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Georgia Power
the southern electric system

November 28, 1995

Docket No. 50-366

HL-5075

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

Edwin I. Hatch Nuclear Plant - Unit 2
Reactor Vessel Inventory Loss Results in
Unplanned Engineered Safety Feature System Actuations

Gentlemen:

In accordance with the requirements of 10 CFR 50.73(a)(2)(iv), Georgia Power Company is submitting the enclosed Licensee Event Report (LER) concerning a loss in reactor vessel inventory which resulted in Engineered Safety Feature system actuations.

Sincerely,

J. T. Beckham, Jr.

OCV/eb

Enclosure: LER 50-366/1995-008

cc: *Georgia Power Company*
Mr. H. L. Sumner, Nuclear Plant General Manager
NORMS

U.S. Nuclear Regulatory Commission, Washington, D.C.
Mr. K. Jabbour, Licensing Project Manager - Hatch

U.S. Nuclear Regulatory Commission, Region II
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Mr. B. L. Holbrook, Senior Resident Inspector - Hatch

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NRC FORM 366 (5-92) U.S.NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 5/31/95
ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, 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)
Edwin I. Hatch Nuclear Plant - Unit 2	05000366	1 OF 13

TITLE (4)
Reactor Vessel Inventory Loss Results in Unplanned Engineered Safety Feature System Actuations

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER(S)
11	02	95	95	008	00	11	28	95		05000
									FACILITY NAME	05000

OPERATING MODE (9)	4	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR ?: (Check one or more of the following) (11)					
POWER LEVEL (10)	000	20.402(b)		20.405(c)	X	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)		50.36(c)(1)		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 (include area code)
Steven B. Tipps , Nuclear Safety & Compliance Manager, Hatch	AREA CODE 912 367-7851

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-space typewritten lines) (16)

On 11/2/95, Unit 2 was in a refueling outage in the Cold Shutdown mode with the "A" loop of the Residual Heat Removal (RHR) System in the shutdown cooling (SDC) mode. Personnel were at the Unit 2 Remote Shutdown Panel (RSDP) troubleshooting reported problems with RHR valves 2E11-F004B and 2E11-F006B. They opened valve 2E11-F006B from the RSDP and valve 2E11-F004B unexpectedly opened as well. With both valves open, a flow path from the reactor vessel to the suppression pool was created and vessel water level began to decrease. At approximately 2131 EST, level reached the automatic reactor shutdown and Group 2/6 Primary Containment Isolation System (PCIS) actuation setpoint of three inches above instrument zero. The Group 2/6 Primary Containment Isolation Valves automatically closed, terminating the inventory loss by isolating SDC. Minimum level reached was approximately 152 inches above the top of the active fuel. Operations personnel increased water level and restored SDC by 2202 EST.

Valves 2E11-F004B and 2E11-F006B opened simultaneously because: 1) Limitorque operator limit switch LS-14 on valve 2E11-F006B was set improperly and 2) the RSDP control switch for valve 2E11-F004B was selected to "OPEN." With LS-14 set improperly and the control switch for valve 2E11-F004B in "OPEN," its normal position, valve 2E11-F004B unexpectedly opened when valve 2E11-F006B was opened. The reason LS-14 was set improperly could not be determined, but may have been the result of unclear drawings and/or a mislabeled limit switch.

Corrective actions for this event include revising procedures and drawings, correcting a label, resetting LS-14, checking limit switches, and testing valve interlock logic.

PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor
Energy Industry Identification System codes are identified in the text as (EIIS Code XX).

DESCRIPTION OF EVENT

On 11/2/95, Unit 2 was in its 12th refueling outage in the Cold Shutdown mode with the "A" loop of the Residual Heat Removal (RHR, EIIS Code BO) System in the shutdown cooling (SDC) mode. Maintenance electricians and Operations personnel were troubleshooting reported problems with Unit 2 RHR System valves 2E11-F004B (the suppression pool suction valve for the 2B RHR pump) and 2E11-F006B (the reactor vessel suction valve for the 2B RHR pump). On 10/26/95 between 0134 EST and 0233 EST, valve 2E11-F006B had failed to open from the Unit 2 Remote Shutdown Panel (RSDP, EIIS Code JL) during valve operability testing performed per surveillance procedure 34SV-E11-002-2S, "RHR Valve Operability," subsection 7.5. Operations personnel generated Deficiency Card CO9504485 to document this problem, and Planning and Controls personnel initiated Maintenance Work Order (MWO) 2-95-3317 to investigate and repair.

