SAFETY EVALUATION REPORT BY THE

OFFICE OF NUCLEAR REACTOR REGULATION

EQUIPMENT QUALIFICATION BRANCH

FOR VERMONT YANKEE ATOMIC POWER COMPANY

VERMONT YANKEE ATOMIC POWER STATION

DOCKET NO. 50-271

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ENVIRONMENTAL QUALIFICATION OF SAFETY-RELATED ELECTRICAL EQUIPMENT

1 INTRODUCTION

General Design Criteria 1 and 4 specify that safety-related electrical equipment in nuclear facilities must be capable of performing its safety-related function under environmental conditions associated with all normal, abnormal, and accident plant operation. In order to ensure compliance with the criteria, the NRC staff required all licensees of operating reactors to submit a reevaluation of the qualification of safety-related electrical equipment which may be exposed to a harsh environment.

2 BACKGROUND

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

Subsequently, Commission Memorandum and Order CLI-80-21 (issued on May 23, 1980) states that the DOR guidelines and portions of NUREG-0588 (which were issued on January 14, 1980, as enclosures 4 and 5 to IEB-79-01B) form the requirements that licensees must meet regarding environmental qualification of safety-related electrical equipment in order to satisfy those aspects of 10 CFR 50, Appendix A, General Design Criterion (GDC)-4. This order also requires the staff to complete safety evaluation reports (SERs) for all operating plants by February 1, 1981. In addition, this order requires that the licensees have qualified safety-related equipment installed in their plants by June 30, 1982.

Supplements to IEB 79-01B were issued for further clarification and definition of the staff's needs. These supplements were issued on February 29, September 30, and October 24, 1980.

In addition, the staff issued orders dated August 29, 1980 (amended in September 1980) and October 24, 1980 to all licensees. The August order required that the licensees provide a report, by November 1, 1980, documenting the qualification of safety-related electrical equipment. The October order required the establishment of a central file location for the maintenance of all equipment-qualification records. The central file was mandated to be established by December 1, 1980. The order also required that all safety-related electrical

equipment be qualified by June 30, 1982. In response, the licensee submitted information through letters dated June 2 and November 1, 1980.

2.1 Purpose

The purpose of this SER is to identify equipment whose qualification program does not provide sufficient assurance that the equipment is capable of performing the design function in hostile environments. The staff position relating to any identified deficiencies is provided in this report.

2.2 Scope

The scope of this report is limited to an evaluation of the equipment which must function in order to mitigate the consequences of a loss-of-coolant accident (LOCA) or a high-energy-line-break (HELB) accident, inside or outside containment, while subjected to the hostile environments associated with these accidents.

3 STAFF 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 (1) a preliminary evaluation of the licensee's response, documented in a technical evaluation report (TER) and (2) an onsite verification inspection (September 29 - October 2, 1980) of selected safety-related electrical equipment. The main steam and high pressure coolant injection systems were inspected. The inspection verified proper installation of equipment, overall interface integrity, and manufacturers' nameplate data. The manufacturer's name and model number from the nameplate data were compared to information given in the Component Evaluation Work Sheets (CES) of the licensee's report. The site inspection is documented in report IE 50-271/80-13. No deficiencies were noted. For this review, the documents 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 270 items of equipment which were assessed by the staff.

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 Vermont Yankee, 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	325	44	100
MSLB	(not provided)	(not provided)	100

The staff has concluded that the minimum temperature profile for equipment qualification purposes should include a margin to account for analytical uncertainties in the calculated temperature profiles for postulated accidents. A margin of 20°F above steam saturation temperature is considered to be appropriate for either a postulated LOCA or MSLB, whichever is controlling as to potential adverse environmental effects on equipment.

The licensee's minimum temperature profile for qualification purposes includes a margin at least as large as would result from the staff's recommendation. Therefore, the staff concludes that the specified temperature profile is acceptable.

3.4 Temperature, Pressure, and Humidity Conditions Outside Containment

The licensee has provided the temperature, pressure, humidity and applicable environment associated with an HELB outside containment. The following areas outside containment have been addressed:

(1) Steam tunnel
(2) Torus area
(3) Reactor building
(4) HPCI pump room
(5) RCIC pump room

The staff has verified that the parameters identified by the licensee for the MSLB are acceptable.

