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FYR 84-30
2.C.2.1

YANKEE ATOMIC ELECTRIC COMPANY

1671 Worcester Road, Framingham, Massachusetts 01701

March 5, 1984

United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Office of Nuclear Reactor Regulation
Mr. D. G. Eisenhut, Director
Division of Licensing

References:
(a) License No. DPR-3 (Docket No. 50-29)
(b) YAEC Letter to USNRC, dated February 14, 1979 (WYR 79-15)
(c) YAEC Letter to USNRC, dated September 8, 1981 (FYR 81-132)
(d) YAEC Letter to USNRC, dated September 8, 1982 (FYR 82-89)
(e) USNRC Letter to YAEC, dated December 16, 1982 (NYR 82-282)
(f) USNRC Letter to YAEC, dated February 1, 1983 (NYR 83-14)
(g) YAEC Letter to USNRC, dated May 20, 1983 (FYR 83-53)
(h) YAEC Letter to USNRC, dated August 30, 1983 (FYR 83-81)
(i) YAEC Letter to USNRC, dated May 1, 1980 (WYR 80-48)
(j) YAEC Letter to USNRC, dated July 29, 1980 (WYR 80-89)
(k) YAEC Letter to USNRC, dated October 31, 1980 (WYR 80-119)
(l) YAEC Letter to USNRC, dated March 29, 1974, Proposed Change No. 115
(m) USNRC Letter to YAEC, dated December 29, 1980
(n) YAEC Letter to USNRC, dated June 5, 1980 (WYR 80-62)

Subject: Environmental Qualification

Dear Sir:

The following information is intended to provide the staff with a complete submittal of the Yankee Nuclear Power Station (YNPS) environmental qualification program for electrical equipment. The staff has previously transmitted the equipment qualification Safety Evaluation Report (SER) on December 16, 1982, Reference (e). Included in this letter was the Technical Evaluation Report (TER) prepared by Franklin Research Center (FRC) under contract to NRC. The results of the staff's review documented several deficiencies, which were the subject of subsequent correspondence. These deficiencies, as well as recent equipment replacements, planned modifications, document reviews, and refinements of equipment operation requirements and environmental parameters are addressed in the attachments to this correspondence. These attachments are:

- Attachment A - itemizes the previous FRC concerns and provides the intended action to resolve the concerns. It also lists FRC items that have since been determined to be out-of-scope of 10CFR50.49, with appropriate justification.

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- Attachment B - provides the staff with the master list of electrical equipment to be environmentally qualified. It includes the qualification status of those items determined to have deficient qualification documentation. Also, this attachment includes the previously submitted and revised Justifications for Continued Operation (JCOs), which support our conclusion that the plant can be operated safely pending completion of the qualification program.

- Attachment C - response to USNRC letter to YAEC, dated February 1, 1983.

- Attachment D - response to FRC conclusions in Appendix C of TER-C5257-463.

On January 17, 1984, a meeting was held with members of your staff to discuss the YNPS EQ Program and its conformance to 10CFR50.49. The YNPS methodology for compliance to 10CFR50.49 is provided as follows:

- Selection process of safety-related (b)(1) equipment and nonsafety-related (b)(2) equipment:

  The (b)(1) equipment were selected by first identifying those safety-related systems required to function for the safe shutdown of the plant during all postulated DBEs, and second, determining by review of plant documents which equipment was required to assure system operation. Reference (g) provided a description of the methodology used to identify (b)(2) equipment and the actions necessary to isolate the non-safety-related equipment identified during the design review process. These actions have been completed.

- Display Instrumentation:

  Reference (h) submitted information describing the instrumentation used for measurements and indications of Types A, B, C, D, and E variables as identified in Regulatory Guide 1.97. The information includes statements on qualification for all the equipment identified. While certain equipment listed in Reference (h) are already included in the master list of electrical equipment to be environmentally qualified, it should be noted that the Reference (h) submittal is currently under review by the NRC staff. Once this review is completed and all items resolved, the equipment qualification program will be revised as necessary to incorporate any additional items.

- Environmental Conditions:

  References (i) and (n) submitted the curves that defined the plant-specific environments for the LOCA and MSLB events inside the vapor container. Reference (j) provided a summary comparison of the LOCA analysis to current-day practice as justification for use of the curves as a best estimate analysis. However, the staff provided

their own containment LOCA temperature profile in Reference (e) (derived from SEP Topic Assessment VI-2.D) for use by Yankee in equipment qualification. It is our position that this curve is inappropriate for equipment qualification purposes.

The SEP analysis performed for the staff is not realistic and is overly conservative. Assumptions used in the analysis are not representative of actual plant conditions and are not suitable for a best-estimate calculation. Specifically, the initial containment pressure of 17.7 psi is an upper bound and is not representative of normal plant operating conditions. Secondly, the outside ambient temperature of 100°F is high and should be reduced. Thirdly, the value of 0.4 Btu/hr-ft^2-°F used for heat transfer from the containment to the outside air is significantly underestimated. A value of 2 Btu/hr-ft^2-°F to include convective and radiant heat transfer is justified.

The staff analysis (i.e., computer input listing) has been recently received for further evaluation. A re-analysis is in progress to evaluate the staff assumptions and perform a more realistic analysis. A supplement to this letter describing the results of this evaluation and re-analysis will be submitted by March 23, 1984.

The YNPS pipe break analysis for outside containment was submitted in References (k) and (d) and identifies the postulated environments for the Primary Auxiliary Building (PAB). The NRC High Energy Line Break (HELB) concern, registered in Reference (f), is addressed by Attachment C to this letter. Refer to Attachment D to this letter for our response to the concern of qualifying emergency feedwater instrumentation recorded on Page C-4 of the previously referenced Franklin TER.

Additional environmental parameters are documented in Reference (b), and includes the description of the habitability of the Control Room during a postulated loss of cooling.

Flooding in the primary containment (submergence) will not affect any safety-related electrical equipment as documented in Reference (k). No equipment is located below the level established for maximum submergence.