On 10/30/95 at approximately 2320 EST, while attempting to open valve 2E11-F004B from the Main Control Room to align the "B" loop of the RHR System to the Low Pressure Coolant Injection (LPCI, EIIS Code BO) mode following completion of an RHR System Logic System Functional Test, light indication for the valve had been lost. When cycling the valve motor breaker did not restore indication, Operations personnel generated Deficiency Card CO9504579 to document this problem. Planning and Controls personnel initiated Maintenance Work Order (MWO) 2-95-3388 to investigate and repair.

On 11/2/95, Maintenance electricians went to the Main Control Room (EIIS Code NA) to troubleshoot the aforementioned valve problems. They requested Operations personnel to stroke the two valves from the Main Control Room panels. The Unit 2 Shift Supervisor gave his permission to stroke valves 2E11-F004B and 2E11-F006B from the Main Control Room panels provided only one valve was open at a time. A licensed operator cycled one valve and then the other; both valves and their respective light (position) indications functioned properly. The Maintenance electricians then requested valve 2E11-F006B to be stroked using the controls at the Unit 2 RSDP. The Unit 2 Shift Supervisor gave his permission to stroke valve 2E11-F006B from the RSDP provided valve 2E11-F004B was closed.

The licensed operator contacted two Plant Equipment Operators (PEOs) who were already in the plant. The PEOs proceeded to the Unit 2 RSDP and contacted the licensed operator when they arrived. One electrician went to the RSDP while the other electrician went to Motor Control Center (EIIS Code EC) 2R24-S012 to listen to the valve motor starter while valve 2E11-F006B was being operated from the RSDP.

The licensed operator in the Main Control Room established contact with one of the two PEOs via a telephone which is near (about 40 feet from) and within line-of-sight of the RSDP. The other PEO was stationed at the RSDP to operate the control switches as directed by the licensed operator through the PEO on the telephone. At the RSDP, "EMERG/NORM" switch S-10 was in the "NORM" position, the control switches for valves 2E11-F006B and 2E11-F006D (the reactor vessel suction valve for the 2D RHR pump) were in the "CLOSE" position and the control switch for valve 2E11-F004B was in the "OPEN" position. This is the normal line-up for these switches. The licensed operator instructed the PEO to place switch S-10 in the "EMERG" position, which he did. (This is in accordance with the sequence given in subsection 7.5 of surveillance procedure 34SV-E11-002-2S; however, this procedure was not being used to perform this valve movement since this was not a surveillance activity.) When switch S-10 was placed in the "EMERG" position, the light (position) indication illuminated at, and control was transferred to, the RSDP for valves 2E11-F004B, 2E11-F006B and 2E11-F006D (these are the only components at the RSDP affected by switch S-10). All three valves indicated closed at the RSDP as expected.

When RSDP switch S-10 was placed in the "EMERG" position, valve 2E11-F004B should have started to open. This is because its RSDP control switch was in the "OPEN" position and the interlock between valves 2E11-F004B and 2E11-F006B, which prevents the opening of one valve when the other is not fully closed, should have been satisfied with valve 2E11-F006B fully closed (see Figure 1). However, valve 2E11-F004B did not open when the PEO placed switch S-10 in the "EMERG" position because Limitorque operator limit switch LS-14 for valve 2E11-F006B was set to operate opposite from design. This limit switch, which provides the interlock permissive to open valve 2E11-F004B from the RSDP only, was improperly set to provide a permissive signal to open valve 2E11-F004B when valve 2E11-F006B started to open (see Figures 2 and 4). This was a problem only when control was at the RSDP, however. The Main Control Room control and interlock logic functioned properly because a different Limitorque operator limit switch (LS-6) is used to provide the position of valve 2E11-F006B. This limit switch was, and is, set correctly.