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 maximum submergence is at elevation 239 ft 8 in. No equipment below this level inside the containment has been identified by the licensee. It is not clear from the information submitted that submergence of safety-related electrical equipment outside of containment was addressed. The licensee should address this area more specifically in the 90-day response and upgrade the CES as appropriate.

3.6 Chemical Spray

The licensee has not identified containment spray as a safety-related system, and credit has not been taken in the analysis. The system is manually operated and uses demineralized water. Because spray is available and could be used, any equipment upon which it impinges must be qualified for the spray parameter. The licensee should provide additional information to resolve this concern.

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. 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 from 5.0×10^7 to 1.0×10^8 rads. This value envelopes the DOR guideline requirements and is therefore acceptable.

A required value outside containment of 1.6×10^6 rads has been used by the licensee to specify limiting radiation levels around the RHR system in the reactor building. This value appears to consider the radiation levels influenced by the source term methodology associated with post-LOCA recirculation fluid lines and is therefore 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

Appendix A identifies equipment (if any) in this category. The licensee was asked to review the facility's safety-related electrical equipment. The licensee's review of this equipment has not identified any equipment requiring immediate corrective action; therefore, no licensee event reports (LERs) were submitted. In addition, in this review, the staff has not identified any safety-related electrical equipment which is not able to perform its intended safety function during the time in which it must operate.

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 1 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.

6 CONCLUSIONS

The staff has determined that the licensee's listing of safety-related systems and associated electrical equipment whose ability to function in a harsh environment following an accident is required to mitigate a LOCA or HELB is complete and acceptable, except as noted in Section 3 of this report. The staff has also determined that the environmental service conditions to be met by the electrical equipment in the harsh accident environment are appropriate, except as noted in Section 3 of this report. Outstanding information identified in Section 3 should be provided within 90 days of receipt of this SER.

The staff has reviewed the qualification of safety-related electrical equipment to the extent defined by this SER and has found no outstanding items which would require immediate corrective action to ensure the safety of plant operation. However, the staff has determined that many items of safety-related electrical equipment identified by the licensee for this review do not have adequate documentation to ensure that they are capable of withstanding the harsh environmental service conditions. This review was based on a comparison of the qualification values with the specified environmental values required by the design, which were provided in the licensee's summary sheets.

Subsection 4.2 identified deficiencies that must be resolved to establish the qualification of the equipment; the staff requires that the information lacking in this category be provided within 90 days of receipt of this SER. Within this period, the licensee should either provide documentation of the missing qualification information which demonstrates that such equipment meets the DOR guidelines or NUREG-0588 or commit to a corrective action (requalification, replacement, relocation, and so forth) consistent with the requirements to establish qualification by June 30, 1982. If the latter option is chosen, the licensee must provide justification for operation until such corrective action is complete.

Subsection 4.3 identified acceptance and conditional acceptance based on noted deficiencies. Where additional information is required, the licensee should respond within 90 days of receipt of this SER by providing assurance that these concerns will be satisfactorily resolved by June 30, 1982.

The staff issued to the licensee Sections 3 and 4 of this report and requested, under the provisions of 10 CFR 50.54(f), that the licensee review the deficiencies enumerated and the ramifications thereof to determine whether safe operation of the facility would be impacted in consideration of the deficiencies. The licensee has completed a preliminary review of the identified deficiencies and has determined that, after due consideration of the deficiencies and their ramifications, continued safe operation would not be adversely affected.

Based on these considerations, the staff concludes that conformance with the above requirements and satisfactory completion of the corrective actions by June 30, 1982 will ensure compliance with the Commission Memorandum and Order of May 23, 1980. The staff further concludes that there is reasonable assurance of continued safe operation of this facility pending completion of these corrective actions. This conclusion is based on the following:

(1) that there are no outstanding items which would require immediate corrective action to assure safety of plant operation

(2) some of the items found deficient have been or are being replaced or relocated, thus improving the facility's capability to function following a LOCA or HELB

(3) the harsh environmental conditions for which this equipment must be qualified result from low-probability events; events which might reasonably be anticipated during this very limited period would lead to less demanding service conditions for this equipment.