As discussed in our January 17, 1984 meeting, the YNPS EQ Program documentation will consist mainly of Qualification Documentation Review (QDR) packages. These QDRs will document equipment qualification and, where applicable, will address the concerns identified by the staff such as (1) auditability of Rockbestos Firewall III cable qualification documentation data base, (2) instrument application of terminal blocks inside containment, and (3) orientation of equipment (Limitorque) with respect to manufacturer's and qualification restrictions. This third item will be addressed as part of an additional plant walkdown to verify and document each safety-related electrical equipment installation. This walkdown is intended to demonstrate that the installed equipment is representative of its associated qualification test data and documentation records.

With respect to the ongoing qualification of equipment, including aging considerations, a detailed description of the Yankee plant maintenance and surveillance program was submitted in Reference (c). This program was reviewed by FRC in their TER stating that the program adequately addresses concerns relative to aging and qualified life.

In general, the YNPS EQ Program will establish a qualified equipment life by evaluating materials using type-test data or other documented sources of materials properties. This evaluation is based on Arrhenius methodology or other engineering approved methods. Materials data is being integrated into the existing plant maintenance and surveillance programs. Qualification Document Review (QDR) packages contain the test reports and analyses which provide the basis for equipment qualification and are reviewed by our engineering staff to identify age-sensitive materials or components. In addition, the QDR aging evaluations and manufacturers maintenance recommendations will be reviewed against previous maintenance records and existing maintenance procedures will be modified and new maintenance procedures developed as necessary. Any manufacturer recommendations not already included in the procedures will be incorporated.

This program was discussed with the staff at the January 17 meeting. Relative to assuring that components will be replaced with parts that will maintain the qualification of the equipment, we will procure replacement parts in conformance with the staff guidance set forth in the November 1983 draft of Regulatory Guide 1.89. We will further assure that maintenance personnel are cognizant of the equipment in this program and the importance of maintaining the ongoing qualification of this equipment.

Also, as described at our January 17, 1984 meeting, a committee, consisting of plant and engineering personnel, will be established to review the revised or interim maintenance and surveillance procedures. This committee will complete their review prior to the deadline of the rule.

At the January 17, 1984 meeting, the staff requested confirmation that all design-basis events at YNPS which could result in a potentially harsh environment, including flooding outside containment, were addressed in identifying safety-related electrical equipment at YNPS which was to be environmentally qualified. The flooding and environmental effects resulting from all postulated design-basis accidents analyzed and documented in Reference (1), including the Loss-of-Coolant Accident (LOCA) and the Main Steam-Line Break Accident (MSLB) inside containment, were considered in the identification of safety-related electrical equipment which was to be environmentally qualified. The flooding and environmental effects resulting from High Energy Line Breaks (HELB), as documented in Reference (d), were also considered in the identification of this equipment. The effects of flooding outside containment from sources other than HELBs were analyzed at YNPS in 1975 as documented in the Staff Safety Evaluation Report in Reference (m). Certain protective measures implemented at that time, including door and wall openings in the PAB, installation of sump switches/alarms, and operating procedures to provide assurance of proper operator action in the event of

flooding, preclude adverse flooding effects to safety-related equipment required for safe shutdown or mitigation of the consequences of postulated accidents. Therefore, all design-basis events, including accidents at YNPS, were considered in the identification of electrical equipment within the scope of Paragraph (b)(1) of 10CFR50.49.

It is our position that the above described YNPS equipment qualification program complies with the requirements of 10CFR50.49. Also, the JCOs in Attachment B to this letter ensure that the YNPS can be safely operated, without undue risk to the health and safety of the general public, pending the completion of the EQ Program at the end of the upcoming refueling outage currently set for early June 1984.

Based on the January 17 discussions with the staff and the YNPS EQ Program described above, the staff is requested to issue a supplemental SER to show that our EQ Program meets the requirements of 10CFR50.49 and that previous staff deficiencies and concerns have been satisfactorily resolved.

We trust this information is satisfactory; however, please advise should you have any questions.

Very truly yours,

YANKEE ATOMIC ELECTRIC COMPANY

J. A. Kay
Senior Engineer - Licensing

JAK/clr

ATTACHMENT A

PROPOSED RESOLUTION FOR SPECIFIC EQUIPMENT
ENVIRONMENTAL QUALIFICATION DEFICIENCIES IDENTIFIED
IN FRANKLIN RESEARCH CENTER TER-C5257-463

PROPOSED RESOLUTION FOR SPECIFIC EQUIPMENT ENVIRONMENTAL QUALIFICATION DEFICIENCIES IDENTIFIED IN FRANKLIN RESEARCH CENTER TER-C5257-463

FRC TER ITEM #	DESCRIPTION	NRC CATEGORY	DEFICIENCIES	PROPOSED RESOLUTION
1	Solenoid Valve Atkomatic 32861-CV	I.B	Documentation	Replaced with qualified Valcor Solenoid Valves (V526-5820-9)
4	Motorized Valve Actuator Limitorque SMA	II.A	Documentation Similarity Aging Qualified Life	Replace with qualified Limitorque (SMB-2)
5	Motorized Valve Actuator Limitorque SMA	II.A	Documentation Similarity Aging Qualified Life	Not in scope of 10CFR50.49 (cold shutdown equipment)
6	Radiation Detector Victoreen 877	II.A	Similarity	Victoreen supplied cable has been replaced with qualified Rockbestos Coax Cable (XLP) and Victoreen Seal
7	Accelerometer Babcock & Wilcox	I.B	Documentation	Analysis and documentation
8	Acoustic Transmitter Babcock & Wilcox		Documentation	Replace with qualified TEC Series 504 Charge Converter and Model 160-2 Transient Shield
9	Thermocouple Thermo Electric	I.B	Documentation	Thermo Electric connector has been replaced with qualified Conax Model QDHT Thermocouple Connector
10	Level Transmitter Rosemount 1153A	II.C	Aging Qualified Life Surveillance Program	Additional analysis and documentation. Ongoing maintenance and surveillance per Rosemount 1153B Series program

