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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Re: 10CFR50.73(a)(2)(v)
September 30, 1992
MP-92-1057

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Reference: Facility Operating License No. DPR-21
Docket No. 50-245
Licensee Event Report 91-020-01

Gentlemen:

This letter forwards update Licensee Event Report 91-020-01 required to be submitted pursuant to 10CFR50.73(a)(2)(v).

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

Stephen Scace

Stephen E. Scace
Vice President - Millstone Station

SES/WN:dlr

Attachment: LER 91-020-01

cc: T. T. Martin, Region I Administrator
P. D. Swetland, Senior Resident Inspector, Millstone Unit Nos. 1, 2 and 3
J. W. Andersen, NRC Acting Project Manager, Millstone Unit No. 1

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NRC Form 366 (6-89) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

Estimated burden per response to comply with this information collection request: 50.0 hrs. Forward comments regarding burden estimate to the Records and Reports Management Branch (p-530), U.S. Nuclear Regulatory Commission, Washington, DC 20555, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Millstone Nuclear Power Station Unit 1	0 5 0 0 0 2 4 5	1 OF 0 8

TITLE (4): Contain..nent Isolation Valve Electrical Wiring Separation and HELB Analysis Deficiencies

EVENT DATE (5) MONTH	DAY	YEAR	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	REPORT DATE (7) MONTH	DAY	YEAR	OTHER FACILITIES INVOLVED (8) FACILITY NAMES	DOCKET NUMBER(S)
0 7	1 2	9 1	9 1	0 2 0	0 1	0 9	3 0	9 2		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9): N

POWER LEVEL (10): 0 0 0

THIS REPORT IS BEING SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
20.405(a)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(v)	73.71(c)
20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER AREA CODE	
William G. Noll, Sr. Engineer, Ext. 4442	2 0 3	4 4 7 - 1 7 9 1

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS
B	J M			N					

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE) X NO

EXPECTED SUBMISSION DATE (15) MONTH DAY YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On July 12, 1991, at 1215 hours, with the plant in cold shutdown (155 degrees Fahrenheit and 0 psig), it was discovered that the Isolation Condenser logic (associated with high flow isolation) did not meet separation design criteria. In addition, all four (4) valves in the Isolation Condenser system, which provide containment isolation in the event of a line break, were found to be powered from the same electrical division.

On July 15, 1991, at 1515 hours, with the plant in cold shutdown (155 degrees Fahrenheit and 0 psig), as a result of reviewing design changes for the Isolation Condenser wiring separation criteria, it was determined that the line break analysis (for breaks outside containment) associated with the Isolation Condenser system was potentially nonconservative. The line break analysis associated with the Isolation Condenser system did not consider the time delay effects that could exist during an isolation condition concurrent with a loss of normal power. In this event, the delay associated with the Diesel Generator start time could add several seconds to isolation valve closure.

Design changes have been implemented to correct the deficiencies in the containment isolation valve power supplies and wiring separation issues. A final analysis has been completed to account for the delay associated with the Diesel Generator start time in isolating an Isolation Condenser line break.

No safety systems were required to function as a result of this event and no safety consequences resulted from this event.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

I. Description of Event

On July 12, 1991, at 1215 hours, with the plant in cold shutdown (155 degrees Fahrenheit and 0 psig), it was discovered that the Isolation Condenser logic (associated with high flow isolation) did not meet separation design criteria. In addition, all four (4) valves in the Isolation Condenser system, which provide containment isolation in the event of a line break, were found to be powered from the same electrical division.

On July 15, 1991, at 1515 hours, with the plant in cold shutdown (155 degrees Fahrenheit and 0 psig), as a result of reviewing design changes for the Isolation Condenser wiring separation criteria, it was determined that the line break analysis (for breaks outside containment) associated with the Isolation Condenser system was potentially nonconservative. The line break analysis associated with the Isolation Condenser system did not consider the time delay effects that could exist during an isolation condition concurrent with a loss of normal power (LNP). In this event, the delay associated with the Diesel Generator start time could add several seconds to isolation signal valve closure.

