NORTHEAST UTILITIES

THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

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May 4, 1984

Docket No. 50-423
B11138

Director of Nuclear Reactor Regulation
Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

References: (1) W. G. Counsil letter to B. J. Youngblood, NRC-ICSB Review Meeting, (March 13, 1984), dated April 2, 1984.

(2) B. J. Youngblood to W. G. Counsil, Draft SER for Millstone Nuclear Power Station, Unit 3, dated December 20, 1983.

Dear Mr. Youngblood:

Millstone Nuclear Power Station, Unit No. 3
Responses to Draft SER Open Items ICSB 1, 3, 6, 7, 19 and 21

Attachment I provides the revised responses to the Draft SER open items ICSB-1, 6 and 21 that remained open at the March 13, 1984 ICSB meeting (Reference 1). Also enclosed are responses to the Draft SER open items ICSB-3, 7 and 19 contained in Reference 2. These responses will be incorporated into the FSAR in a future amendment.

If you have any concerns related to information contained herein or any questions related to our responses, please contact our Licensing representative.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY ET AL
By Northeast Nuclear Energy Company, Their Agent

W. G. Counsil

W. G. Counsil
Senior Vice President

CFSears

By: C. F. Sears
Vice President Nuclear and
Environmental Engineering

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STATE OF CONNECTICUT)
) ss. Berlin
COUNTY OF HARTFORD)

Then personally appeared before me C. F. Sears, who being duly sworn, did state that he is Vice President of Northeast Nuclear Energy Company, an Applicant herein, that he is authorized to execute and file the foregoing information in the name and on behalf of the Applicants herein and that the statements contained in said information are true and correct to the best of his knowledge and belief.

Lorraine J. D'Amico
Notary Public

My Commission Expires March 31, 1988

Attachment I

Responses to the Draft SER Open Items

Item No.	Description
ICSB-1	Design Modification for Automatic Reactor Trip Using Shunt Trip Coil Attachment.
ICSB-3	Steam Generator Level Control and Protection.
ICSB-6	Non-Class 1E Signals to Class 1E Control Circuits.
ICSB-7	Isolators Used in the BOP Design for Isolation Between Safety and Non-Safety Related Systems.
ICSB-19	Reactor Coolant System Loop Isolation Valve Interlocks.
ICSB-21	Control System Failure Caused by High-Energy Line Breaks.

Open Items

Instrumentation and Control Systems Branch

ICSB-1 Design Modification for Automatic Reactor
Trip Using Shunt Coil Trip Attachment (Draft SER Section 7.2.2.4)

The Westinghouse Owners Group (WOG) has submitted a generic design modification to provide automatic reactor trip system (RTS) actuation of the breaker shunt trip attachments in response to Salem ATWS events. The staff has reviewed and accepted the generic design modification and has identified additional information required on a plant specific basis. The applicant has not however, provided a response to Generic Letter 83-28 which established the requirements for this modification. The resolution of this matter will be addressed in a supplement to this report. This is an open item.

Response (3/84)

On August 10, 1983, the NRC issued the Final Safety Evaluation Report (SER) on the Westinghouse Owners' Group (WOG) generic design modification to provide automatic reactor trip system actuation of the breaker shunt trip attachments. The SER endorsed the generic design, but listed thirteen items that must be addressed on a utility-specific basis prior to implementation of the shunt trip modification. The generic design has been evaluated to determine the applicability to Millstone 3 plant. The WOG generic modification for the automatic shunt trip actuation of the reactor trip system breakers will be incorporated to Millstone 3 design. The NRC Staff requested that NNECO to provide the specific information package to close this item.

Status (3/84)

Open.

Additional Response (4/84)

The Attachment I addresses the thirteen items as listed in the SER on the WOG generic design modification to provide automatic reactor trip system actuation of the breaker shunt trip attachments.

Status (4/84)

Confirmatory.

ATTACHMENT I

1. Request for Drawings

"Provide the electrical schematic/elementary diagrams for the reactor trip and bypass breakers showing the undervoltage and shunt coil actuation circuits as well as the breaker control (e.g., closing) circuits, and circuits providing breaker status information/alarms to the control room."

Response

Presently Westinghouse has not provided plant specific electrical drawings showing the automatic actuation of the reactor trip breaker shunt trip attachment for Millstone Unit No. 3.

Once the drawings are transmitted, our architectural engineer (Stone & Webster Engineering) will revise all plant specific elementary diagrams incorporating the generic design as defined by Westinghouse.

After all drawings are revised, a complete set will be provided to you for review.

2. Request for Class 1E Power with Indication and Overvoltage Capability

"Identify the power sources for the shunt trip coils. Verify that they are Class 1E and that all components providing power to the shunt trip circuitry are Class 1E and that any faults within non-Class 1E circuitry will not degrade the shunt trip function. Describe the annunciation/indication provided in the control room upon loss of power to the shunt trip circuits. Also describe the overvoltage protection and/or alarms provided to prevent or alert the operator(s) to an overvoltage condition that could affect both the UV coil and the parallel shunt trip actuation relay."

Response

A. The power supply for the shunt trip mechanisms are from a Class 1E electrical power source and is of such a reliability that it is not interrupted during plant transients. The power supply for Reactor Trip Breaker A shunt trip mechanism is from a Train A power supply and the power supply for Reactor Trip Breaker B shunt trip mechanisms is from a Train B power supply.

   The Class 1E 125VDC power system is a safety-related, two-wire ungrounded bus system. This system is divided into four separate channels. Two of these channels are devoted exclusively to supplying the associated regulated 120VAC vital bus power supply.

   The Class 1E 125VDC power supply system equipment for each channel consists of one operating battery charger, one spare battery charger shared by two channels of the same train, one 125VDC battery, and one distribution switchboard.

The Class 1E circuitry provided to the shunt trip is separated from non-Class 1E circuitry, a fault within non-Class 1E circuitry will not degrade the shunt trip function.

