorque	CV-2667	RT,QT,A
Valve Operator	Limitorque	CV-2670	RT,QT,A
Valve Operator	Limitorque	CV-2676	RT,QT,A
Valve Operator	Limitorque	CV-2680	RT,QT,A
Valve Operator	Rotork	CV-2626	RT,QT,T,P,H,R,A
Valve Operator	Rotork	CV-2627	RT,QT,T,P,H,R,A
Pressure Switch	G.O.R. Inc.	PS-2617A	RT,QT,T,P,H,R,A
Pressure Switch	G.O.R. Inc.	PS-2617B	RT,QT,T,P,H,R,A
Pressure Switch	Barksdale	PS-2618A	RT,QT,T,P,H,R,A
Pressure Switch	Barksdale	PS-2618B	RT,QT,T,P,H,R,A
Pressure Switch	?	PS-2667A	RT,QT,T,P,H,R,A
Pressure Switch	?	PS-2667B	RT,QT,T,P,H,R,A
Pressure Switch	G.O.R. Inc.	PS-2668A	RT,QT,T,P,H,R,A
Pressure Switch	G.O.R. Inc.	PS-2668B	RT,QT,T,P,H,R,A
Valve Positioner	Honeywell	CV-2618	RT,QT,T,P,H,R,A
Valve Positioner	Honeywell	CV-2668	RT,QT,T,P,H,R,A

Equipment Description	Manufacturer	Plant ID No.	Deficiency
Valve Positioner	?	CV-2668A	RT,QT,T,P,H,R,A
Valve Positioner	Honeywell	CV-2668B	RT,QT,T,P,H,R,A
Limit Switch	Honeywell Microswitch	ZS-2618	RT,QT,T,P,H,R,A
Limit Switch	Honeywell Microswitch	ZS-2668	RT,QT,T,P,H,R,A
Limit Switch	NAMCO	ZS-2691-1	RT,QT,T,P,H,R,A
Limit Switch	NAMCO	ZS-2691-2	RT,QT,T,P,H,R,A
Limit Switch	NAMCO	ZS-2695	RT,QT,T,P,H,R,A
Limit Switch	NAMCO	ZS-2692-1	RT,QT,T,P,H,R,A
Limit Switch	NAMCO	ZS-2692-2	RT,QT,T,P,H,R,A
Limit Switch	NAMCO	ZS-2696	RT,QT,T,P,H,R,A
Pneumatic Conv.	Bailey Controls	E/P-2618	RT,QT,T,P,H,R,A
Pneumatic Conv.	Bailey Controls	E/P-2668	RT,QT,T,P,H,R,A
?	?	FY-2618	RT,QT,T,P,H,R,A
?	?	FY-2668	RT,QT,T,P,H,R,A
Diff. Press. Trans.	Rosemount	PDT-26020A	RT,QT,A
Diff. Press. Trans.	Rosemount	PDT-2620B	RT,QT,A
Diff. Press. Trans.	Fischer & Porter	PDT-2670	RT,QT,R,A
Diff. Press. Trans.	Rosemount	PDT-2670B	RT,QT,A
Pilot Solenoid	Norgren	SV-2691	RT,QT,T,P,H,R,A
Pilot Solenoid	Norgren	SV-2692	RT,QT,T,P,H,R,A
Valve Operator	Limitorque	CV-2800	RT,QT,A
Valve Operator	Limitorque	CV-2802	RT,QT,A
Valve Operator	Limitorque	CV-2803	RT,QT,A

APPENDIX B (continued)

Equipment Description	Manufacturer	Plant ID No.	Deficiency
Valve Operator	Limitorque	CV-2806	RT,QT,A
Valve Operator	Limitorque	CV-2813	RT,QT,A
Valve Operator	Limitorque	CV-2814	RT,QT,A
Press. Trans. & Indicator	Fischer & Porter	PIT-2811	RT,QT,R,A
Press. Trans. & Indicator	Fischer & Porter	PIT-2812	RT,QT,R,A
Valve Operator	Rotork	CV-3800	RT,QT,T,P,H,R,A
Valve Operator	Rotork	CV-3801	RT,QT,T,P,H,R,A
Valve Operator	Rotork	CV-3802	RT,QT,T,P,H,R,A
Valve Operator	Rotork	CV-3803	RT,QT,T,P,H,R,A
Valve Operator	Rotork	CV-3806	RT,QT,T,P,H,R,A
Valve Operator	Rotork	CV-3807	RT,QT,T,P,H,R,A
Valve Operator	Rotork	CV-3808	RT,QT,T,P,H,R,A
Valve Operator	Rotork	CV-3809	RT,QT,T,P,H,R,A
Valve Operator	Rotork	CV-3810	RT,QT,T,P,H,R,A
Valve Operator	Limitorque	CV-3811	RT,QT,A
Valve Operator	Limitorque	CV-3820	RT,QT,A
Valve Operator	Limitorque	CV-3821	RT,QT,A
Valve Operator	Limitorque	CV-3822	RT,QT,A
Valve Operator	Limitorque	CV-3823	RT,QT,A
Valve Operator	Limitorque	CV-3824	RT,QT,A
Valve Operator	Limitorque	CV-3851	RT,QT,T,P,H,R,A
Valve Operator	?	CV-3850	RT,QT,T,P,H,R,A
Solenoid Valve	?	SV-3804	RT,QT,R,A