II. Cause of Event

The cause of this event was the implementation of a design change which did not properly consider the electrical separation of power supplies and physical separation of cables for the inboard and outboard containment isolation valves associated with the Isolation Condenser.

The original plant design had power supplies to the Isolation Condenser and Feedwater Coolant Injection (FWCI) system powered from the S1 (Gas Turbine) division. A design change was implemented in 1980 to make the Isolation Condenser electrically independent of the FWCI system to allow the Isolation Condenser to be credited as a backup to the FWCI system. The modification performed in 1980 changed the power supplies for the Isolation Condenser to S2 (Diesel Generator) division. Refer to Figure 1 for the original design configuration design change implemented in 1980, and the current design following changes implemented during the 1991 refueling outage.

The ability of the Diesel Generator to function is dependent on S2 DC power. The design change did not consider that a single failure of the S2 DC power supply, coupled with an assumed LNP, would have resulted in the inability to isolate an Isolation Condenser line break outside containment. The inboard AC powered valves would not have functioned due to an assumed LNP and loss of Diesel Generator, and the outboard DC valves would not have functioned due to an assumed failure of S2 DC power. With respect to the original design, a Gas Turbine start is not dependent on station DC power supplies. However, an assumed failure of S1 DC power, coupled with a LNP, would have prevented the Gas Turbine from powering the inboard AC isolation valves due to unavailability of DC breaker control power.

The design change implemented in 1980 provided the electrical power separation between the Isolation Condenser and the FWCI system, but also perpetuated a potential failure scenario that could lead to an unisolable line break associated with the Isolation Condenser. Implementation of this design change also introduced deficiencies in the wiring separation criteria between the S1 and S2 safety related power supplies associated with the Isolation Condenser.

The analysis of an Isolation Condenser line break in the Reactor Building and the effect on the off-site dose calculation and electrical equipment qualification (EEQ) profile did not properly consider single failures and the effects of LNP. Specifically, the line break analysis did not consider the delay time in isolating the break which could result if an LNP is postulated along with an assumed single failure of the DC valves. In this scenario, the break isolation by the inboard AC isolation valves would have been delayed due to the Diesel Generator start time. For the original plant configuration (i.e., all Isolation Condenser valves powered from the S1 division), this design oversight would have been more significant for the line break scenario that relied upon IC-1 for isolation. The line break isolation would have been delayed 48 seconds due to the Gas Turbine start time.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

III. Analysis of Event

These events are reportable pursuant to 10CFR50.72(b)(2)(iii), any event or condition that alone could have prevented the fulfillment of a safety function needed to mitigate the consequences of an accident.

System Description

The Isolation Condenser is provided to remove decay heat following a reactor scram and reactor isolation from the main condenser. The Isolation Condenser is also credited for a small break Loss of Coolant Accident (LOCA). The Isolation Condenser has a heat removal capacity sufficient to handle the decay heat production at 300 seconds following a reactor scram. The Isolation Condenser system automatically initiates on high reactor pressure in excess of 1085 psig sustained for 15 seconds, or at low-low reactor water level of -48 inches. The Isolation Condenser automatically isolates on a sensed condition of either high steam flow or high condensate flow. The isolation system senses the high flow conditions from elbow taps located in the system piping as shown in Figure 1.

Deficiencies Identified During Implementation of Design Change

During the implementation of a design change to install a time delay in the Isolation Condenser isolation logic (LER 91-008-01), the following discrepancies were identified:

1. Failure to Meet Electrical Separation Design Criteria

   The design of the Isolation Condenser isolation logic and the valve power supplies was not single failure proof nor did it provide adequate separation between the S1 and S2 power sources.