FRC TER ITEM #	DESCRIPTION	NRC CATEGORY	DEFICIENCIES	PROPOSED RESOLUTION
11	Level Transmitter Fischer & Porter 13D-2495-JBNS	II.B	Documentation Similarity Aging Qualified Life Surveillance Program Temperature/Pressure Testing Test Duration	Replaced with qualified Rosemount 1153B Series Transmitters
12	Pressure Transmitter Rosemount 1152	II.C	Aging Qualified Life Surveillance Program	Replace with qualified Rosemount 1153B Series Transmitter
13	Pressure Transmitter Rosemount 1153A	II.C	Aging Qualified Life Surveillance Program	Additional analysis and documentation Ongoing maintenance and surveillance per Rosemount 1153B Series program
14	Pressure Transmitter Rosemount 1153A	II.C	Aging Qualified Life Surveillance Program	Additional analysis and documentation Ongoing maintenance and surveillance per Rosemount 1153B Series program
15	Pressure Transmitter Rosemount 1153A	II.C	Aging Qualified Life Surveillance Program	Additional analysis and documentation Ongoing maintenance and surveillance per Rosemount 1153B Series program
16	Pressure Switch Static-O-Ring 7828-100	I.B	Documentation Radiation Test Duration	Function replaced with a signal from a qualified Rosemount 1153A Transmitter
17	Electric Motor Electric Machinery	II.C	Aging Qualified Life	Additional analysis and documentation
18	Electric Motor General Electric	II.A	Similarity	Additional analysis and documentation
19	Electric Motor Westinghouse TBFC	II.C	Aging Qualified Life	Additional analysis and documentation Ongoing maintenance and surveillance

FRC TER ITEM #	DESCRIPTION	NRC CATEGORY	DEFICIENCIES	PROPOSED RESOLUTION
20	Electric Motor Westinghouse CSP	II.C	Aging Qualified Life	Not in scope of 10CFR50.49 (cold shutdown equipment)
21	Electric Motor Westinghouse CSP	II.C	Aging Qualified Life	Not in scope of 10CFR50.49 (cold shutdown equipment)
24	Electric Cable Okonite Styrene/Butadiene	II.A	Documentation Similarity	Not in scope of 10CFR50.49 (cold shutdown equipment)
29	Electric Cable Simplex Butyl/PVC	II.A	Documentation Similarity	Replace with qualified cable
30	Electric Cable Simplex PE/PVC	II.A	Documentation Similarity	Replace with qualified cable
31	Electrical Penetration Chicago Bridge and Iron	I.B	Aging Temperature/Pressure Radiation	Replaced with qualified Westinghouse penetrations
32	Electrical Penetration Westinghouse	IV	None	
36	Contactor With Control Transformer ITE/Gould A103C12	III.B	None	Not in scope of 10CFR50.49 (mild environment)
37	Contactor With Control Transformer ITE/Gould 2032-T3	III.B	None	Not in scope of 10CFR50.49 (mild environment)
38	Motor Starter Westinghouse	I.B	None	Not in scope of 10CFR50.49 (replaced by equipment located in a mild environment)
39	Motor Control Center Westinghouse	III.B	None	Not in scope of 10CFR50.49 (replaced by equipment located in a mild environment)
40	Motor Control Center Westinghouse	II.C	Qualified Life	Additional analysis and documentation
42	Battery Switchboard Westinghouse	II.A	Documentation Similarity	Additional analysis and documentation

ATTACHMENT B

MASTER LIST OF ELECTRICAL EQUIPMENT
TO BE ENVIRONMENTALLY QUALIFIED FOR
YANKEE NUCLEAR POWER STATION
(REFERENCED NOTES AND JCOs ARE ATTACHED)

MASTER LIST OF ELECTRICAL EQUIPMENT REQUIRED FOR HOT SHUTDOWN TO BE ENVIRONMENTALLY QUALIFIED FOR YANKEE NUCLEAR POWER STATION

System: I. Accident Monitoring

SCEW NO.	YR TAG NO.	FPC-TER NO.	MODEL/TYPE NO.	DESCRIPTION	INSTALLATION STATUS	NOTE REFERENCE
AM-1	RM-130 RM-131	6	877	Victoreen radiation detector and cable high range radiation	Replaced	Note d
AM-2	VC-LT-241 VC-LT-242	10	1153A	Rosemount level transmitter - containment level	Installed	Note g
AM-3	VC-PT-243 VC-PT-244	15	1153A	Rosemount pressure transmitter - containment pressure	Installed	Note g
AM-5	HV-SOV-39 HV-SOV-42	None	81RR-001	Target Rock solenoid valve - H_2 monitoring inlet/outlet isolation	Installed	Note z
AM-6	VC-LT-240	None	1153A	Rosemount level transmitter - containment sump level indication	Installed	Note g
AM-7	HV-GA-2	None	K-111	Comsip hydrogen analyzer - vapor container hydrogen concentration	Installed	Note r

MASTER LIST OF ELECTRICAL EQUIPMENT REQUIRED FOR HOT SHUTDOWN TO BE ENVIRONMENTALLY QUALIFIED FOR YANKEE NUCLEAR POWER STATION

System: II. Atmospheric Recirculation

SCEW NO.	YR TAG NO.	FRC-TER NO.	MODEL/TYPE NO.	DESCRIPTION	INSTALLATION STATUS	NOTE REFERENCE
AR-1	FN-18-1 FN-18-2 FN-18-3	19	72Y51238	Westinghouse motor - vapor container air recirculation	Installed	Note x

MASTER LIST OF ELECTRICAL EQUIPMENT REQUIRED FOR HOT SHUTDOWN TO BE ENVIRONMENTALLY QUALIFIED FOR YANKEE NUCLEAR POWER STATION

System: III. Component Cooling

SCEW NO.	YR TAG NO.	FRC-TER NO.	MODEL/TYPE NO.	DESCRIPTION	INSTALLATION STATUS	NOTE REFERENCE
CC-1	P-20-1 P-20-2	20	CSP/19N2705-1 CSP/19N2705-2	Westinghouse motor-primary cooling pump	Installed	Note c

MASTER LIST OF ELECTRICAL EQUIPMENT REQUIRED FOR HOT SHUTDOWN TO BE ENVIRONMENTALLY QUALIFIED FOR YANKEE NUCLEAR POWER STATION

System: IV. Containment Isolation

SCEW NO.	YR TAG NO.	FRC-TER NO.	MODEL/TYPE NO.	DESCRIPTION	INSTALLATION STATUS	NOTE REFERENCE
CI-4	CA-SOV-801 - CA-SOV-822 CA-SOV-901 - CA-SOV-922	None	HV-202-303-1G	ASCO solenoid valve - maintain isolation	Installed	Note t