B. Existing indications on the Main Control Board for breaker operation are the red and green position lights. The green light indicates that the breaker is open and power is available to the closing circuit of the breaker. The red light indicates that the breaker is closed, since the red lamp is connected in series with the shunt coil. Also because of this continuity, the red light also indicates that power is available to the shunt trip device. This provides detectability of power failure to the shunt trip coil. If the breaker is closed, the green light is extinguished and the red light is on. If the red light goes out with the green light remaining off, the breaker remaining closed or a power loss to the shunt trip coil or a discontinuity in the shunt trip coil would be indicated. Another possibility is that the light bulbs could have been burned out, but this is readily determined by lamp test circuitry available on the main control board.

C. The added shunt trip circuitry is powered from the reactor protection logic voltage supply. Components in the added shunt trip circuitry will perform their intended function up to a voltage as high as approximately 115% nominal voltage. The reactor protection logic voltage is regulated with overvoltage protection which is set at approximately 115% of nominal voltage.

The shunt trip coils in the reactor trip breakers are powered from 125VDC via the station batteries. Normally, the shunt trip coils are in a deenergized condition. When the trip breakers are closed, the red lamp current (approximately 50 ma) flows through the trip coil to monitor the circuit continuity. This current is not large enough to actuate the trip coil armature. The reactor trip signal applies a nominal voltage of 125VDC to each shunt trip coil in the redundant trains. As the breaker trips, its auxiliary switch opens to deenergize the shunt trip coil. Since the 125VDC voltage is supplied from the battery system, it may temporarily rise to the battery equalizing voltage not to exceed 140VDC. The reactor trip breaker shunt trip coil can operate at this overvoltage condition without deleterious effects since it is energized for a very small time.

Annunciations are provided in the Main Control Room to alert the operator(s) to an overvoltage condition in the electrical system.

3. Request for Information on Added Relays

"Verify that the relays added for the automatic shunt trip function are within the capacity of their associated power supplies and that the relay contacts are adequately sized to accomplish the shunt trip function. If the added relays are other than the Potter & Brumfield MDR series relays (P/N 2383A38 or P/N 955655) recommended by Westinghouse, provide a description of the relays and their design specifications."

Response

The added relay contacts are adequately sized for the shunt trip function and are within the capacity of their associated power supplies. The added relays are the Potter & Brumfield MDR series relays (P/N 955655 48VDC).

4. Request for Test Procedure Proposed by WOG

"State whether the test procedure/sequence used to independently verify operability of the undervoltage and shunt trip devices in response to an automatic reactor trip signal is identical to the test procedure proposed by the WOG. Identify any differences between the WOG test procedure and the test procedure to be used and provide the rationale/justification for these differences."

Response

The test procedure/sequence used to verify operability of the undervoltage and shunt trip devices is conceptually the same as the WOG test procedure. The periodicity of testing these devices will be identified in Millstone Unit No. 3's Chapter 16 technical specifications.

5. Request for Class 1E Shunt Trip Function

Verify that the circuitry used to implement the automatic shunt trip function is Class 1E (safety-related), and that the procurement, installation, operation, testing, and maintenance of this circuitry will be in accordance with the quality assurance criteria set forth in Appendix B to 10CFR Part 50."

Response

The added circuitry used to implement the automatic shunt trip function is Class 1E and that procurement, installation, operation, testing, and maintenance of this circuitry will be in accordance with the quality assurance procedures as stated in Chapter 17 of the Millstone Unit No. 3 FSAR which satisfies the quality assurance requirements of Appendix B to 10CFR Part 50.

6. Request for Seismic Qualification

"Verify that the shunt trip attachments and associated circuitry are/will be seismically qualified (i.e., be demonstrated to be operable during and after a seismic event) in accordance with the provisions of Regulatory Guide 1.100, Revision 1 which endorses IEEE Standard 344, and that all non-safety related circuitry/components in physical proximity to or associated with the automatic shunt trip function will not degrade this function during or after a seismic event."

Response

The DS-416 RT switchgear including the circuit breaker draw-out elements for Millstone Unit No. 3 have been environmentally and seismically qualified in accordance with IEEE 323-1974 and 344-1975 to meet the accident conditions through which this equipment must operate.

The Westinghouse Owners' Group is working with Westinghouse to obtain seismic qualification of the shunt trip attachments and seismic qualification will be provided for the added circuitry. If qualification tests show that any of the added components do not perform their intended function during or after a postulated seismic event, they will be replaced. Once all components have been qualified an auditable link will be established.

7. Request for Environmental Qualification

"Verify that the components used to accomplish the automatic shunt trip function are designed for the environment where they are located."

Response

The shunt trip mechanism for Millstone Unit No. 3 is located in the Auxiliary Building, Zone: AB-22 at elevation 43 ft. - 6 in. Table 1 of this response supplies normal and abnormal conditions for this area.

It has been verified that the environmental conditions as stated in WCAP-8587 envelopes Millstone Unit No. 3 requirements for this equipment. An auditable link will be established for the components.

TABLE 1

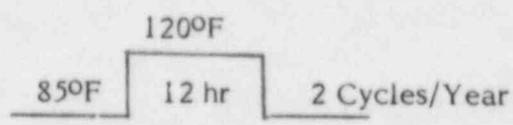
AUXILIARY BUILDING - Elevation 43 ft. - 6 in.
Zone: AB-22 RDS Area (48.5-51.3/F-F.8)

Normal Environment (40-year life)

Temperature: (External Ventilation)

Range: 55 - 120°F
Normal Maximum
Average (NMA): 85°F

Maximum Normal
Excursion (MNE): 120°F



Maximum Abnormal
Excursion (MAE): N/A

Pressure: Atmosphere

Relative Humidity: 10 - 90%

Radiation Dose (RADS) 40-year life: 700

One Time Accident Environment: Same as Normal Environment described above

Accident Radiation Dose (RADS): 300

Radiation Dose (Rads) - 40-year life plus accident: 1.0×10^3

8. Request for Separation

"Describe the physical separation provided between the circuits used to manually initiate the shunt trip attachments of the redundant reactor trip breakers. If physical separation is not maintained between these circuits, demonstrate that faults within these circuits can not degrade both redundant trains."

Response

Wiring and component location for the redundant sets of automatic shunt trip addition will employ physical separation to ensure independence of the circuits to the extent that is equivalent to the existing independence measures employed by the reactor trip switchgear. The cables from the Main Control Board and Reactor Protection logic to redundant Train A and Train B reactor trip switchgear are routed as Train A and Train B circuits. The hardware for the upgrade will be housed in separate metal enclosures ensuring physical separation between trains.