2. Effects Resulting from a Postulated Loss of the S2 DC Power Supply

   A single failure of the S2 DC power supply, along with an assumed LNP, could result in the inability to isolate an Isolation Condenser line break. The four Isolation Condenser isolation valves are powered from the S2 facility for both the AC and DC valves. Loss of the S2 DC bus prevents the closure of IC-2. Loss of the S2 DC bus also prevents the ability to close the Diesel Generator output breaker and flash the generator field which results in the inability to provide power for closure of the AC valves, IC-1 and IC-4 (see Figure 1)

3. Effects of Diesel Generator Start Time on Line Break Analysis

   During the investigation for alternate power supplies to the Isolation Condenser isolation valves, a review was performed to determine if the Diesel Generator start times were included in the line break analysis for the Isolation Condenser. Assuming a single failure of the S2 DC bus, or an active failure of IC-2, AC isolation valve IC-1 would be required to isolate a postulated Isolation Condenser line break. The High Energy Line Break criteria stipulate that the failure analysis should include a LNP if the line break results in a reactor trip or turbine trip. If an Isolation Condenser line break were to occur, the isolation signal would be generated at the time of the actual line break, but the AC isolation valve closure would not begin until the Diesel Generator was operating to supply AC power. The delay time for Diesel Generator startup of approximately 13 seconds was not considered in the line break analysis associated with the Isolation Condenser.

Deficiencies Identified During Corrective Action Inspection

As a result of the wiring and cable separation deficiencies identified above, additional inspections were performed on other systems with containment isolation valves.

1. A single failure discrepancy was identified on the reactor recirculation isolation bypass control switch for valves RR-36 and RR-37.

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2. Reactor Water Cleanup (RWCU) system containment isolation valve CU-2A was identified as being powered from S1-DC division power with its power cable located in an S2 division cable tray. CU-2A is a normally closed solenoid operated bypass valve designed to equalize pressure around CU-2 when placing the RWCU system in service. Loss of power to CU-2A results in the valve failing closed to the position required for containment isolation. The power cable for CU-2A was relocated from the S1 division to the S2 division to correct the S1/S2 cable tray separation discrepancy.

Impacts of the Design Deficiencies on the Safety Analysis for Millstone Unit One

1. Failure to Meet Electrical Separation Design Criteria

The following postulated failure scenario resulting from inadequate S1/S2 separation was considered. The Isolation Condenser isolation logic is divided into two logic channels and each channel is capable of isolating the Isolation Condenser in the event of a line break. The two logic channels share a common reset switch. A postulated failure of this switch would adversely affect both the S1 and S2 logic channels that could result in inadvertent Isolation Condenser initiation without the means to provide an isolation signal in the event of a postulated line break. The review of the safety impact on inadequate electrical separation is the same as a loss of the S2 power supply presented as follows.

An unisolable Isolation Condenser line break outside containment would result in a mass release in excess of design basis analysis values. The Emergency Operating Procedures (EOPs) would direct the operator to rapidly depressurize the reactor vessel to less than 50 psig and inject water into the vessel using the Low Pressure Coolant Injection (LPCI) systems. This action would significantly reduce the break mass release but would not completely eliminate it. The EOPs would also direct the operator to perform a plant cooldown. The mass release would be terminated once the reactor coolant temperature is cooled below 212 degrees. Since the core cooling is maintained throughout these postulated events, no fuel damage would occur.

Although not quantified here, increased mass could result in higher off-site dose or temperatures higher than the environmental qualification of the electrical equipment.

2. Effects Resulting from a Postulated Loss of the S2 DC Power Supply.

A loss of the S2 power supply, along with an assumed LNP, would result in the inability to isolate the Isolation Condenser in the event of a postulated line break. As previously stated, loss of S2 DC results in the inability to close the DC isolation valves and also inhibits the Diesel Generator to provide AC power to the AC isolation valves. The review of the safety impact resulting from a postulated loss of the S2 DC power supply would be the same as stated in the previous paragraph.

3. Effects of Diesel Generator Start Time on Line Break Analyses

The delay associated with the Diesel Generator start time and the affects on containment isolation valve closure were not considered in the Isolation Condenser line break analysis. The potential increase in containment isolation valve closure time could adversely affect the following criteria used for the line break analysis:

a. Off-site dose calculations for an Isolation Condenser line break must remain less than those calculated for the Main Steam Line Break.

b. Core uncovery may not occur as a result of the Isolation Condenser line break.

c. The existing EEQ profile must not be exceeded.