After the PEO placed switch S-10 in the "EMERG" position, the licensed operator asked the PEO on the telephone if valves 2E11-F004B and 2E11-F006B were closed. The PEO told the operator both valves were closed. The operator then asked the PEO to put down the telephone, go to the RSDP, and confirm the valves were closed. The PEO did as instructed and returned to the telephone

to report to the operator that he had confirmed both valves were closed. This evolution took approximately 20 to 30 seconds to complete. The operator failed to ask specifically about valve control switch position and no one noted valve 2E11-F004B was not opening during this time, as it should have been if limit switch LS-14 for valve 2E11-F006B had been set properly (see Figure 3).

The operator then instructed the PEO at the RSDP, via the PEO on the telephone, to place the RSDP control switch for valve 2E11-F006B to the "OPEN" position. The PEOs did as instructed at which time both valves 2E11-F006B and 2E11-F004B began to open (see Figure 4). This created a flow path from the reactor vessel through SDC valves 2E11-F008 and 2E11-F009 and valves 2E11-F006B and 2E11-F004B to the Unit 2 suppression pool. Unit 2 reactor vessel water level began to decrease from its pre-event level of about 58 inches above instrument zero. The PEO at the RSDP noted that valve 2E11-F004B was opening unexpectedly and took the control switches for valves 2E11-F004B and 2E11-F006B to the "CLOSE" position as he had been told previously that both valves were not to be open at the same time. Both valves are designed to stroke fully open or fully closed once they start in the respective direction; therefore, placing the control switches in the "CLOSE" position did not stop the valves from continuing to open.

The licensed operator, noting the water level decrease, contacted the PEOs at the RSDP and instructed them to place the control switches for valves 2E11-F004B and 2E11-F006B to the "CLOSE" position; by this time, the PEO had already done this. The licensed operator then instructed the PEO to place switch S-10 to the "NORM" position and told the PEOs to begin make-up to the reactor vessel by opening Condensate Transfer System valves 2P11-F083 and 2P11-F084. The operator also placed the control switches for valves 2E11-F004B and 2E11-F006B in the Main Control Room to the "CLOSE" position; however, the valves did not close at that time because both valves are designed to stroke fully open.

Reactor vessel water level continued to decrease as valves 2E11-F004B and 2E11-F006B continued to open (approximate open stroke times are 116 seconds and 103 seconds, respectively). At approximately 2131 EST, about 32 seconds after valves 2E11-F004B and 2E11-F006B began to open, water level reached the automatic reactor protection system (EIIS Code JC) and Group 2/6 Primary Containment Isolation System (PCIS, EIIS Code JM) actuation setpoint of three inches above instrument zero and full automatic reactor shutdown and Group 2/6 PCIS isolation signals were received per design. The Group 2/6 Primary Containment Isolation Valves (PCIVs, EIIS Code JM), including SDC isolation valves 2E11-F008 and 2E11-F009, automatically closed as required. All control rods were fully inserted at the time of the event; therefore, no control rod motion occurred or was required to occur in response to the reactor vessel water level decrease. Operations personnel entered abnormal operating procedures 34AB-E11-001-2S, "Loss of Shutdown Cooling," and 34AB-C71-001-2S, "Scram Procedure." When valves 2E11-F008 and

2E11-F009 fully closed, approximately 22 seconds after receipt of the isolation signal, the flow path from the reactor vessel to the suppression pool through open valves 2E11-F004B and 2E11-F006B was isolated. Minimum water level reached in this event was approximately six inches below instrument zero (152 inches above the top of the active fuel).

Operations personnel increased reactor vessel water level to greater than 53 inches above instrument zero using the Condensate Transfer System. Valves 2E11-F006B and 2E11-F004B were closed, valves 2E11-F008 and 2E11-F009 were opened, and SDC was restored by 2202 EST, approximately 31 minutes after the Group 2/6 PCIS isolation occurred.