9. Request for Test Procedure of Control Board Manual Switches

"Verify that the operability of the control room manual reactor trip switch contacts and wiring will be adequately tested prior to startup after each refueling outage. Verify that the test procedure used will not involve installing jumpers, lifting leads, or pulling fuses and identify any deviations from the WOG procedure. Permanently installed test connections (i.e., to allow connection of a voltmeter) are acceptable."

Response

The control room manual reactor trip switch contacts and wiring will be tested prior to startup after each refueling outage. Testing is conceptually identical to the WOG test procedures.

10. Request for Bypass Breaker Testing

"Verify that each bypass breaker will be tested to demonstrate its operability prior to placing it into service for reactor trip breaker testing."

Response

Because the bypass breakers are tested at the same frequency as the main trip breakers, the bypass breakers will be tested concurrent with the main breakers. As the verification of breaker operability is performed monthly and redundant independent protection is provided, the additional cycling of the breaker would only serve to reduce life expectancy.

11. Request for Reactor Trip Breaker Operability Indication Test Procedure

"Verify that the test procedure used to determine reactor trip breaker operability will also demonstrate proper operation of the associated control room indication/annunciation."

Response

Verification of control room indication/annunciation for the reactor trip breakers will be accomplished in accordance with Millstone Unit No. 3 technical specifications which would verify associated alarms and indication.

12. Request for Response Time Testing

"Verify that the response time of the automatic shunt trip feature will be tested periodically and shown to be less than or equal to that assumed in the FSAR analyses or that specified in the technical specifications."

Response

Verification of response time of the automatic shunt trip will be accomplished in accordance with Millstone Unit No. 3 technical specifications which will verify to be shown to be less than or equal as specified in the technical specifications.

13. Request for Technical Specification Changes

"Propose technical specification changes to require periodic testing of the undervoltage and shunt trip functions and the manual reactor trip switch contacts and wiring."

Response

Technical specifications for Millstone Unit No. 3 will incorporate independent undervoltage trip, shunt trip and manual trip testing.

Open Items

Instrumentation and Control Systems Branch

ICSB-3 Steam Generator Level Control and Protection (Draft SER Section 7.3.3.4)

Three steam generator level channels are used in a two-out-of-three logic for isolation of feedwater on high steam generator level. One of the three level channels is used for control. This design for actuation of feedwater isolation does not meet the requirements of Paragraph 4.7 of IEEE 279 on "Control and Protection System Interaction" in that the failure of the level channel used for control could require protective action and the remainder of the protection system channels would not satisfy the single-failure criterion. The applicant has not responded to this concern. This is an open item.

Response (4/84)

High steam generator level trip will be changed to two-out-of-four logic. This design will meet the requirements of Paragraph 4.7 of IEEE 279 on "Control and Protection System Interaction".

Status (4/84)

Closed.

Open Items

Instrumentation and Control Systems Branch

ICSB-6 Non-Class IE Control Signals to Class IE Control Circuits (Draft SER Section 7.3.3.11)

The staff requested the applicant to provide a list of non-Class IE control signals that are used as inputs to Class IE control circuits and justification that these non-Class IE signals are either bypassed by the ESF actuation signal, or that the non-Class IE signal can only act to the safe direction and therefore would not degrade safety systems. This is an open item.

Response (3/84)

The justification of the use of non-class IE signals as input to class IE control circuits will be provided at a later date.

Status (3/84)

Open.

Additional Response (4/84)

Attachment 1 is a list and Attachment 2 is the descriptions of non-Class IE control signals that are used as inputs to Class IE control circuits and justification that these non-Class IE signals are either bypassed by the ESF actuation signal, or that the non-Class IE signal can only act to the safe direction and therefore will not degrade safety systems.

Status (4/84)

Closed.

Attachment 1 - Listing of non-Class 1E Signals to Class 1E Circuits

ESK No. From: Non-Class 1E Signal	To: Class 1E Circuit	Control Signal Description
5BB	5BD	Interlock Reserve Station Service Breaker (3ENS*ACB-AR)
	5EX (Reference drawing only no analysis required)	Intlk. Lockout Relay (86EI-3NNS-ACB-AN)
	7J	Intlk. 62R-3ENSA02
	7FG	Intlk. 62P-3ENSA10
	5BF	Intlk. Normal to Emergency Bus Tie Breaker 3ENS*ACB-TA
5BC	5BE	Intlk. Reserve Station Service Breaker (3ENS*ACB-BR)
	5EX (Reference drawing only no analysis required)	Intlk. Lockout Relay (86EI-3NNS-ACB-BN)
	7L	Intlk. 62R-3ENSB02
	7FH	Intlk 62P-3ENSB10
	5BG	Intlk. Normal to Emergency Bus Tie Breaker (3ENS*ACBTB)
7H	5BF	Intlk. Bus Tie Breaker (3ENS*ACB-TA)
		Intlk. 86E-3ENS*ACB-TA
7K	5BG	Intlk. Bus Tie Breaker (3ENS*ACB-TB)
		Intlk. 86E-3ENS*ACB-TB
6ADG	6AMG	Intlk. Main Steam Valve Bldg. Ventilation Exhaust Fan Dampers (3HW*AOD50A) and (3HVV*AOD50B)

Attachment 1 (Cont)

ESK No. From: Non-Class IE Signal	To: Class IE Circuit	Control Signal Description
7CR	6GD	Intlk. Boric Acid Transfer Pump (3CHS*P2A)
	7CT	Intlk. Boric Acid Injection Valve to Boric Acid Blender (3CHS*FCV110A) and Intlk. Boric Acid Makeup Injection Valve to Charging Pump Header (3CHS*FCV110B)
	7CU	Intlk. Reactor Makeup Water Injection Valve to Boric Acid Blender (3CHS*FCV111A) and Intlk. Boric Acid Dilution Injection Valve to Volume Control Tank (3CHS*FCV111B)
7CS	6GE	Intlk. Boric Acid Transfer Pump (3CHS*P2B)
	7CT	Intlk. Boric Acid Makeup Injection Valve to Charging Pump Header [3CHS*FCV110B]
	7CU	Intlk. Boric Acid Dilution Injection Valve to Volume Control Tank [3CHS*FCV111B]
7CV	7CW	Intlk. Radioactive Gaseous Waste System Divert Valve [3CHS*LCV112A]
7JC 7JD 7JE	7DX	Intlk. Letdown Isolation Valve [3RCS*LCV459] and [3RCS*LCV460]
7DX	7JC	Intlk. Letdown Orifice Isolation Valve [3CHS*AV8149A]
7JA	7JD	Intlk. Letdown Orifice Isolation Valve [3CHS*AV8149B]
	7JE	Intlk. Letdown Orifice Isolation Valve [3CHS*AV8149C]
7FE	5EX (Reference drawings only, no analysis required.)	Intlk. Lockout Relay 86HAND5-3NNSA15
7FF	5EX (Reference drawings only, no analysis required.)	Intlk. Lockout Relay 86HBND4-3NNSB16