MASTER LIST OF ELECTRICAL EQUIPMENT REQUIRED FOR HOT SHUTDOWN TO BE ENVIRONMENTALLY QUALIFIED FOR YANKEE NUCLEAR POWER STATION

System: V. Emergency Power

SCEW NO.	YR TAG NO.	FRC-TER NO.	MODEL/TYPE NO.	DESCRIPTION	INSTALLATION STATUS	NOTE REFERENCE
EPS-1		43	KU15	C&D Battery - 125V DC power Number 3 battery	Installed	Note z
EPS-2		42	CDP	Westinghouse battery switchboard - 125V DC electrical distribution Number 3 and Number 3A battery switchboard	Installed	Note v
EPS-3		41	AKD-5	GE 480V switchgear - 480V emergency bus 1, 2, and 3	Installed	Note z
EPS-4		40	N/A	Westinghouse 480V MCC - electrical power to 480V emergency MCC-2	Installed	Note 1
EPS-5	FO-LT-1 FO-LT-2 FO-LT-3	None	XM-800 Type 3	GEMS level transmitter - monitor day tank oil level	Installed	Note s
EPS-6	FO-SOV-1 FO-SOV-2 FO-SOV-3	None	80173	ASCO solenoid valve - day tank fill valves	Installed	Note y
EPS-7	FO-LIC-1 FO-LIC-2 FO-LIC-3	None	Numerous	GEMS level indicator control - maintain day tank oil levels	To Be Relocated	Note s

MASTER LIST OF ELECTRICAL EQUIPMENT REQUIRED FOR HOT SHUTDOWN TO BE ENVIRONMENTALLY QUALIFIED FOR YANKEE NUCLEAR POWER STATION

System: VI. Feedwater

SCEW NO.	YR TAG NO.	FRC-TER NO.	MODEL/TYPE NO.	DESCRIPTION	INSTALLATION STATUS	NOTE REFERENCE
FW-4	FW-LT-1003 FW-LT-1103 FW-LT-1203 FW-LT-1303	None	1153B	Rosemount level transmitter - steam generator level indication (narrow range)	Installed	Note n, z
N/A	N/A	11	13D-2495-JBNS	Fischer & Porter level transmitter	Replaced	Note n
FW-8	FW-LT-1004 FW-LT-1104 FW-LT-1204 FW-LT-1304	None	1153B	Rosemount level transmitter - steam generator level indication (wide range)	Installed	Note z

MASTER LIST OF ELECTRICAL EQUIPMENT
REQUIRED FOR HOT SHUTDOWN TO BE ENVIRONMENTALLY
QUALIFIED FOR YANKEE NUCLEAR POWER STATION

System: VII. Hydrogen Ventilation

SCEW NO.	YR TAG NO.	FRC-TER NO.	MODEL/TYPE NO.	DESCRIPTION	INSTALLATION STATUS	NOTE REFERENCE
HV-1	HV-SOV-1 HV-SOV-2	2	V52658209	Valcor solenoid valve - vapor container atmosphere sampling	Installed	Note z
N/A	N/A	1	32861-CV	Atkomatic Solenoid Valve	Replaced	Note a

MASTER LIST OF ELECTRICAL EQUIPMENT
REQUIRED FOR HOT SHUTDOWN TO BE ENVIRONMENTALLY
QUALIFIED FOR YANKEE NUCLEAR POWER STATION

System: VIII. Heating, Ventilation, and Air Conditioning

SCEW NO.	YR TAG NO.	FRC-TER NO.	MODEL/TYPE NO.	DESCRIPTION	INSTALLATION STATUS	NOTE REFERENCE
HVAC-1		None	R482C10062 T42	Honeywell damper controls - ventilation control	To Be Replaced	Note q
HVAC-2	PRV-1 PRV-2	None	T2518	Lincoln fan motor - removal of heat from SI Building	Installed	Note q
HVAC-3	PRV-1 PRV-2	None	Modutrol	Honeywell damper motor -	To Be Replaced	Note q

MASTER LIST OF ELECTRICAL EQUIPMENT
REQUIRED FOR HOT SHUTDOWN TO BE ENVIRONMENTALLY
QUALIFIED FOR YANKEE NUCLEAR POWER STATION

System: IX. Electrical Distribution

SCEW NO.	YR TAG NO.	FRC-TER NO.	MODEL/TYPE NO.	DESCRIPTION	INSTALLATION STATUS	NOTE REFERENCE
J-18	Various	35	542247	Westinghouse terminal block - electrical connection within containment	Installed	Note z
J-19	Various	31		Chicago Bridge & Iron Company penetration assembly - electrical connection within containment	Replaced	Note k
J-20	Various	26	Mineral Insulated	General Cable - electrical power and control cable located within containment	Installed	Note z
J-23	Various	28	Silicone Rubber/ Asbestos	Rockbestos cable - power cable located within containment	Installed	Note z
J-24	Various	27	Firewall III	Rockbestos cable - electrical power, instrumentation and control cable located within containment	Installed	Note z
J-25	Various	25	XLP/Hypalon	Continental cable - instrumentation circuitry located within containment	Installed	Note z
J-26	Various	29	Butyl/PVC	Simplex cable - electrical power cable located within containment	To Be Replaced	Note u
J-27	Various	36	A103C12	Gould-ITE - electrical contactor with control transformer	Installed	Note m
J-27	Various	37	2032-T3	Gould-ITE - electrical contactor with control transformer	Installed	Note m

MASTER LIST OF ELECTRICAL EQUIPMENT
REQUIRED FOR HOT SHUTDOWN TO BE ENVIRONMENTALLY
QUALIFIED FOR YANKEE NUCLEAR POWER STATION

System: IX. Electrical Distribution (continued)