The results of the Isolation Condenser line break were evaluated with respect to the three criteria specified above, assuming a valve closure delay of 13 seconds after a turbine trip. The value of 13 seconds was chosen since this time represents the Diesel Generator design start time of 10 seconds, plus an additional of 3 seconds for signal processing time used in the accident analysis.

General Electric has completed the final IC line break analysis. This analysis shows that a 13-second delay in the Isolation Condenser isolation would not violate the previously mentioned acceptance criteria. The analysis assumes that a loss of normal power occurs either before or concurrently with the isolation signal. Therefore, the 2.5 second delay added to the isolation logic runs concurrently with the Diesel Generator starting sequence.

4. The single failure criteria discrepancy associated with the recirculation sample valve control switch for RR-36 and RR-37, and the wiring separation criteria associated with CU-2A, were determined to have low safety significance due to the following:

   a. The containment penetrations are less than one inch.

   b. The valves are normally closed.

   c. The isolation valves are solenoid operated and fail closed on a loss of power.

Design changes have been implemented to correct these deficiencies.

IV. Corrective Action

The deficiencies determined during the review of cable power supplies and control panel wiring were directly attributed to previous design changes implemented during the early 1980s. Since that time, the plant design change process has been significantly updated. This fact is substantiated since the majority of the separation discrepancies identified in this report were uncovered by implementing a design change with the review process required by the current design change procedure.

The corrective actions and investigation that were implemented as a result of the Containment Isolation Valve deficiencies were extensive.

1. Review of Cable Separation

   The major contributing factor which resulted in the wiring separation discrepancies was the implementation of previous plant design changes associated with the Isolation Condenser. Several previous design changes between 1979 to 1980 were reviewed to identify any potential S1/S2 separation problems. The purpose of this review was to ensure that additional wiring separation discrepancies did not exist or were not inadvertently introduced during design changes. A sampling of various control room panels and in-plant cable raceways were reviewed to identify any additional problems.

   The results of this inspection revealed that the wiring separation problems originally discovered were limited to the control room panel wiring associated with the Isolation Condenser. In addition, the wiring separation problems were limited to those portions of the system affected by previous design change modifications. The original plant wiring inspected showed no signs of wiring separation problems.

   A complete review of the Core Spray system wiring was also performed as an example of a system that basically retained its original plant configuration. The results of this review showed that all wiring separation criteria required by the design specifications were satisfied.

The conclusion of the inspections performed on the Core Spray system and the sampling of previous design changes provided assurance that the cable separation deficiencies were limited to the previous design modifications performed on the Isolation Condenser system.

2. Review of Containment Isolation Valve System.

   A review of all containment isolation valves (dependent upon electrical power) was conducted to ensure that each primary containment penetration met all design requirements for power supply separation, cable separation, and ability to withstand a single active failure.

   With the exception of the original problems found in the Isolation Condenser system, RWCU valve CU-2A, and the recirculation sample line, all containment isolation valves met the required design criteria.

3. Cable Tray Raceway Review for S1/S2 Separation Requirements

   The discrepancies associated with the Isolation Condenser wiring and the wiring for RWCU valve CU-2A resulted in a review of separation criteria of S1/S2 cable tray separation. This inspection consisted of a review of several plant design changes and a complete review of over 300 cables associated with the LPCI system. The results of this review identified no separation discrepancies indicating that the previous identified problems were limited to the design changes implemented on the Isolation Condenser system and RWCU valve CU-2A.

4. Isolation Condenser System Corrective Action

   The power supply to IC-2 has been changed from S2-DC power to S1-DC power. This modification will ensure that an Isolation Condenser line break can be isolated in the event that a loss of S2-DC power occurs. This design change is consistent with design basis analysis which assumes that Isolation Condenser condensate return valve IC-3 remains closed and that a line break in the Isolation Condenser would be the initiating event. Operating procedures restricting the operation of the Isolation Condenser except for accident and transient mitigation have been implemented to ensure this assumption remains valid.