ESK No. From: Non-Class 1E Signal	ESK No. To: Class 1E Circuit	Control Signal Description
7JA	6AN	Intlk. Close and Trip Circuits [3RCS*H1A]
7JB	6AP	Intlk. Close and Trip Circuits [3RCS*H1B]
8DA Synchronizing	5BF	Intlk. Bus Tie Breaker [3ENS*ACB-TA]
8DB Synchronizing	5BG	Intlk. Bus Tie Breaker [3ENS*ACB-TB]
8JB	5BD	Intlk. Block Auto Close Reserve Station Service Breaker [3ENS*ACB-AR]
8JC	5BE	Intlk. Block Auto Close Reserve Station Service Breaker [3ENS*ACB-BR]
8JD 8JF	5BD	Intlk. Trip and Lockout Reserve Station Service Breaker [3ENS*ACB-AR]
8HC 8HG	5BE	Intlk. Trip and Lockout Reserve Station Service Breaker [3ENS*ACB-BR]
I03	7QE	Intlk. Main Steam Pressure Relief Valve [3MSS*PV20A]
I04	7QF	Intlk. Main Steam Pressure Relief Valve [3MSS*PV20B]
I05	7QG	Intlk. Main Steam Pressure Relief Valve [3MSS*PV20C]
I04	7QH	Intlk. Main Steam Pressure Relief Valve [3MSS*PV20D]
7ABU	7ABV	Intlk. Solid State Protection System Train A Input Cabinet [3RPS*RAKINPA] and Train B Input Cabinet [3RPS*RAKINPB] (Reactor Trip on Turbine Trip Inputs)
PSCA2	6PK	Interlock Volume Control Tank Level Control Valve (3CHS*LCV112B)
PSCB2	6PL	Interlock Volume Control Tank Level Control Valve (3CHS*LCV112C)

ESK No. From: Non-Class IE Signal	ESK No. To: Class IE Circuit	Control Signal Description
PSCA2	6PM	Intlk. Charging Pump Suction Valve From RWST (3CHS*LCV112D)
PSCB2	6PN	Intlk. Charging Pump Suction Valve From RWST (3CHS*LCV112E)
3HVC-AE17A	7TA	Chlorine Detector Input to Control Building Isolation Logic
3HVC-AE17B	7TC	Chlorine Detector Input to Control Building Isolation Logic

Loop No.	
3MSS-505 3MSS-506	Turbine Impulse Chamber Pressure, [3MSS-PT505] and [3MSS-PT506] - Inputs to Protection Set
3TMB-150	Emergency Trip System Fluid Pressure [3TMS-150A], [3TMB-150B], and [3TMB-150C] - Reactor Trip Circuit Interlocks

Attachment 2 - Non-Class 1E Inputs to Class 1E Control Circuits

ESK-5BB/ESK-5BD

Description

Input from Category II normal station service transformer 4 kV supply breaker which automatically closes reserve station service transformer supply breaker to power the Category I 4 kV emergency bus. Worst case condition would be failure to transfer.

Justification

Both sources are non-Category I. Category I diesel generator will supply power to Category I 4 kV emergency bus.

ESK-5BB/ESK-7J

Description

Input from Category II normal station service transformer 4 kV supply breaker which prevents automatic transfer under certain conditions to the reserve station service transformer 4 kV supply breaker to power the Category I 4 kV emergency bus. Worst case condition would be failure to transfer.

Justification

Both sources are Category II. Category I diesel generator will supply power to Category I 4 kV emergency bus.

ESK-5BB/ESK-7FG

Description

Input from Category II normal station service transformer 4 kV supply breaker which used to alarm when both sources to the 4 kV emergency bus is paralleled. There is no worst case failure mode for this input.

Justification

Isolated input is used in an alarm circuit only.

ESK-5BB/ESK-5BF

Description

Input from Category II normal station service transformer 4 kV supply breaker which automatically opens and prevents closing of the 4 kV normal bus to emergency bus tie breaker.

Justification

Both sources are non-Category I. Category I diesel generators will supply power to the Category I 4 kV emergency bus.

ESK-5BC/ESK-5BE

Description

Input from Category II normal station service transformer 4 kV supply breaker which automatically closes reserve station service transformer supply breaker to power the Category I 4 kV emergency bus. Worst case condition would be failure to transfer.

Justification

Both sources are non-Category I. Category I diesel generator will supply power to Category I 4 kV emergemcy bus.

ESK-5BC/ESK-7L

Description

Input from Category II normal station service transformer 4 kV supply breaker which prevents automatic transfer under certain conditions to the reserve station service transformer 4 kV supply breaker to power the Category I 4 kV emerge.cy bus. Worst case condition would be failure to transfer.

Justification

Both sources are Category I. Category I diesel generator will supply power to Category I 4 kV emergency bus.

ESK-5BC/ESK-7FH

Description

Input from Category II normal station service transformer supply breaker which is used to alarm when both sources to the 4 kV emergency bus is paralleled. There is no worst case failure mode for this impact.

Justification

Isolated input is used in an alarm circuit only.

ESK-5BC/ESK-5BG

Description

Input from Category II normal station service transformer 4 kV supply breaker which automatically opens and prevents closing of the 4 kV normal bus to emergency bus tie breaker.

Justification

Both sources are non-Category I. Category I diesel generators will supply power to the Category I 4 kV emergency bus.