APPENDIX A

Equipment Requiring Immediate Corrective Action (Category 4.1)

No equipment in this category.

APPENDIX B

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

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

Equipment Description	Manufacturer	Component No.	Deficiency
Motor Operator	Limitorque	MOV-70-19A	QI
Motor Operator	Limitorque	MOV-70-19B	QI
Motor Operator	Limitorque	MOV-70-19C	QI
Solenoid Oper. Valve	Target Rock	VG-23	QM,QT,H,A
Solenoid Oper. Valve	Target Rock	VG-9A	QM,QT,H,A
Solenoid Oper. Valve	Target Rock	VG-12A	QM,QT,H,A
Solenoid Oper. Valve	Target Rock	VG-22A	QM,QT,H,A
Solenoid Oper .Valve	Target Rock	VG-33	QM,QT,H,A
Solenoid Oper. Valve	Target Rock	VG-26	QM,QT,H,A
Solenoid Oper. Valve	Target Rock	VG-9B	QM,QT,H,A

Equipment Description	Manufacturer	Component No.	Deficiency
Solenoid Oper. Valve	Target Rock	VG-12B	QM,QT,H,A
Solenoid Oper. Valve	Target Rock	VG-22B	QM,QT,H,A
Solenoid Oper. Valve	Target Rock	VG-34	QM,QT,H,A
Solenoid Oper. Valve	Target Rock	VG-75A3	QM,QT,H,A
Solenoid Oper. Valve	Target Rock	VG-11A	QM,QT,H,A
Solenoid Oper. Valve	Target Rock	VG-13A	QM,QT,H,A
Solenoid Oper. Valve	Target Rock	VG-24	QM,QT,H,A
Solenoid Oper. Valve	Target Rock	VG-75A4	QM,QT,H,A
Solenoid Oper. Valve	Target Rock	VG-11B	QM,QT,H,A
Solenoid Oper. Valve	Target Rock	VG-13B	QM,QT,H,A
Solenoid Oper. Valve	Target Rock	VG-25	QM,QT,H,A
Solenoid Oper. Valve	Atkomatic	FSO-109-75B1	QM,QT,T,P,H,A
Solenoid Oper. Valve	Atkomatic	FSO-109-75C1	QM,QT,T,P,H,A
Solenoid Oper. Valve	Atkomatic	FSO-109-75D1	QM,QT,T,P,H,A
Solenoid Oper. Valve	Atkomatic	FSO-109-75B2	QM,QT,T,P,H,A
Solenoid Oper. Valve	Atkomatic	FSO-109-75C2	QM,QT,T,P,H,A
Solenoid Oper. Valve	Atkomatic	FSO-109-75D2	QM,QT,T,P,H,A
Pressure Transmitter	Rosemount	PT-VG-4A	QM,QT,A
Pressure Transmitter	Rosemount	PT-VG-4B	QM,QT,A
H_2 Analyzer	Delphi	SAH-VG-5	QM,QT,A,T

Equipment Description	Manufacturer	Component No.	Deficiency
Solenoid Oper. Valve	Atkomatic	FSO-109-75A1	QM,QT,T,P, H,R,A
Solenoid Oper. Valve	Atkomatic	FSO-109-75A2	QM,QT,T,P, H,R,A
Motor	GE	P46-1A	QI
Motor	GE	P46-1B	QI
Motor Operator	Limitorque	MOV-14-11A	QI
Motor Operator	Limitorque	MOV-14-11B	QI
Motor Operator	Limitorque	MOV-14-12A	QI
Motor Operator	Limitorque	MOV-14-12B	QI
Motor Operator	Limitorque	MOV-14-26A	QI
Motor Operator	Limitorque	MOV-14-26B	QI
Motor Control Center	Westinghouse	MCC-8E	QI
Motor Control Center	Westinghouse	MCC-9D	QI
Motor Control Center	ITE	MCC-89A	QI
Motor Control Center	ITE	MCC-89B	QI
Uninterruptible Power Sys.	Exide	UPS-1A	QI
Uninterruptible Power Sys.	Exide	UPS-1B	QI
Power Panel	GE	PP-89	QI
Motor Generator Set	GE	MG-2-1A	QI
Motor Control Center	Westinghouse	MCC-9B	QI
Motor Control Center	Westinghouse	DC-2A	QI
Motor Control Center	Westinghouse	DC-1A	QI
Motor Control Center	Westinghouse	DC-1B	QI
Motor Control Center	Westinghouse	DC-2B	QI