Plant Management reported to the plant site to start an investigation that night and formed an Event Review Team on the morning of 11/3/95 to investigate this event. Based on a review of personnel statements and Unit 2 RHR System elementary drawings, members of the Event Review Team requested that Operations stroke open valve 2E11-F004B from the RSDP so the times required for various limit switches to change state could be determined. Operations personnel were unable to open valve 2E11-F004B using the control switch at the RSDP. Maintenance electricians suggested this problem might have been caused by limit switch LS-14 on valve 2E11-F006B being out of adjustment (see Figure 2). Members of the Event Review Team determined that if LS-14 was set to operate such that it was closed when valve 2E11-F006B was not fully closed and the 2E11-F004B valve control switch was in the "OPEN" position, then valve 2E11-F004B would open when valve 2E11-F006B was opened from the RSDP (see Figures 2 and 4). On 11/3/95, Maintenance personnel confirmed LS-14 on valve 2E11-F006B operated as shown on Figure 2; i.e., it was set to operate in a manner opposite that intended per design. They also found LS-14 was labeled as LS-15; Maintenance personnel corrected the labeling error and set LS-14 to operate properly.

CAUSE OF EVENT

Valves 2E11-F004B and 2E11-F006B opened simultaneously because: 1) limit switch LS-14 on valve 2E11-F006B was set incorrectly and 2) the RSDP control switch for valve 2E11-F004B was in the "OPEN" position, its normal position. It could not be determined conclusively how or when LS-14 on valve 2E11-F006B was set incorrectly, but it may have been the result of unclear drawings and/or a mislabeled limit switch. The licensed operator directing the valve stroking activities at the RSDP failed to ask specifically about valve control switch position. Therefore, he did not realize the control switch for valve 2E11-F004B was in the "OPEN" position and did not instruct the PEOs to place it in the "CLOSE" position.

RHR System elementary drawings were not clear regarding the limit switch set-up for valve 2E11-F006B. The limit switch setting diagram which applies to this valve does not explicitly state this. Furthermore, below this diagram is a note which references another drawing whose limit switch setting diagram could be interpreted to apply to valve 2E11-F006B. This latter limit switch setting diagram is formatted in such a way as to be confusing regarding limit switch set-up and therefore could have led to LS-14 being set to operate in the manner found on 11/3/95 (see Figure 2).

Limit switch LS-14 was found labeled "LS-15." Additionally, limit switch LS-15 (an unused switch) was found set to operate as LS-14 should have been set, i.e., to close only when valve 2E11-F006B was fully closed. Consequently, it is possible the interlock logic wiring for LS-14, at some time, had been incorrectly connected to LS-15 as a result of the aforementioned labeling error. Had the interlock logic been wired to LS-15, the valves and interlock logic would have functioned correctly. However, had this wiring error been corrected at a later date, that is, the logic wiring for LS-14 connected correctly to LS-14, the RSDP valve interlock would have been defeated because LS-14 was not set to operate per design.

The Event Review Team reviewed maintenance history for valve 2E11-F006B from 1978, when the interlock between valves 2E11-F004B and 2E11-F006B was installed and proven to work properly, to 1995. It could not determine conclusively when the limit switch was set improperly, if the labeling error resulted in a past wiring error, or if the limit switch wiring had ever been moved from LS-15 to LS-14.

REPORTABILITY ANALYSIS AND SAFETY ASSESSMENT

This report is required by 10 CFR 50.73(a)(2)(iv) because of unplanned actuations of the reactor protection system and the Group 2/6 PCIS; these are engineered safety feature (ESF) systems.

The Primary Containment Isolation System is designed to automatically close certain Primary Containment Isolation Valves, depending on the condition which caused the isolation, to provide protection against accidents involving the release of radioactive material from the fuel or nuclear process barriers and to help maintain reactor vessel inventory. Low reactor vessel water level indicates that the capability to cool the fuel may be threatened. Should reactor vessel water level decrease too far, fuel damage could result. Therefore, isolation of some reactor vessel interfaces, i.e., PCIS Group 2 and 6 isolation valves, occurs to isolate the potential causes of inventory loss. In particular, the closure of SDC isolation valves 2E11-F008 and 2E11-F009 on low reactor vessel water level (Level 3) supports actions to ensure that the water level does not drop below the top of the active fuel due to a leak (e.g., a pipe break or inadvertent valve opening) in the RHR System while in the SDC mode.

SDC isolation valves 2E11-F008 and 2E11-F009 are redundant isolation valves; therefore, the closure of either valve will isolate leaks in the RHR System while the system is in the SDC mode. Each valve motor is powered by a separate, Class 1E power supply and receives an isolation signal from redundant reactor water level transmitters and trip units which are also powered by separate supplies. Consequently, a single failure can not prevent the isolation of the SDC mode of the RHR System in the event of a low reactor vessel water level condition.