ESK-7H/ESK-5BF

Description

Input from 4 kV normal unit sub-station feeder breakers backup overcurrent relay protection. Purpose is to trip Category I 4 kV emergency bus to normal station service transformer supply tie breaker on nonisolateable normal bus unit substation feeder overcurrent conditions. Worst case would be failure to operate preventing tie from opening.

Justification

Normal station service transformer 4 kV supply to Category I emergency bus tie breaker has its own overcurrent relay protection. Breaker will open on overcurrent condition.

ESK-7K/ESK-5BG

Description

Same as above.

Justification

Same as above.

ESK-6ADG/ESK-6AMG

Description

Input from Category II ventilation fan to permit Category I dampers to open on fan operation. There is no worst case condition for this input.

Justification

Input is bypassed by the ESF actuation signal.

ESK-7CR/ESK-6GD

Description

Input from Category II reactor coolant makeup auxiliary control to Category I boric acid transfer pump. There is no worst case failure for this input.

Justification

Pump can be manually operated.

ESK-7CR/ESK-7CT

Description

Input from Category II reactor coolant makeup auxiliary control to Category I boric acid injection valve 3CHS*FCV110A. The only control signal to valve is Category II.

Justification

Valve does not perform a safety function.

ESK-7CR/ESK-7CT and ESK-7CS/ESK-7CT

Description

Input from Category II reactor coolant makeup auxiliary control to Category I boric acid injection valve 3CHS*FCV110B. There is no worst case failure for this input.

Justification

Valve may be manually operated.

ESK-7CR/ESK-7CU and ESK-7CS/ESK-7CU

Description

Input from Category II reactor coolant makeup auxiliary control to Category I RCS water makeup injection valve 3CHS*FCV111A. The only control signal to valve is Category II.

Justification

The valve does not perform a safety function.

ESK-7CR/ESK-7CU

Description

Input from Category II reactor coolant makeup auxiliary control to Category I boric acid dilution injection valve to volume control tank 3CHS*FCV111B. There is no worst case failure for this input.

Justification

Valve may be manually operated.

ESK-7CS/ESK-6GE

Description

Input from Category II reactor coolant makeup auxiliary control to Category I boric acid transfer pump. There is no worst case failure for this input.

Justification

Pump may be manually operated.

ESK-7CV/ESK-7CW

Description

Input from Category II reactor coolant makeup auxiliary control to Category I radioactive gaseous waste system diverter valve 3CHS*LCV112A. There is no worst case failure for this input.

Justification

Valve may be manually operated.

ESK-7JC, 7JD, 7JE/ESK-7DX

Description

Input from Category II reactor coolant makeup auxiliary control to Category I letdown line isolation valve 3RCS*LCV459 and 460. Worst case condition would be failure to manually open valve on failure of Category II signal, not allowing RCS letdown.

Justification

The letdown line containment isolation valves are closed on receipt of a CIA signal.

ESK-7DX, ESK-7JA/ESK-7JC, 7JD, 7JE

Description

Input from Category II reactor coolant makeup auxiliary control to Category I letdown line isolation valve 3CHS*AV8149A,B,C. Worst case condition would be failure to open valve on failure of Category II signal not allowing RCS letdown.

Justification

The letdown line containment isolation valves are closed on receipt of a CIA signal.

ESK-7JA/ESK-6AN ESK-7JB/ESK-6AP

Description

Input from Category II reactor coolant makeup auxiliary control to Category I pressurizer heaters. Worst case condition would be failure to turn on heater on failure of Category II signal.

Justification

Reactor trip on high pressurizer level or low pressurizer pressure.

ESK-8DA

Description

120 V ac ANALOG Category I synchronizing potential to Category II synchronizing instruments and lights. There is no worst case failure for this input.

Justification

Operation of Category I system is isolated from Category II by qualified isolating transformer.

ESK-5BF

Description

Input of Category II synchronizing select to close circuit of normal station service 4160 V supply to emergency bus tie ACB. Worst case condition would be failed open and unable to close tie breaker.

Justification

Emergency bus can be powered from Category I emergency diesel generators.

ESK-8DB

Description

120 V ac ANALOG Category I synchronizing potential to Category II synchronizing instruments and lights. There is no worst case failure for this input.

Justification

Operation of Category I system is isolated from Category II by qualified isolating transformer.

ESK-5BG

Description

Input of Category II synchronizing select to close circuit of normal station service 4160 V supply to emergency bus tie ACB. Worst case condition would be failed open and unable to close tie breaker.

Justification

Emergency bus can be powered from Category I emergency diesel generators.

ESK-8JB, 8JC, 8JD, 8JF, 8HC, 8HG/ESK-5BD, 5BE

Description

Input from Category II normal station service transformer overcurrent protection to Category I reserve station service transformer supply breaker to 4 kV emergency bus. Worst case condition would be failure to open the breaker.

Justification

Category I diesel generator will supply power to 4 kV emergency bus.

ESK-7QE, 7QF, 7QG, 7QH

Description

Category II main steam pressure signal input to permit modulation of Category I main steam pressure relieving valve. There is no worst case failure for this input.

Justification

Input is bypassed by the ESF actuation signal.

ESK-6PK, 6PL

Description

Input from Category II volume control tank level signal fails to close 3CHS*LCV112B&C.

Justification

Category II input signals from volume control tank level are isolated and bypassed by a Category I safety injection signal.

ESK-6PM, 6PN

Description

Input from Category II volume control tank level signal fails to open 3CHS*LCV112D&E.

Justification

Category II input signals from volume control tank level are isolated and bypassed by a Category I safety injection signal.

ESK-7TA, 7TC

Description

Category II control building ventilation chlorine detection input to Category I control building ventilation isolation system. Worst case condition would be failure to isolate control building ventilation on chlorine detection upon the occurrence of a seismic event.

Justification

Upon the occurrence of a seismic event, the control room ventilation will be put into the recirculation mode (i.e., control room will be isolated manually). An evaluation will be made to determine if chlorine leakage is present. If chlorine leakage exists, control room pressurization will be manually initiated.

Loop 3TMB-150

Description

Category II turbine electro-hydraulic fluid pressure switch for turbine trip input to Category I reactor protection system. Worst case would be failure to open and not trip reactor.