Equipment Description	Manufacturer	Component No.	Deficiency
Power Panel	Westinghouse	LT-ITA	QI
Motor	Allis-Chalmers	RRU-5	QM,QT,T,P,H,R,A
Motor	Allis-Chalmers	RRU-7	QM,QT,T,P,H,R,A
Motor	Allis-Chalmers	RRU-8	QM,QT,T,P,H,R,A
Motor	Allis-Chalmers	RRU-6	QM,QT,T,P,H,R,A
Motor Operator	Limitorque	MOV-23-15	QM,QT,T,P,H,R,A
Motor Operator	Limitorque	MOV-23-16	QI
Motor Operator	Limitorque	MOV-23-19	QI
Pressure Switch	Barksdale	PS-23-68A	QM,QT,R,A
Pressure Switch	Barksdale	PS-23-68B	QM,QT,R,A
Pressure Switch	Barksdale	PS-23-68C	QM,QT,R,A
Pressure Switch	Barksdale	PS-23-68D	QM,QT,R,A
Flow Transmitters	GE/MAC	PT-23-82	QM,QT,H,R,A
Pressure Switch	Barksdale	PS-23-84	QM,QT,R,A
Pressure Switch	Barksdale	PS-23-97A	QM,QT,R,A
Pressure Switch	Barksdale	PS-23-97B	QM,QT,R,A
Local Controls	Terry	-	QI
Motor Operator	Limitorque	MOV-23-14	QI
Motor Operator	Limitorque	MOV-23-24	QI
Motor Operator	Limitorque	MOV-23-17	QI
Motor Operator	Limitorque	MOV-23-57	QI
Motor Operator	Limitorque	MOV-23-20	QI
Motor Operator	Limitorque	MOV-23-58	QI
Motor Operator	Limitorque	MOV-23-21	QI

Equipment Description	Manufacturer	Component No.	Deficiency
Solenoid Valve	ASCO	23-50A	RPN
Motor Operated Valve	Limitorque	MOV-2-74	QM,QT,R,A
Pressure Switch	Barksdale	PS-2-3-52A	QM,QT,R,A
Pressure Switch	Barksdale	PS-2-3-52C	QM,QT,R,A
Pressure Switch	Barksdale	PS-2-3-53A	QM,QT,R,A
Pressure Switch	Barksdale	PS-2-3-53B	QM,QT,R,A
Relief Valve Pos. Mon.	GE	DWG #112D1943G005	QI
Pressure Switch	Static-O-Ring	PS-2-71A	QI
Pressure Switch	Static-O-Ring	PS-2-72B	QI
Pressure Switch	Static-O-Ring	PS-2-73C	QI
Pressure Switch	Static-O-Ring	PS-2-72A	QI
Pressure Switch	Static-O-Ring	PS-2-73B	QI
Pressure Switch	Static-O-Ring	PS-2-71D	QI
Pressure Switch	Static-O-Ring	PS-2-73A	QI
Pressure Switch	Static-O-Ring	PS-2-71C	QI
Pressure Switch	Static-O-Ring	PS-2-72D	QI
Pressure Switch	Static-O-Ring	PS-2-71B	QI
Pressure Switch	Static-O-Ring	PS-2-72C	QI
Pressure Switch	Static-O-Ring	PS-2-73D	QI
Thermocouple Assembly	Thermoelectric	TE-16-19-30	QI
Acoustic Transmitter	B&W	-	QI
Acoustic Accelerometer	B&W	-	QI
Radiation Detector	Victoreen	RD-16-19-1A	QI
Radiation Detector	Victoreen	RD-16-19-1B	QI