5. Administrative Diesel Generator Start Time Limit

   An administrative limit of 8 seconds was imposed on the Diesel Generator start times to ensure the total delay time of 11 seconds (8-second start time plus 3-second signal processing time) assumed in the Isolation Condenser line break analysis was satisfied. Previous Diesel Generator surveillance start times were reviewed to confirm that the historical start times ranged between 5 and 7 seconds. The final Isolation Condenser line break analysis demonstrated that a total delay time of 13 seconds was acceptable. The Diesel Generator administrative start time limit of 8 seconds was restored to the original value of 10 seconds.

   All other line break analyses which could be affected by the Diesel Generator start time delay were reviewed and found to be acceptable.

6. General Electric to Complete Isolation Line Break Analysis with Diesel Generator Time Delay Effects on Mass Release Calculations

   General Electric completed the additional line break analysis to support the time delay associated with the Diesel Generator. The results of this analysis demonstrated that the additional time delay was acceptable. However, the results of this line break analysis had an impact on the Reactor Building temperature profile which was documented in LER 92-005-00.

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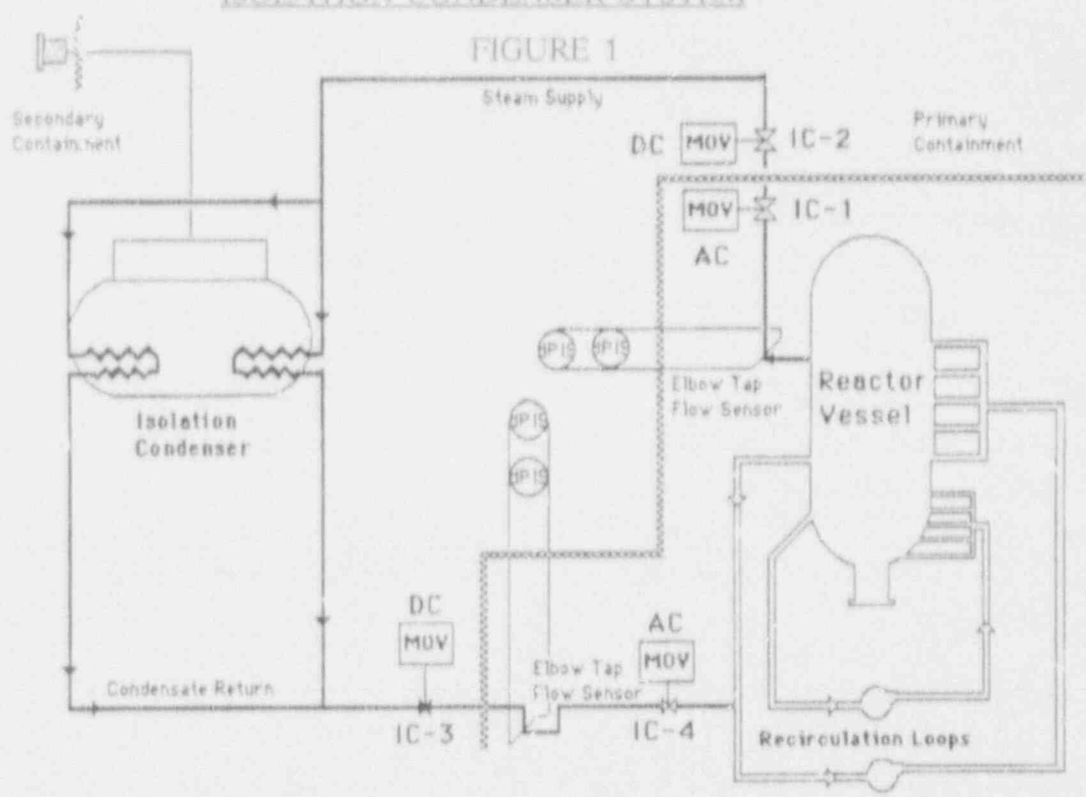
TEXT (If more space is required, use additional NRC Form 366A's) (17)