APPENDIX B (continued)

Equipment Description	Manufacturer	Plant ID No.	Deficiency
Solenoid Valve	?	SV-3805	RT,QT,R,A
Solenoid Valve	ASCO	SV-3812	RT,QT,T,P,H,R,A
Solenoid Valve	ASCO	SV-3813	RT,QT,T,P,H,R,A
Solenoid Valve	ASCO	SV-3814	RT,QT,T,P,H,R,A
Solenoid Valve	ASCO	SV-3815	RT,QT,T,P,H,R,A
Solenoid Valve	ASCO	SV-3840	RT,QT,T,P,H,R,A
Solenoid Valve	ASCO	SV-3841	RT,QT,T,P,H,R,A
Limit Switch	?	ZS-3804	RT,QT,R,A
Limit Switch	?	ZS-3805	RT,QT,R,A
Limit Switch	NAMCO	ZS-3812	RT,QT,T,P,H,R,A
Limit Switch	NAMCO	ZS-3813	RT,QT,T,P,H,R,A
Limit Switch	NAMCO	ZS-3814	RT,QT,T,P,H,R,A
Limit Switch	NAMCO	ZS-3815	RT,QT,T,P,H,R,A
Limit Switch	Microswitch	ZS-3840	RT,QT,T,P,H,R,A
Limit Switch	Honeywell Microswitch	ZS-3841	RT,QT,T,P,H,R,A
Limit Switch	?	ZS-4400	RT,QT,R,A
Solenoid Valve	ASCO	SV-4400	RT,QT,R,A
Solenoid Valve	ASCO	SV-4804	RT,QT,R,A
Solenoid Valve	ASCO	SV-6201	RT,QT,R,A
Solenoid Valve	ASCO	SV-6202	RT,QT,R,A
Solenoid Valve	ASCO	SV-6203	RT,QT,R,A
Solenoid Valve	ASCO	SV-7401	RT,QT,R,A
Solenoid Valve	ASCO	SV-7402	RT,QT,R,A

Equipment Description	Manufacturer	Plant ID No.	Deficiency
Limit Switch	Honeywell Microswitch	ZS-4804	RT,QT,R,A
Limit Switch	NAMCO	ZS-6202	RT,QT,R,A
Limit Switch	NAMCO	ZS-6203	RT,QT,R,A
Limit Switch	Betteswitch	ZS-7401	RT,QT,R,A
Limit Switch	Betteswitch	ZS-7402	RT,QT,R,A
Valve Actuator	Limitorque	CV-7454	RT,QT,R,A
Valve Actuator	?	CV-7459	RT,QT,R,A
Valve Actuator	?	CV-7467	RT,QT,R,A
Valve Actuator	?	CV-7469	RT,QT,R,A
Valve Actuator	?	CV-7457	RT,QT,R,A
Valve Motor Operator	Rotork	CV-4446	RT,QT,T,P,CS,A
Motor Operated Valve	Limitorque	DV-4803	QT,T,P,H,CS,R,A
Valve Motor Operator	Rotork	CV-5612	RT,QT,T,P,CS,A
Motor Operated Valve	Limitorque	CV-6205	QT,T,P,H,CS,R,A
Motor Operated Valve	Limitorque	CV-7403	QT,T,P,H,CS,R,A
Motor Operated Valve	Limitorque	CV-7404	QT,T,P,H,CS,R,A
Motor	General Electric	SV-7410	QT,CS,A
Motor	General Electric	SV-7411	QT,CS,A
Motor	General Electric	SV-7412	QT,CS,A
Motor	General Electric	SV-7413	QT,CS,A
Limit Switch	?	ZS-7441	RT,QT,R,A
Limit Switch	?	ZS-7442	RT,QT,R,A
Solenoid Valve	ASCO	SV-7441	RT,QT,R,A
Solenoid Valve	ASCO	SV-7442	RT,QT,R,A

APPENDIX B (continued)