Equipment Description	Manufacturer	Component No.	Deficiency
Level Transmitter	GE	LT-16-19-38A	QI
Level Transmitter	GE	LT-16-19-38B	QI
Temperature Element	Thermo-Electric	TE-16-19-33A	QI
Temperature Element	Thermo-Electric	TE-16-19-33C	QI
Pressure Transmitter	GE	PT-6-53A	QM,QT,R,A
Pressure Transmitter	GE	PT-6-53B	QM,QT,R,A
Level Transmitter	Rosemount	LT-16-19-10A	QM,QT,R,A
Level Transmitter	Rosemount	LT-16-19-10B	QM,QT,R,A
Level Switch	Yarway	LITS-2-3-73A	QM,QT,A
Level Switch	Yarway	LITS-2-3-73B	QM,QT,A
Pressure Transmitter	GE	PT-16-19-23	QI
Temperature Element	Thermo-Electric	TE-16-19-34	QI
Pressure Transmitter	GE	PT-16-19-36	QI
Temperature Element	Thermo-Electric	TE-1-149-1	QI
Solenoid Oper. Valve	ASCO	FCV-2-39	QM,QT,A
Solenoid Oper. Valve	ASCO	FCV-2-40	RPN
Solenoid Pilot Valve	ASCO	16-19-11A	RPN
Solenoid Pilot Valve	ASCO	16-19-11B	RPN
Pressure Switch	Barton	dPIS-16-19-32A	QM,QT,A
Pressure Switch	Barton	dPIS-16-19-32B	QM,QT,A
Sensor	GE	17-430A	QI
Sensor	GE	17-430B	QI

Equipment Description	Manufacturer	Component No.	Deficiency
Sensor	GE	17-431A	QI
Sensor	GE	17-431B	QI
Motor Operator	Limitorque	MOV-13-15	QM,QT,R,A
Motor Operator	Limitorque	MOV-13-16	QI
Pressure Switch	Barksdale	PS-13-72A	QM,QT,R,A
Pressure Switch	Barksdale	PS-13-67A	QM,QT,R,A
Pressure Switch	Barksdale	PS-13-72B	QM,QT,R,A
Pressure Switch	Barksdale	PS-13-67B	QM,QT,R,A
Pressure Switch	Barksdale	PS-13-87A	QM,QT,R,A
Pressure Switch	Barksdale	PS-13-87B	QM,QT,R,A
Pressure Switch	Barksdale	PS-13-87C	QM,QT,R,A
Pressure Switch	Barksdale	PS-13-87D	QM,QT,R,A
Flow Transmitter	GE	FT-13-58	QI
Local Controls	Terry	-	QI
Motor Operator	Limitorque	MOV-2-53A	QM,QT,R,A
Motor Operator	Limitorque	MOV-2-53B	QM,QT,R,A
Motor Operator	Limitorque	MOV-2-54A	QM,QT,R,A
Motor Operator	Limitorque	MOV-2-54B	QM,QT,R,A
Motor Operator	Limitorque	MOV-2-66A	QM,QT,R,A
Motor Operator	Limitorque	MOV-2-66B	QM,QT,R,A
Motor Operator	Limitorque	MOV-12-15	QM,QT,R,A
Motor Operator	Limitorque	MOV-12-18	R,A
Motor Operator	Limitorque	MOV-10-18	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-32	QM,QT,R,A

Equipment Description	Manufacturer	Component No.	Deficiency
Motor Operator	Limitorque	MOV-10-27A	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-31A	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-13C	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-15C	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-27B	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-31B	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-13D	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-15D	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-26A	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-13A	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-15A	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-26B	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-13B	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-15B	QM,QT,R,A
Motor	GE	P10-1A	QM,QT,T,P,H,R,A
Motor	GE	P10-1B	QM,QT,T,P,H,R,A
Motor	GE	P10-1C	QM,QT,T,P,H,R,A
Motor	GE	P10-1D	QM,QT,T,P,H,R,A
Motor	Westinghouse	P8-1A	QM,QT,T,A
Motor	Westinghouse	P8-1B	QM,QT,T,A
Motor	Westinghouse	P8-1C	QM,QT,T,A
Motor	Westinghouse	P8-1D	QM,QT,T,A
Motor Operator	Limitorque	MOV-10-25A	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-25B	QM,QT,R,A