Justification

Refer to FSAR Section 7.2.1.1.2, Reactor Trips, Item 6.

Open Items

Instrumentation and Control Systems Branch

ICSB-7 Isolators Used in the BOP Design for Isolation
Between Safety and Non Safety-related Systems (Draft SER Section 7.3.3.12)

Millstone 3 utilizes multiplexers for information processing. Portions of the radiation monitoring system are safety related and use a safety-related microprocessor which has interface with the non safety-related radiation monitoring computer via qualified isolators. The staff requested additional information on the qualification of the isolators used for the radiation monitoring system. This is an open item.

Response (4/84)

IEEE qualification test report (2 copies) on the qualification of the isolators used for "Digital Radiation Monitoring System" was provided to the NRC Project Manager for Millstone Unit No. 3 on April 9, 1984.

Status (4/84)

Closed.

Open Items

Instrumentation and Control Systems Branch

ICSB-19 Reactor Coolant System Loop Isolation Valve Interlocks (Draft SER Section 7.6.2.5)

The FSAR Section 7.6.5 describes the reactor coolant system loop isolation valve interlocks. The description is incomplete and additional information is required to clarify that the design is in conformance with IEEE-279 requirements. This is an open item.

Response (4/84)

Millstone 3 is equipped for operation in N-1 loop mode. Therefore, it is our intention to pursue an operating license which permits such operation. Affected portions of the Millstone 3 FSAR will be revised accordingly to take into account N-1 loop operation. This material will be submitted as an amendment during August 1984. Technical Specifications governing operation in the N-1 loop mode will be submitted along with our proposed Technical Specifications for N loop operation in November, 1984.

As such, review of this item should be considered as confirmatory pending Staff review of our submittal and the publication of an appropriate supplement to the Millstone 3 SER.

Status (4/84)

Confirmatory.

Open Items

Instrumentation and Control Systems Branch

ICSB-21 Control System Failure Caused By High-Energy Line Breaks (Draft SER Section 7.2.2.2)

Operating reactor licensees were informed by IE Information Notice 79-22, that if certain non safety-grade control equipment were subjected to the adverse environment of a high energy line break, it may impact the safety analyses and the adequacy of the protection functions performed by the safety-grade equipment. The staff has requested a review to determine whether the harsh environment associated with high-energy line breaks might cause control system malfunction and result in a consequence more severe than those of the FSAR Chapter 15 analyses or beyond the capability of operators or safety systems.

The applicant has not provided a response to this open item.

Response (3/84)

The attached response to Question 420.3 was provided and discussed at the ICSB meeting. The staff requested to revise and modify the response to consider effects of harsh environment associated with high-energy line breaks on PORV control system.

Status (3/84)

Open.

Additional Response (4/84)

Refer to the revised response to Question 420-3.

Status (4/84)

Closed.

NRC Letter: May 31, 1983

Question Q420.3 (Section 7.7)

Provide response to IE Information Notice 79-22 concerns. (Control system malfunction due to a high energy break inside or outside of containment.)

Response:

Introduction

During a high energy line break (such as a steam line rupture), certain sensors used in control systems could be exposed to an adverse environment. If the equipment is not qualified for an adverse environment, a control system malfunction may occur.

The performance of nonsafety-related equipment subjected to an adverse environment could impact the protective functions performed by safety-related equipment. These nonsafety-related systems include:

- Steam generator power operated relief valve control system
- Pressurizer power operated relief valve control system
- Main feedwater control system
- Automatic rod control system.

These systems could potentially malfunction due to a high energy line break inside or outside of containment. Also, the adverse environment could given erroneous information to the plant operators.

A review was made on the above four controls systems for the environmental qualification of equipment. This review of equipment determined whether the harsh environment associated with high energy line breaks might cause control system malfunction and result in a consequence more severe than those of the FSAR Chapter 15 analyses or beyond the capability of operators or safety systems.

Steam Generator Power-Operated Relief Valve Control System

The steam generator power operated relief valve control system for each steam generator consists of an air-operated PORV (3MSS*PV20) and associated solenoid-operated valve (3MSS*SOV20). The PORV and solenoid-operated valve are safety-related valves. In parallel with the PORV is a normally closed, safety-related, motor-operated bypass valve (3MSS*MOV74). In series with the PORV and bypass valve is a normally open, safety-related, motor-operated valve (3MSS*MOV18). The motor-operated valves are powered from separate emergency buses and have manual controls and indication on the main control board and on the auxiliary shutdown panel. The solenoid-operated valve associated with the PORV is powered from an emergency dc bus, the

same train as the bypass valve. The solenoid-operated valve is energized to admit air and modulate the PORV when no steam line isolation signal exists and steam line pressure is above a predetermined setpoint. The solenoid-operated valve is deenergized to vent air from and close the PORV when a steam line isolation signal exists or when steam line pressure is below a predetermined setpoint. The PORV is modulated by a nonsafety-related pressure indicating controller on the main control board or on the auxiliary shutdown panel. A REMOTE/LOCAL control transfer switch is located on the auxiliary shutdown panel.

In the event of a high energy line break in the main steam valve building, the PORV (3MSS*PV20) could fail in the open or closed position due to failure of a nonsafety-related I/P converter. The I/P converter receives a 4 to 20 mA signal from the pressure indicating controllers and converts the signal to a control air signal that modulates the PORV. The I/P converter could fail with either a maximum or minimum output signal, therefore, the PORV could fail open or closed. If the PORV fails open, the safety-related isolation valve (3MSS*MOV18) can be modulated from the main control board or from the auxiliary shutdown panel to control steam generator pressure. If the PORV fails closed, the safety-related bypass valves (3MSS*MOV74) can be modulated from the main control board or from the auxiliary shutdown panel to control steam generator pressure.

Safety-related steam generator pressure indicators on the main control board and on the auxiliary shutdown panel are listed in Table Q420.3-1.