MILLSTONE UNIT ONE

ISOLATION CONDENSER SYSTEM

FIGURE 1



INITIATION SIGNALS	ISOLATION SIGNALS
1085 psig Reactor Pressure for 15 seconds or Low Low (-48 inches) Reactor Water Level	3 X Normal Condensate 3 X Normal Steam Flow

Isolation Condenser Valve Data

Valve	Power Supply Original Design	Power Supply 1980 Design	Power Supply 1991 Design
IC-1	S1 AC	S2 AC	S2 AC
IC-2	S1 DC	S2 DC	S1 DC
IC-3	S1 DC	S2 DC	S2 DC
IC-4	S1 AC	S2 AC	S2 AC

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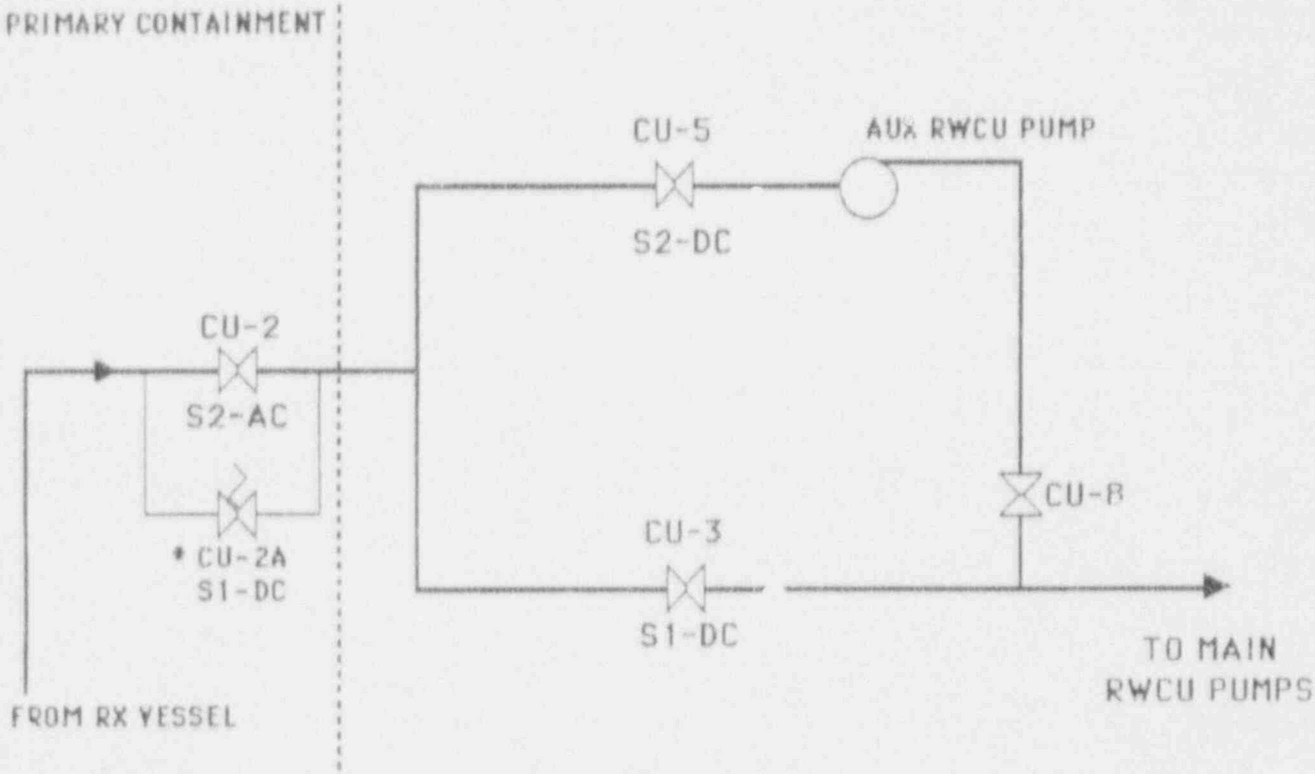
Reactor Water Cleanup System

Figure 2



*CU-2A power supply changed from S1-DC to S2-DC during 1991 refueling outage