Equipment Description	Manufacturer	Component No.	Deficiency
Motor Operator	Limitorque	MOV-10-17	QI
Motor Operator	Limitorque	MOV-10-38A	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-57	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-89A	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-38B	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-65A	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-89B	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-39A	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-65B	QI,QT,R,A
Motor Operator	Limitorque	MOV-10-183	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-39B	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-66	QM,QT,R,A
Motor Operator	Limitorque	MOV-10-184	QM,QT,R,A
Fan Motor	Allis-Chalmers	REF-2A	QI
Fan Motor	Allis-Chalmers	REF-2B	QI
Solenoid	ASCO	SB-2A	RPN
Solenoid	ASCO	SB-2B	RPN
Solenoid	ASCO	SB-3A	RPN
Solenoid	ASCO	SB-3B	RPN
Solenoid	ASCO	SB-4A	RPN
Solenoid	ASCO	SB-4B	RPN
Solenoid	ASCO	SB-5	RPN
Limit Switch	NAMCO	AOV-2-86A	QM,QT,A
Limit Switch	NAMCO	AOV-2-86B	QM,QT,A

Equipment Description	Manufacturer	Component No.	Deficiency
Limit Switch	NAMCO	AOV-2-86C	QM,QT,A
Limit Switch	NAMCO	AOV-2-86D	QM,QT,A
Thermocouple	Lewis Engineering	TE-16-19-30	QM,QT,T,A
Power Cable	Rome Cable	Generick	QM,QT,A
Penetration Assembly	GE	Generick	QM,QT,A
Terminal Blocks	Buchanan	Generick	QM,QT,A
Power Cable	Rome Cable	XLP/PVC	QM,QT,T,P,H,R,A
Power Cable	Kerite	Generick	QM,QT,A
Power Cable	Collyer	P46-1A	QM,QT,T,P,H,R,A
Power Cable	Collyer	P46-1B	QM,QT,T,P,H,R,A
Control Cable	Rome	XLP/PVC/PVC	QM,QT,T,P,H,R,A
Terminal Block	States	Type NT	QM,QT,R,A
Terminal Block	States	AOV-2-86A	QM,QT,R,A
Terminal Block	States	AOV-2-86B	QM,QT,R,A
Terminal Block	States	AOV-2-86C	QM,QT,R,A
Terminal Block	States	AOV-2-86D	QM,QT,R,A
Instrument Cable	Boston Insulated Wire Co.	Generick	QM,QT,T,P,H,R,A

APPENDIX C

Equipment Considered Acceptable or Conditionally Acceptable
(Category 4.3)

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

Equipment Description	Manufacturer	Component No.	Deficiency
Solenoid Oper. Valve	ASCO	RV-2-71A	A
Solenoid Oper. Valve	ASCO	RV-2-71B	A
Solenoid Oper. Valve	ASCO	RV-2-71C	A
Solenoid Oper. Valve	ASCO	RV-2-71D	A
Temperature Switch	Fenwall	TS-23-101A	A
Temperature Switch	Fenwall	TS-23-102A	A
Temperature Switch	Fenwall	TS-23-103A	A
Temperature Switch	Fenwall	TS-23-104A	A
Temperature Switch	Fenwall	TS-23-101-B	A
Temperature Switch	Fenwall	TS-23-102-B	A

Appendix C (Continued)