SCEW NO.	YR TAG NO.	FRC-TER NO.	MODEL/TYPE NO.	DESCRIPTION	INSTALLATION STATUS	NOTE REFERENCE
J-28	Various	38	A210M1CAT	Westinghouse motor starter - electrical control	Installed	Note aa
J-29	Various	30	PE/PVC	Simplex - electrical control cable	To Be Replaced	Note u
J-31	Various	32		Westinghouse - penetration assembly	Installed	Note z
J-32	Various	23	XLP/Neoprene	Collyer Insulated Wire - electrical control cable	Installed	Note z
J-33	Various	24	Styrene/ Butadiene	Okonite - electrical power cable	Installed	Note c
J-34	Various	22	XLP	General Cable Corp - electrical power cable	Installed	Note z
J-35	MCC-4	39		Westinghouse 480V MCC - 480V a-c electrical power	Installed	Note aa
J-36	N/A	33		Conax - electrical connection seal	Installed	Note z
J-37	Various	34	6012B	Marathon terminal blocks - electrical connection located within containment	Installed	Note z

MASTER LIST OF ELECTRICAL EQUIPMENT
REQUIRED FOR HOT SHUTDOWN TO BE ENVIRONMENTALLY
QUALIFIED FOR YANKEE NUCLEAR POWER STATION

System: IX. Electrical Distribution (continued)

SCEW NO.	YR TAG NO.	FRC-TER NO.	MODEL/TYPE NO.	DESCRIPTION	INSTALLATION STATUS	NOTE REFERENCE
J-38 J-41	Various	None	SAK RSF	Weidmuller terminal blocks - electrical termination of instrument and control circuits	Installed	Note z
J-39	Various	None		Cinch terminal blocks - electrical connections for CA-SOV-801 through 822 and CA-SOV-901 through 922	Installed	Note p

MASTER LIST OF ELECTRICAL EQUIPMENT
REQUIRED FOR HOT SHUTDOWN TO BE ENVIRONMENTALLY
QUALIFIED FOR YANKEE NUCLEAR POWER STATION

System: X. Main Coolant

SCEW NO.	YR TAG NO.	FRC-TER NO.	MODEL/TYPE NO.	DESCRIPTION	INSTALLATION STATUS	NOTE REFERENCE
MC-3	MC-PT-100 MC-PT-200 MC-PT-300 PR-PT-6	13	1153GA9	Rosemount pressure transmitter - reactor trip/safety injection and main coolant pressure information	Installed	Note g
MC-4	MC-PT-712	12	1152	Rosemount pressure transmitter - main coolant pressure information and input to saturation monitor	To Be Replaced	Note h
MC-10	MC-TD-XX	None	QDHT	Conax thermocouple connector on core exit thermocouples - electrical connection	Installed	Note f
N/A	N/A	9	WE Spec 676511	Thermo-electric connector on core exit thermocouples - electrical connections	Replaced	Note f

MASTER LIST OF ELECTRICAL EQUIPMENT REQUIRED FOR HOT SHUTDOWN TO BE ENVIRONMENTALLY QUALIFIED FOR YANKEE NUCLEAR POWER STATION

System: XI. Pressurizer

SCEW NO.	YR TAG NO.	FRC-TER NO.	MODEL/TYPE NO.	DESCRIPTION	INSTALLATION STATUS	NOTE REFERENCE
PR-1	PR-PT-700	14	1153 GA9	Rosemount pressure transmitter - pressurizer pressure information and input to saturation monitor	Installed	Note g
PR-6	PR-ZE-1A PR-ZE-1B PR-ZE-1C	/	2273AMI (Endevco)	B&W acoustic accelerometer - relief valve position indication	Installed	Note e
PR-7	PR-ZT-1A PR-ZT-1B PR-ZT-1C	8		B&W acoustic transmitter - relief valve position indication	To Be Replaced	Note e
PR-8	PR-LT-705	None	1153A	Rosemount level transmitter - pressurizer level indication	Installed	Note g

MASTER LIST OF ELECTRICAL EQUIPMENT REQUIRED FOR HOT SHUTDOWN TO BE ENVIRONMENTALLY QUALIFIED FOR YANKEE NUCLEAR POWER STATION

System: XII. Shutdown Cooling

SCEW NO.	YR TAG NO.	FRC-TER NO.	MODEL/TYPE NO.	DESCRIPTION	INSTALLATION STATUS	NOTE REFERENCE
SC-1	SC-MOV-551 SC-MOV-552 SC-MOV-553 SC-MOV-554	5	SMA-1	Limitorque motor operated valve - long term cooling	Installed	Note c
SC-2	P-19	21	CSP	Westinghouse motor - shutdown cooling pump	Installed	Note c

MASTER LIST OF ELECTRICAL EQUIPMENT REQUIRED FOR HOT SHUTDOWN TO BE ENVIRONMENTALLY QUALIFIED FOR YANKEE NUCLEAR POWER STATION

System: XIII. Safety Injection

SCEW NO.	YR TAG NO.	FRC-TER NO.	MODEL/TYPE NO.	DESCRIPTION	INSTALLATION STATUS	NOTE REFERENCE
SI-4	P-48-1 P-48-2 P-48-3	17	1C	Electric Machinery motor - low pressure safety injection pump	Installed	Note w
SI-5	P-49-1 P-49-2 P-48-3	18	5K4' `K174	General Electric motor - high pressure safety injection pump	Installed	Note j
SI-6	SI-PS-14	16	7828-100	Static-O-Ring pressure switch - safety injection initiation	Replaced	Note i
SI-8	SI-MOV-48 SI-MOV-49 SI-MOV-514 SI-MOV-515 SI-MOV-516 SI-MOV-517 SI-MOV-518	3	SMB-1 SMB-00 SMB-000	Limitorque motor operated valve - transfer to recirculation mode	Installed	Note z
SI-9	CS-MOV-535	4	SMA-2	Limitorque motor operated valve - recirculation mode alignment	To Be Replaced	Note b
SI-10	SI-MOV-46	None	SMB-5000	Limitorque motor operated valve - hot leg injection	Installed	Note o
SI-24	SI-FT-5	None	1153A	Rosemount flow transmitter - safety injection hot leg flow indication	Installed	Note g

REFERENCED NOTES (Including JCOs)

a. Atkomatic Solenoid Valve

This equipment has been replaced with a qualified valve as identified in TER item number 2 (Valcor solenoid valve V526-5820-9).

b. Limitorque Motorized Valve Actuator

CS-MOV-535 is located in the supply piping to the low pressure safety injection distribution header inside containment. CS-MOV-535 is normally open, and following a LOCA it must remain open during the injection phase of safety injection.