The steam generator power-operated relief valve control system valves are as follows:

Steam Generator	Isolation Valve	PORV	Bypass Valve
1A	3MSS*MOV18A (AO)	3MSS*PV20A (AP)	3MSS*MOV74A (AP)
1B	3MSS*MOV18B (BP)	3MSS*PV20B (BO)	3MSS*MOV74B (BO)
1C	3MSS*MOV18C (CO)	3MSS*PV20C (CP)	3MSS*MOV74C (CP)
1D	3MSS*MOV18D (DP)	3MSS*PV20D (DO)	3MSS*MOV74D (DO)

The letters in parentheses after the mark number designate the associated steam generator and electrical train respectively. For example, (AO) designates steam generator 1A and electrical Train A (orange); (BP) designates steam generator 1B and electrical Train B (purple).

The isolation valve is normally open and the PORV and bypass valve are normally closed.

There are at least two steam generators available for cooldown on loss of one electrical train. The acceptance criteria for these valves is found in Table Q420.3-2.

Pressurizer Power-Operated Relief Valve Control System

A review was conducted to evaluate what effect a high energy line break occurring inside the containment in the area of the presurizer would have on the two out of four pressurizer pressure loops that are used for both protection and control. There are four pressurizer pressure protection channels, located outside the crane wall, that are used for both protection and control. The channels are arranged in a two out of four matrix for tripping the reactor and controlling the pressurizer PORVs (3RCS*PCV455A and 456). These transmitters are of the fail safe design, and will trip on either high or low pressurizer pressure (two out of four) or loss of control power to trip the reactor and open or close the pressurizer relief valves. The sensing lines from the pressurizer to the transmitters are separated by a minimum distance of 4 feet; are color coded red, white, blue, and yellow; and go through different thimbles in the crane wall down to their respective transmitters located on the outside of the crane wall. The signal cables, from the transmitters to the protection cabinets, are run in red, white, blue, and yellow conduit from the transmitters to the containment penetration. From the containment penetration to the protection cabinets in the instrument room, the cables are run in red, white, blue, and yellow cable trays separated by a minimum distance of 2 feet. Control signals are run from the protection cabinets in the instrument room to the control cabinets in the same room through a raceway in the floor as non-colored cables. The signals that are used to control the PORVs from the control cabinets are then routed to the solid-state protection system cabinets as Train A and Train B cables that are designated orange cables for Train A and purple cables for Train B. At the solid-state protection system, these signals are isolated and then routed in safety grade cable trays and conduit out to the valves. The instrument room does not contain any high energy lines. Since all of the transmitter cable and equipment that is used for protection and control is fully qualified for the environment during a high energy line break inside the containment, a high energy line break inside the containment will not affect the operation of the pressurizer PORV.

Refer to Table Q420.3-2 for the acceptance criteria of the pressurizer PORVs.

Main Feedwater Control System

A review was conducted to determine what effect a high energy line break occurring inside the containment would have on the instrumentation used to isolate the main feedwater system on either a high-high or a low-low level condition. The system that is used consists of transmitters that will detect a high-high level condition in a two out of four matrix in any of the four steam generators and cause a trip of the main turbine generator and close all feedwater isolation valves. Also included off the same transmitters is a two out of four matrix for detection of low-low level combined with the loop isolation cold leg stop valves in the open position, to trip the reactor and start the auxiliary feedwater system. A reactor trip

will cause a turbine trip and a turbine trip will cause a reactor trip. There are 20 safety-related level transmitters, located inside the containment structure, that are used for level detection.

The sensing lines that are installed between the steam generator and the level transmitters (which are located outside the crane wall) are run similar to electrical cables; i.e., they are color coded red, white, blue, and yellow and have the same or more stringent criteria imposed upon them. From the transmitter through the containment penetration, the cables are routed as red, white, blue, and yellow and comply to the cable separation criteria for routing to the instrument room where the protection and control cabinets are located. Cables will enter the instrument room in red, white, blue, and yellow cable trays and are routed to the red, white, blue, and yellow protection racks. From the protection racks they are routed in non-colored raceway to the control racks through isolation devices located in the protection cabinets. Upon completing their intended function in the control cabinets, they are then isolated and the output functions are routed from the control cabinets to the associated equipment to be controlled by cables that are color coded orange (Train A) and purple (Train B). These train-associated cables are redundant and separated according to cable separation criteria. The transmitters, cable, and associated circuitry are qualified for the environment inside and outside the containment during a high energy line break. Therefore, a high energy line break inside of the containment will not affect the feedwater control system.

Each steam generator has an air-operated, safety-related steam generator level control valve that fails closed on loss of air and an air-operated, safety-related steam generator control valve bypass valve. Each of the valves has a safety-releated solenoid valve (3FWS*SOV510, 520, 530, 540, 550, 560, 570, 580), that is normally energized to admit a control air signal and modulate the associated valve. The solenoid valve is deenergized to vent air and close the associated valve by a feedwater isolation signal. The solenoid valves, electrical cables, and connectors are fully qualified for an adverse environment. Each feedwater control valve has a flow controller with a 4 to 20 mA output to an I/P converter which converts the electrical signal to a control air signal that modulates the asscoiated valve. Each bypass valve has a level controller with a 4 to 20 mA output to an I/P converter which converts the electrical signal to a control air signal that modulates the associated bypass valve. The I/P converters are not safety-related qualified and could fail with a maximum or minimum output as a result of a high energy line break outside the containment. Therefore, the feedwater control valves and bypass valves could fail open or closed. If the valves fail open, a steam generator high-high level signal would initiate a feedwater isolation signal and close the valves by deenergizing the associated safety-related solenoid valves and vent air to close the feedwater control and bypass valve. The feedwater isolation valves are also closed on receipt of a feedwater isolation signal. If the feedwater control and bypass valves fail closed, a steam generator low-low level signal, which is safety-related, trips the reactor and starts the auxiliary feedwater pumps.