Equipment Description	Manufacturer	Component No.	Deficiency
Temperature Switch	Fenwall	TS-23-103-B	A
Temperature Switch	Fenwall	TS-23-104-B	A
Temperature Switch	Fenwall	TS-23-101-C	A
Temperature Switch	Fenwall	TS-23-102-C	A
Temperature Switch	Fenwall	TS-23-103-C	A
Temperature Switch	Fenwall	TS-23-104-C	A
Temperature Switch	Fenwall	TS-23-101-D	A
Temperature Switch	Fenwall	TS-23-102-D	A
Temperature Switch	Fenwall	TS-23-103-D	A
Temperature Switch	Fenwall	TS-23-104-D	A
Solenoid Oper. Valve	ASCO	AOV-2-80A	A
Solenoid Oper. Valve	ASCO	AOV-2-80B	A
Solenoid Oper. Valve	ASCO	AOV-2-80C	A
Solenoid Oper. Valve	ASCO	AOV-2-80D	A
Solenoid Oper. Valve	ASCO	AOV-2-86A	A
Solenoid Oper. Valve	ASCO	AOV-2-86B	A
Solenoid Oper. Valve	ASCO	AOV-2-86C	A
Solenoid Oper. Valve	ASCO	AOV-2-86D	A
Pressure Switch	Barton	PS-2-3-52B	A
Pressure Switch	Barton	PS-2-3-52D	A
Level Transmitter	Rosemount	LT-2-3-72A	A
Level Transmitter	Rosemount	LT-2-3-72B	A
Level Transmitter	Rosemount	LT-2-3-72C	A
Level Transmitter	Rosemount	LT-2-3-72D	A

Appendix C (Continued)

Equipment Description	Manufacturer	Component No.	Deficiency
Temperature Switch	Fenwall	TS-13-79-A	A
Temperature Switch	Fenwall	TS-13-80-A	A
Temperature Switch	Fenwall	TS-13-81-A	A
Temperature Switch	Fenwall	TS-13-82-A	A
Temperature Switch	Fenwall	TS-13-79-B	A
Temperature Switch	Fenwall	TS-13-80-B	A
Temperature Switch	Fenwall	TS-13-81B	A
Temperature Switch	Fenwall	TS-13-82B	A
Temperature Switch	Fenwall	TS-13-79C	A
Temperature Switch	Fenwall	TS-13-80C	A
Temperature Switch	Fenwall	TS-13-81C	A
Temperature Switch	Fenwall	TS-13-82C	A
Temperature Switch	Fenwall	TS-13-79D	A
Temperature Switch	Fenwall	TS-13-80D	A
Temperature Switch	Fenwall	TS-13-81D	A
Temperature Switch	Fenwall	TS-13-82D	A
Differential PIS	Barton	dPIS-13-83	A
Differential PIS	Barton	dPIS-13-84	A
Limit Switch	NAMCO	AOV-2-80A	A
Limit Switch	NAMCO	AOV-2-80B	A
Limit Switch	NAMCO	AOV-2-80C	A
Limit Switch	NAMCO	AOV-2-80D	A
Control Cable	Rockbestos	AOV-2-80A	A
Control Cable	Rockbestos	AOV-2-80B	A

Equipment Description	Manufacturer	Component No.	Deficiency
Control Cable	Rockbestos	AOV-2-80C	A
Control Cable	Rockbestos	AOV-2-80D	A

APPENDIX D

Safety-Related Systems List[1]

Function	System
Emergency Reactor Shutdown	Reactor Protection Engineered Safeguards Actuation Standby Liquid Control
Containment Isolation	Main Steam Reactor Water Cleanup Primary Containment Atmospheric Control Sampling Residual Heat Removal Drywell Sump Discharge Reactor Core Isolation Cooling Containment Isolation[2]
Reactor Core Cooling	High Pressure Coolant Injection Low Pressure Coolant Injection Automatic Depressurization Core Spray
Containment Heat Removal	Containment Spray Residual Heat Removal Service and Cooling Water
Core Residual Heat Removal	Residual Heat Removal Reactor Core Isolation Cooling Service and Cooling Water Standby Coolant Supply
Prevention of Significant Release of Radioactive Material to Environment	Containment Atmospheric Dilution Post Accident Monitoring Post Accident Sampling Standby Gas Treatment Primary Containment and Atmospheric Control
Supporting Systems	Emergency Power Heating and Ventilation

[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]Other systems with isolation valves covered by engineered safeguards actuation system.