Upon transfer to the recirculation phase of safety injection, CS-MOV-535 is required to close, it must remain closed during the rest of the accident. A loss of power to the motor operator does not change the position of the valve. The safety function of this valve can be accomplished by CS-MOV-533 which is in series with this valve, but is located outside containment.

CS-MOV-535 will be replaced with a qualified actuator during the next refueling outage.

c. Cold Shutdown Equipment

Based on the NRC's Final Rule, qualification of equipment to achieve and maintain a cold shutdown is no longer a requirement. Therefore, since the equipment identified in TER items 5, 20, 21, and 24 are used only for achieving cold shutdown conditions, they need not be considered under this rule and will be deleted from the Master List.

d. Victoreen Radiation Detector

YAEC has reviewed the FRC comments and has installed qualified Rockbestos Coax Cable with a Victoreen supplied connector. The connector has been sealed to prevent the entrance of moisture. This installation was supervised by a vendor representative using Victoreen Procedure Number 910077.

e. Babcock & Wilcox Accelerometer Dectector and Transmitters

The Babcock & Wilcox (B&W) test program produced only partial success. Difficulties developed with the acoustic transmitter (charge converter) portion of the system (no failures were associated with the Endevco accelerometer). As a result of these failures, YAEC will upgrade the B&W system with similar but qualified components supplied by Technology for Energy Corporation (TEC) during the next outage. The B&W charge converters and associated components will be replaced with TEC series 60 charge converters and model 160-2 transient shield. These equipment items will be installed according to TEC Procedure 30426-I-03. The operators have been trained to recognize symptoms of failure of the existing installation should they occur before the next outage. Further, this indication has been backed up by temperature monitors in each line.

f. Core Exit Thermocouples

YAEC's response in the TER for Item 9 involved a commitment to conduct qualification testing on the thermocouple assemblies. Two models of connectors were included in this testing. Assemblies using Thermo Electric connectors (the connector originally supplied with the thermocouple) and an assembly using a Conax Model QDNT connector (replacing the Thermo Electric connector) were tested. Successful results were achieved only with the assembly that included the Conax connector. Subsequently, six of the core exit thermocouples have had the Thermo Electric connectors replaced with the qualified Conax connectors and are sufficient to provide multiple qualified core exit temperature signals.

g. Rosemount 1153A Transmitters

This equipment was designated as satisfying "all requirements except qualified life or replacement schedule". The deficiency will be resolved by additional analysis and the ongoing maintenance program.

The additional analysis is based on the testing which included aging performed on the Rosemount model 1153B series transmitters. This analysis applies to the Model 1153A transmitter, since both use identical electronics (per Rosemount Report 108025, Revision 8).

h. Rosemount 1152 Transmitter

This equipment was designated as satisfying "all requirements except qualified life or replacement schedule". Although the Model 1152 is similar to the qualified 1153 series, this transmitter will be replaced with a qualified Rosemount 1153B series transmitter during the next outage to reduce maintenance and spare parts requirements for different Rosemount instruments.

i. Static-O-Ring Pressure Switch

This switch has been replaced in function from a bistable located in a mild environment which is operated from a Rosemount 1153A pressure transmitter.

j. General Electric Motor

The High Pressure Safety Injection (HPSI) pumps are used during the recirculation phase of a loss-of-coolant accident. Normally, one HPSI pump and one Low Pressure Safety Injection (LPSI) pump are used to supply the necessary cooling flow. In the event that a HPSI pump motor should become unavailable due to long-term operation in the post-LOCA radiation environment, the LPSI pump alone is capable of accomplishing the required safety function. The LPSI pump motor is qualified for long-term operation.

k. Chicago Bridge and Iron Penetrations

The penetrations have been replaced with Westinghouse penetrations which are qualified.

l. Westinghouse Motor Control Center

The qualified life deficiency as stated in the Franklin Research Center TER has been addressed. The documentation initially provided by the Licensee was for a General Electric preassembled Motor Control Center (MCC). Additional documentation for Westinghouse components represents the installed equipment and will be qualified through a review of the environmental parameters.

m. Mild Environment Equipment

Qualification of equipment located in a "mild environment" is not within the requirements of 10CFR50.49. Therefore, this equipment need not be considered under this rule and is deleted from the Master List.

n. Steam Generator Level Transmitters

One of the four new narrow range steam generator level channels has a terminal block for which qualification has not yet been established. The safety function of this transmitter is short-term reactor protection trip for loss of feedwater and, therefore, the trip function is completed before the environment becomes harsh. In event of failure, any two of the remaining three channels will provide the trip.

o. Limitorque Motorized Valve Actuator

MOV-SI-46 is required to operate for 24 hours post-LOCA to provide throttling, if necessary, for hot leg injection. The motor is located in the Primary Auxiliary Building and is identical to those in a similar location and environment which have been judged qualified in the TER, Item 3, for the same operating time. Since the generic qualification radiation dose for these motors is greater than the 24 hour dose, the safety function will be completed before any damage can occur.

p. Cinch Terminal Blocks

The terminal blocks on the containment isolation solenoid valves are located in the PAB and experience only post-LOCA radiation as a harsh environment. The material has been evaluated against the required radiation dose of 5×10^6R, and it has been demonstrated that the safety function will be completed before any damage will occur.

q. Honeywell Damper Motor and Controls and Lincoln Fan Motor

The fan motor, damper motor, and wall damper controls for the PAB ventilation system experience only post-LOCA radiation as a harsh environment. The one-year dose at their location is only slightly above a dose which is considered a mild environment for this type of equipment. Until qualification documentation is established by either replacement or additional analysis, the dampers will be maintained in a open position during the summer to allow natural circulation to remove excess heat from the room.

r. Comsip Hydrogen Analyzer

The Comsip Delpia Model K-III Hydrogen Analyzer has been qualified to 1.0 x 10^6R. The sample pump has been satisfactorily tested to 1 x 10^7R as documented in Comsip Report Number 1035-8, dated September 1982. The total specified dose for the analyzer and sample pump combination is 1 x 10^6R, which includes a beta dose to which only the sample pump (not the analyzer) could be exposed. Therefore, the qualified dose exceeds the specified one year dose. Finally, a second diverse analyzer is located within a mild environment.

s. GEMS Fuel Oil Tank Level Controls

The fuel oil level controls consist of GEMS Delaval model XM-800 Type 3 level probes (transmitters), GEMS Delaval receivers model RE-36520, and other GEMS electronic models.