The safety-related feedwater control valves, bypass valves and the feedwater isolation valves are as follows:

Steam Generator	Feedwater Control Valve	Bypass Valve	Isolation Valve
3RCS*SG1A	3FWS*FCV510 (AO)	3FWS*LV550 (AO)	3FWS*CTV41A (AP)
3RCS*SG1B	3FWS*FCV520 (BO)	3FWS*LV560 (BO)	3FWS*CTV41B (BP)
3RCS*SG1C	3FWS*FCV530 (CO)	3FWS*LV570 (CO)	3FWS*CTV41C (CP)
3RCS*SG1D	3FWS*FCV540 (DO)	3FWS*LV580 (DO)	3FWS*CTV41D (DP)

Wide range safety-related steam generator level indicators and non-safety-related level recorders are as follows:

Steam Generator	Level Transmitter	Level Indicator ASP	Level Indicator MB5	Recorder MB5
SG1A	3FWS*LT501	3FWS*LI501A (AR)	3FWS*LI501 (AR)	3FWS-LR501
SG1B	3FWS*LT502	3FWS*LI502A (BW)	3FWS*LI502 (BW)	3FWS-LR501
SG1C	3FWS*LT503	3FWS*LI503A (CB)	3FWS*LI503 (CB)	3FWS-LR503
SG1D	3FWS*LT504	3FWS*LI504A (DY)	3FWS*LI504 (DY)	3FWS-LR503

Safety-related steam generator level transmitters that are used for protection and control are as follows:

Steam Gen	Protection Transmitters	Protection Transmitters	Protection/ Control Transmitters	Protection/ Control Transmitters
SG1A	3FWS*LT517 (AY)	3FWS*LT518 (AB)	3FWS*LT519 (AW)	3FWS*LT551 (AR)
SG1B	3FWS*LT527 (BY)	3FWS*LT528 (BB)	3FWS*LT529 (BR)	3FWS*LT552 (BW)
SG1C	3FWS*LT537 (CY)	3FWS*LT538 (CB)	3FWS*LT539 (CR)	3FWS*LT553 (CW)
SG1D	3FWS*LT547 (DY)	3FWS*LT548 (DB)	3FWS*LT549 (DW)	3FWS*LT554 (DR)

Refer to Table Q420.3-2 for the acceptance criteria of the items listed above.

Automatic Rod Control System

During a high energy line break (such as a steam line rupture), certain sensors used in the automatic rod control system could be exposed to an adverse environment. If the equipment is not qualified for the adverse environment, a automatic rod control system malfunction may occur.

The automatic rod control system is one of the control systems that could malfunction. The rod control system relies on measurements of T_{avg}, nuclear power, and turbine impulse pressure to determine if control rod motion is required. A small steam line rupture may occur outside of containment in the vicinity of the turbine impulse pressure transmitters, or inside containment in the vicinity of the excore detectors, thus exposing equipment used in rod control to an adverse environment. If the associated cabling and connections are

not properly qualified, then the potential for steam impinging on this equipment and causing a control sytem malfunction could occur. One type of resultant malfunction may initiate the withdrawal of the control rods coincident with the steam line break.

Turbine impulse chamber pressure transmitters 3MSS*PT505 and 506 provide input signals to the rod control system and are fully qualified for an adverse environment outside the containment. Connectors for the transmitters and electrical cables are also fully qualified for an adverse environment outside the containment (refer to Table Q420.3-1).

The excore detectors and T_{avg} inputs are located inside containment. This equipment along with connectors and cabling were procured fully qualified for an adverse environment for use inside the containment.

Therefore based upon the above information and the acceptance criteria in Table Q420.3-2, a steam line break inside or outside containment will not cause a malfunction within the rod control system.

TABLE Q420.3-1

SAFETY-RELATED STEAM GENERATOR

PRESSURE INDICATORS

Stm. Gen.	Transmitter	Indicator	Location	Channel
1A	3MSS*PT514	3MSS*P1514A	MB5	R
		3MSS*P1514B	ASP	R
	3MSS*PT515	3MSS*P1515A	MB5	W
		3MSS*P1515B	ASP	W
	3MSS*PT516	3MSS*P1516A	MB5	Y
1B	3MSS*PT524	3MSS*P1524A	MB5	R
		3MSS*P1524B	ASP	R
	3MSS*PT525	3MSS*P1525A	MB5	W
		3MSS*P1525B	ASP	W
	3MSS*PT526	3MSS*P1526A	MB5	B
1C	3MSS*PT534	3MSS*P1534A	MB5	R
		3MSS*P1534B	ASP	R
	3MSS*PT535	3MSS*P1535A	MB5	W
		3MSS*P1535B	ASP	W
	3MSS*PT536	3MSS*P1636A	MB5	B
1D	3MSS*PT544	3MSS*P1544A	MB5	R
		3MSS*P1544B	ASP	R
	3MSS*PT545	3MSS*P1545A	MB5	W
		3MSS*P1545B	ASP	W
	3MSS*PT546	3MSS*P1546A	MB5	Y

TABLE Q420.3-2

ACCEPTANCE CRITERIA

Equipment	IEEE 323 1974	IEEE 344 1975	IEEE 382 1980	IEEE 383 1974	ICEA-S-19-81 1978	NUREG-0588 1979	R.G. 1.131 1977
Steam Generator Power-Operated Relief Valve Control System							
3MSS*SOV20A,B,C,D	X	X	X				
3MSS*MOV18A,B,C,D	X	X					
3MSS*MOV74A,B,C,D	X	X					
3MSS*PV20A,B,C,D (Position switches)	X	X					
Pressurizer Power-Operated Relief Valve Control System							
3RCS*PCV455A	X	X					
3RCS*PCV456	X	X					
Main Feedwater Control System							
3FWS*SOV510, 520, 530, 540	X	X					
3FWS*SOV550, 560, 570, 580	X	X					
3FWS*LT517, 527, 537, 547	X	X					
3FWS*LT518, 528, 538, 548	X	X					
3FWS*LT519, 529, 539, 549	X	X					
3FWS*LT551, 552, 553, 554	X	X					
3FWS*LT501, 502, 503, 504	X	X					
3FWS*LI501, 502, 503, 504	X	X					
3FWS*LI501A, 502A, 503A, 504A	X	X					
Automatic Rod Control System							
Pressure transmitters 3MSS*PT505 3MSS*PT506	X	X					

TABLE Q42C 3-2 (Cont)

Equipment	IEEE 323 1974	IEEE 344 1975	IEEE 382 1980	IEEE 383 1974	ICEA-S-19-81 1978	NUREG-0588 1979	R.G. 1.131 1977
Excore detectors							
3NMP*NE41A,B	X	X					
3NMP*NE42A,B	X	X					
3NMP*NE43A,B	X	X					
3NMP*NE44A,B	X	X					
Electrical Cables for all the above	X			X	X	X	X