Equipment Description	Manufacturer	Plant ID No.	Deficiency
D/P Transmitter	Fischer & Porter	PDT-7441	RT,QT,R,A
D/P Transmitter	Fischer & Porter	PDT-7442	RT,QT,R,A
D/P Transmitter	Fischer & Porter	PDT-7451	RT,QT,R,A
D/P Transmitter	Fischer & Porter	PDT-7452	RT,QT,R,A
Temp. Switch	Fenwal	TS-7441	RT,QT,R,A
Temp. Switch	Fenwal	TS-7442	RT,QT,R,A
Radiation Indicator/Switch	?	RIS-7441	RT,QT,R,A
Radiation Indicator/Switch	?	RIS-7442	RT,QT,R,A
Radiation Element	LFE Corp.	RE-7441	RT,QT,R,A
Radiation Element	LFE Corp.	RE-7442	RT,QT,R,A
Radiation Indicator	?	RI-7441	RT,QT,R,A
Radiation Indicator	?	RI-7442	RT,QT,R,A
Valve Actuator	?	CV-7443	RT,QT,R,A
Valve Actuator	?	CV-7445	RT,QT,R,A
Valve Actuator	?	CV-7447	RT,QT,R,A
Valve Actuator	?	CV-7449	RT,QT,R,A
Valve Actuator	Limitorque	CV-7451	RT,QT,R,A
Valve Actuator	Limitorque	CV-7452	RT,QT,R,A
D/P Switch	Barton	DPS-7447	RT,QT,R,A
D/P Switch	Barton	DPS-7448	RT,QT,R,A
D/P Switch	Barton	DPS-7451	RT,QT,R,A

APPENDIX B (continued)

Equipment Description	Manufacturer	Plant ID No.	Deficiency
D/P Switch	Barton	DPS-7452	RT,QT,R,A
Fan Motor	?	VEF-37A	RT,QT,R,A
Fan Motor	?	VEH-37B	RT,QT,R,A
Fan Motor	?	VSF-30A	RT,QT,R,A
Fan Motor	?	VSF-30B	RT,QT,R,A
Vent. Heater	?	VEH-6A	RT,QT,R,A
Vent. Heater	?	VEH-6B	RT,QT,R,A
Motor Operated Valve	Limitorque	CV-7453	QT,T,P,H,CS,R,A
Pump	?	P7A	RT,QT,R,A
Pump	?	P7B	RT,QT,R,A
Pump	?	P34A	RT,QT,R,A
Pump	?	P34B	RT,QT,R,A
Pump Motor	?	P-35A	RT,QT,R,A
Pump Motor	?	P-35B	RT,QT,R,A
Pump	?	P-36A	RT,QT,R,A
Pump	?	P-36B	RT,QT,R,A
Pump	?	P-36C	RT,QT,R,A
Fan Motor	?	VEF-38A	RT,QT,R,A
Fan Motor	?	VEF-38B	RT,QT,R,A
Neutron Detector Local Connector	?	Generic	T,CS,R,A

APPENDIX C

Equipment Considered Acceptable or
Conditionally Acceptable
(Category 4.3)

Equipment Description	Manufacturer	Plant ID No.	Deficiency

No equipment in this category.

APPENDIX D

Safety-Related Systems List[1]

Function	System
Emergency Reactor Shutdown	Reactor Coolant Reactor Protection Engineered Safeguards Actuation Makeup and Purification
Containment Isolation	Main Steam Feedwater Decay Heat Removal Sampling Gaseous Radwaste Intermediate Cooling Service Water Makeup and Purification Chilled Water Firewater Dirty Liquid Radwaste Hydrogen Purge Reactor Building Purge Reactor Building Isolation[2]
Reactor Core Cooling	High Pressure Injection (Makeup and Purification) Low Pressure Injection (Decay Heat Removal) Core Flood
Containment Heat Removal	Reactor Building Spray Reactor Building Cooling Containment Sump Recirculation (Decay Heat Removal)
Core Residual Heat Removal	Decay Heat Removal Power Operated Relief Valves[3] Main Feedwater Emergency Feedwater Steam Dump Intermediate Cooling Water Service Water

[1]The NRC staff recognized that there are differences in nomenclature of systems because of plant vintage and engineering design; consequently some systems performing identical or similar functions may have different names. In those instances it was necessary to verify the system(s) function with the responsible IE regional reviewer and/or the licensee.
[2]Includes other isolation valves in systems not given above.
[3]Covered as part of TMI-2 Lessons Learned.

Function	System
Prevention of Significant Release of Radioactive Material to Environment	Reactor Building Spray (Iodine Removal) Hydrogen Purge Sampling Radiation Monitoring
Supporting Systems	Station Distribution Diesel Generators and Support Systems Control Room Emergency Air Conditioning Emergency Chilled Water