The diesel generator fuel oil day tank level control systems experience only post-LOCA radiation as a harsh environment. An engineering evaluation is being performed to determine the ability of the organic materials used in these level probes to withstand the specified dose (3.4 x 10^4R). This required dose is within the radiation threshold of most materials. An aging analysis is also being performed The level receivers and associated electronics will be relocated to a mild environment during the next refueling outage.

The day tank inventory maintained by Technical Specifications for each diesel will last approximately 8 hours at full load operation. By sequential use of ECCS trains and longer term operation at less than full load, the combined day tank inventory for all three diesels should last 1 - 1 1/2 days. In our operating experience off-site power has been lost only once in 23 years for a period of less than one hour. Therefore, plant operation with only existing day tank inventory would be sufficient.

t. ASCO Solenoid Valves (CIS)

The solenoid valves for containment isolation perform their isolation function immediately after an accident signal and then maintain isolation until reset. The only harsh environment is post-LOCA radiation, so they perform their immediate function before the environment changes. The one year screening dose is 5 x 10^6R. Based on the coil insulation and other materials in the valves, the manufacturer has indicated that these valves are suitable for this exposure. Therefore, the valves will perform their function before any damage occurs. An independent engineering review of material susceptability to the specified radiation value will be performed to provide additional assurance.

u. Simplex Power and Control Cable

This cable is used for the out-of-containment portions of the power supplies for the recirculation fan motors, and control circuits for motor-operated valves. The radiation dose used during qualification is close to the threshold for radiation damage. Further analysis and calculation of the postulated radiation dose shows that the specified long-term one year dose can be reduced to one-half of the tested dose which is below the point at which radiation damage is expected to occur. Therefore, the safety function will be completed and no damage should occur.

However, in order to meet the intent of 10CFR50.49, YAEC will replace this cable with qualified Rockbestos Firewall III Cable during the next refueling outage.

v. Westinghouse Battery Switchboard

The Franklin TER review previously identified the battery switchboard qualification as not established.

All materials have been reviewed, analyzed, and qualification has now been established.

w. Electric Machinery Motor

In accordance with Enclosure 4 to IEB 79-01B (DOR Guidelines) Section 7.0 Aging and Appendix C, "Thermal and Radiation aging and Degradation of Selected Materials", the concern on aging relates to placing "in substantial doubt the ability of the typical equipment using these materials to function in a hostile environment."

As indicated by the following parameters, these motors do not see a hostile or harsh environment due to thermal aging or radiation degradation.

The LPSI motors are located in an area not subjected to a significant temperature rise due to DBA. The temperature is maintained by the safety injection building ventilation system which is designed to keep the ambient room temperature below 95° during post-LOCA recirculation.

The standard allowable ambient temperature is 40°C and the maximum temperature rise of the motor for the class B insulation is 90°C for a total operating temperature of 130°C.

Since the LPSI motors are intermittent duty, only operational for testing and post-LOCA it is concluded that they are suited for their application. This is based on the insulation system being rated at 130°C and the long-term effect on intermittent operation will be negligible as compared to the typical life of a Class B motor.

Therefore, with reasonable assurance, the Electic Machinery motor is qualified for this parameter.

The LPSI pump motors are located in an area with a radiation exposure of 2.16×10^6 rads total integrated dose. Review of the motor's radiation susceptible materials was performed and it was determined that the motor's most radiation sensitive material is its winding insulation. The acceptable radiation tolerance level of the motor's winding insulation is 8×10^6 rads which envelopes the total integrated plant area dose of 2.16×10^6 rads. Lubrication and bearing maintenance will be addressed in the plant surveillance and maintenance procedures. Therefore, with reasonable assurance, the Electric Machinery motor is qualified for this parameter.

x. Westinghouse Motor

The qualification package for this equipment has been updated to address the FRC TER aging concerns. Also, the requirement for greases and bearing replacement schedules will be implemented into the plant surveillance and maintenance program.

y. ASCO Solenoid Valve (Fuel Oil)

The ASCO Valve 8211B56 with Solenoid 80173 is used for filling each of the diesel generator fuel oil day tanks. This equipment is operated by control signals from the level controls discussed in Note s.

The postulated radiation dose to this equipment has been calculated to be 6.7×10^4R. An engineering evaluation is being performed to determine the ability of the organic materials used in these valves to withstand the radiation dose which is within the threshold of most materials. An aging analysis is also in process. These valves and associated subcomponents will be addressed in the Plant Maintenance and Surveillance program.

z. This equipment has undergone full qualification testing and is considered qualified for its intended service.

aa. The function of this equipment has been replaced by equipment located in a mild environment. Therefore, this equipment or its replacement need not be considered under this rule and is deleted from the master list.

ATTACHMENT C

Response to USNRC letter to YAEC, dated February 1, 1983

I. CHARGING/LETDOWN (BLEED) LINE BREAKS

The charging line outside containment has a normal operating temperature of 120°F and a normal operating flow rate of 20 to 30 gpm. Since the charging pumps are positive displacement pumps, a line break will not result in an increased flow. The bleed line outside containment has a normal operating maximum temperature of 150°F and a normal operating flow rate equal to charging flow. In the event of a bleed line break outside containment, the flow rate would increase only slightly since flow is adjusted by a variable breakdown orifice inside containment. There are ample alarms and indications in the Control Room to alert the operators to either break, and the capability exists in the Control Room to terminate either break.

Based on the potential size of these breaks and the capability to quickly terminate either break, a harsh environment is not formed. In addition, the only equipment on the equipment qualification master list which could be effected by these breaks are the hot leg injection valves (SI-MOV-514 and 515) which are not required to function to mitigate this break, and the charging pumps which may not be usable depending on the location of the break. The safety injection pumps, which would be used as a backup to the charging pumps if needed, are located in an area not affected by this break.

II. STEAM HEATING SYSTEM

A. Primary Auxiliary Building (PAB)

The PAB is divided into a shielded and nonshielded section based on the types of primary support equipment located in each. The only equipment on the equipment qualification master list in the shielded area are the charging pumps and the shutdown cooling pump. In the event of a heating steam line break in the shielded section of the PAB and the loss of all three charging pumps, a manual plant shutdown would be initiated. The safety injection pumps, located in another area not affected by this break, could be used for any needed primary makeup. The shutdown cooling pump is required for cold shutdown only, which would not be required to mitigate this break. This break would be detected by the hourly operator tour of the area. Once detected, the break can be quickly isolated from outside the affected area by the operation of just one of the many manual isolation valves in the system. It is expected that this would occur before any equipment is damaged.

The nonshielded section of the PAB also contains the steam generator blowdown piping. Since the blowdown line break is the more limiting of the two, and it was reviewed under Item 3 in the YAEC letter to USNRC, dated September 8, 1981 (FYR 81-132), no further discussion is required here.

B. Diesel Generator Building (DGB)

Equipment from the equipment qualification master list, located in the DGB, include equipment for the safety injection system and the emergency power system.

In the event of a heating steam line break in the DGB, the resulting harsh environment could disable the safety injection system. However, this system is not required to mitigate this break. It could also cause a loss of power to the three 480 volt emergency busses and the loads normally fed from them. A review of all affected loads has determined that the only effect on the normal operation of the plant would be the loss of power to distribution Cabinet A. This would result in a loss of various instrumentation in the Main Control Room. The loss of power would not lead to an automatic plant trip; however, the plant would be manually shut down. This action would be required since a loss of emergency power sources requires that the plant be shut down in accordance with plant Technical Specifications.

The heating steam piping, in the DGB is all 2" or less, and the steam pressure is 30 psig or less. The steam break being considered is small in size. This break would be detected by the hourly operator tour. Once detected, the break can be quickly isolated from outside the affected area by operation of just one of the many manual valves in the steam heating system.

C. Turbine Building (TB)

Two areas in the TB where mild environments must be maintained are the Main Control Room and the Switchgear Room. The Main Control Room does not contain any heating steam lines. The Switchgear Room does, however, contain two small unit heaters, with 1" steam supply lines.

An analysis has been performed to determine the affect on the Switchgear Room environment from a break of one 1" steam supply line. With the normal ventilation air flow, temperature, and humidity for this time of year, this break would cause a slight rise in room temperature and humidity. The room environment would still be classified as a mild environment. Yankee will install an excess flow check valve in each steam supply line to eliminate the possibility of this break causing a harsh environment in the Switchgear Room.

The remaining areas of the TB contain the majority of the heating steam lines. However, these areas also contain the main steam and feed piping. Failure of these lines in the TB have already been discussed under Items 1 and 2 in the YAEC September 8, 1981 letter. Since failures of these lines are the more limiting, no further discussion of heating steam line failures is required.

ATTACHMENT D

Response to FRC Conclusions in Appendix C of TER-C5257-463

o FRC TER Concern:

Feedwater Line Breaks

Emergency feedwater flow elements and flow transmitters are required to mitigate the consequences of a feedwater line break in the Turbine Building. They should be qualified for their post-accident environment.

Response:

The Emergency Feedwater System (EFS) at Yankee has the capability to feed the steam generators through two independent paths. The normal emergency feed path utilizes the main feed piping in the Turbine Building (TB), while the alternate emergency feed path utilizes the steam generator blowdown piping in the Primary Auxiliary Building (PAB).

In the event of a feedwater line break in the Turbine Building, the resulting harsh environment would prevent operator access to the area to determine the location of the break. It would also prevent access to isolate emergency feed flow to the faulted steam generator. This is one of the reasons for designing the EFS with an alternate path. When access is not available to isolate flow to the broken feed path, the Control Room operators would utilize the alternate path. They would also use steam generator level indication to verify flow.

Because of the design of the Yankee steam generators, a minimum of 40 minutes is available for manual actions as described above. This time allows for realigning feed paths and verifying flow using steam generator level indication.

Since the design of the EFS does not require utilizing the normal path for feed line breaks in the Turbine Building, the emergency feedwater flow indication was not qualified for the resulting harsh environment. Essentially, it is not necessary to qualify a piece of equipment for an environment in which it is not required to operate.

o FRC TER Concern:

Steam Line Breaks

Emergency feedwater flow elements and transmitters are required to mitigate the consequences of a steam line break in the Turbine Building. They should be qualified for their post-accident environment.

Response:

A steam line break in the Turbine Building is essentially the same as a feedwater line break. The resulting harsh environment produced prevents operator access to the area of the normal emergency feed path to assess the damage and determine if the normal path is available. The EFS design allows the Control Room operators to use the alternate path in the PAB for this situation. Therefore, as discussed previously, emergency feedwater flow indication is not required to mitigate the consequences of this event, and need not be qualified for it.

o FRC TER Concern:

Steam Generator Blowdown Line Breaks

The quick-acting dampers must reliably perform the function of preventing the creation of a hostile environment in the Primary Auxiliary Building. The Licensee should identify the actuators as electrical or mechanical devices. If they are electrical, the actuators must be environmentally qualified.

Response:

The quick-acting dampers are actuated by an electrical device. However, the failure of this device has been reassessed by Yankee as part of the Systematic Evaluation Program review of ventilation systems, Topic IX-5. The failure of these dampers to function was postulated to determine the effect on equipment required to mitigate a steam generator blowdown line break.

The following was determined:

1. The failure of a Motor Control Center (MCC) was postulated in the lower level PAB. This resulted in the loss of two charging pumps. However, only one charging pump is required to shut down the plant, and the third charging pump is powered from a MCC in the Turbine Building.

2. The two electric-driven emergency feedwater pumps located in the lower level PAB were assumed to fail. However, the steam-driven emergency feedwater pump is capable of providing the emergency feedwater flow required to shut down the plant. This pump is located in the Auxiliary Boiler Room of the Turbine Building.

Therefore, in the event of a steam generator blowdown line break coupled with a failure of the quick-acting dampers to function, and the failure of the mitigating equipment in the affected portions of the PAB, the systems required to mitigate the consequences of this event will remain functional. Based on this assessment, qualification of the quick-acting dampers is not necessary. They are not required to operate to mitigate this event.