In this event, inadvertent simultaneous opening of valves 2E11-F004B and 2E11-F006B created a flow path from the reactor vessel to the suppression pool resulting in a decrease in reactor vessel water level to the Group 2/6 PCIS setpoint. The Group 2 and 6 PCIVs closed as required, terminating the inventory loss. Minimum water level reached during this event was approximately six inches below instrument zero, or 152 inches above the top of the active fuel. No Emergency Core Cooling Systems automatically actuated, or were manually actuated, as a result of this event nor were any needed to mitigate the water level decrease or restore water level following reactor vessel isolation. Water level was restored to greater than 53 inches above instrument zero, approximately the pre-event level, and SDC was restored to service within 31 minutes of the event. Due to the low decay heat load, water temperature increased less than four degrees Fahrenheit during the time SDC was isolated.

Based upon this assessment, it is concluded that this event had no adverse impact on nuclear safety. This assessment is applicable to operation with SDC in service; this event is not feasible with SDC out of service because isolation valves 2E11-F008 and/or 2E11-F009 would be closed and no flow path from the reactor vessel to the suppression pool via the RHR System would be possible.

CORRECTIVE ACTIONS

Maintenance department personnel checked the limit switch setup on RHR System valves 2E11-F004A-D, 2E11-F006A-D, and 2E11-F024B. No additional problems were found.

Operations department personnel performed an interlock logic functional test from the Main Control Room and the RSDP per special purpose procedure 34SP-110495-DC-1-2S, "Functional Test for the Interlocks Between 2E11-F004A (B, C, D) and 2E11-F006A (B, C, D)." The test was completed successfully with no problems found.

A procedure has been written to inspect and test logic on the Unit 1 remote shutdown panels. It will be performed by December 14, 1995.

The applicable RHR System elementary drawings will be clarified to indicate clearly which limit switch setting diagram applies to RHR System valves 2E11-F004A-D and 2E11-F006A-D. Additionally, the note which does not apply to the limit switch setting diagram will be removed or relocated. Similar changes will be made to the applicable Unit 1 RHR System elementary drawings as appropriate.

The licensed operator directing valve stroking activities at the RSDP, the PEO at the RSDP controls, and the Shift Supervisor were temporarily relieved of duty while investigation of the event was ongoing. They were returned to full duty after a discussion with the Operations department manager of the impact of this event and how proper communication could have prevented the loss of reactor vessel inventory.

This event and its causes have been reviewed with Operations department shift personnel.

The Operations department manager issued an Operating Order which requires that only licensed personnel operate equipment from the Unit 1 and Unit 2 RSDPs, except in emergency conditions. Additionally, the Operating Order requires continuous communication to be maintained between personnel at the RSDP and in the Main Control Room.

The Operations department manager issued an Operating Order which requires that valve control switches on the RSDP be set to mimic actual plant conditions before selecting "EMERG" on the applicable Unit 1 and Unit 2 RSDP control switch(es), except in emergency conditions.

The Operations department revised surveillance procedure 34SV-E11-002-2S to eliminate the possibility of creating flow paths between the reactor vessel and the suppression pool. Changes will be made to the corresponding Unit 1 surveillance procedure as necessary. Operations also is considering whether the Unit 1 and Unit 2 RSDP surveillance procedure sections can and should be performed only with the SDC isolation valves closed (e.g., while on-line).

Plant management is considering whether the standard plant practice of manipulating valves during troubleshooting evolutions without the use of written guidance is appropriate.

A telephone was installed beside the Unit 2 RSDP. The telephone cord is long enough to enable an individual at the panel to use the whole panel while on the telephone and will allow direct communication between personnel at the RSDP and personnel in the Main Control Room as required by the aforementioned Operating Order.

ADDITIONAL INFORMATION

No systems other than those mentioned in this report were involved in this event.

No failed components caused or resulted from this event.

No previous similar events in which the creation of an inadvertent flow path from the reactor vessel caused unplanned ESF system actuations have been reported in the last two years.

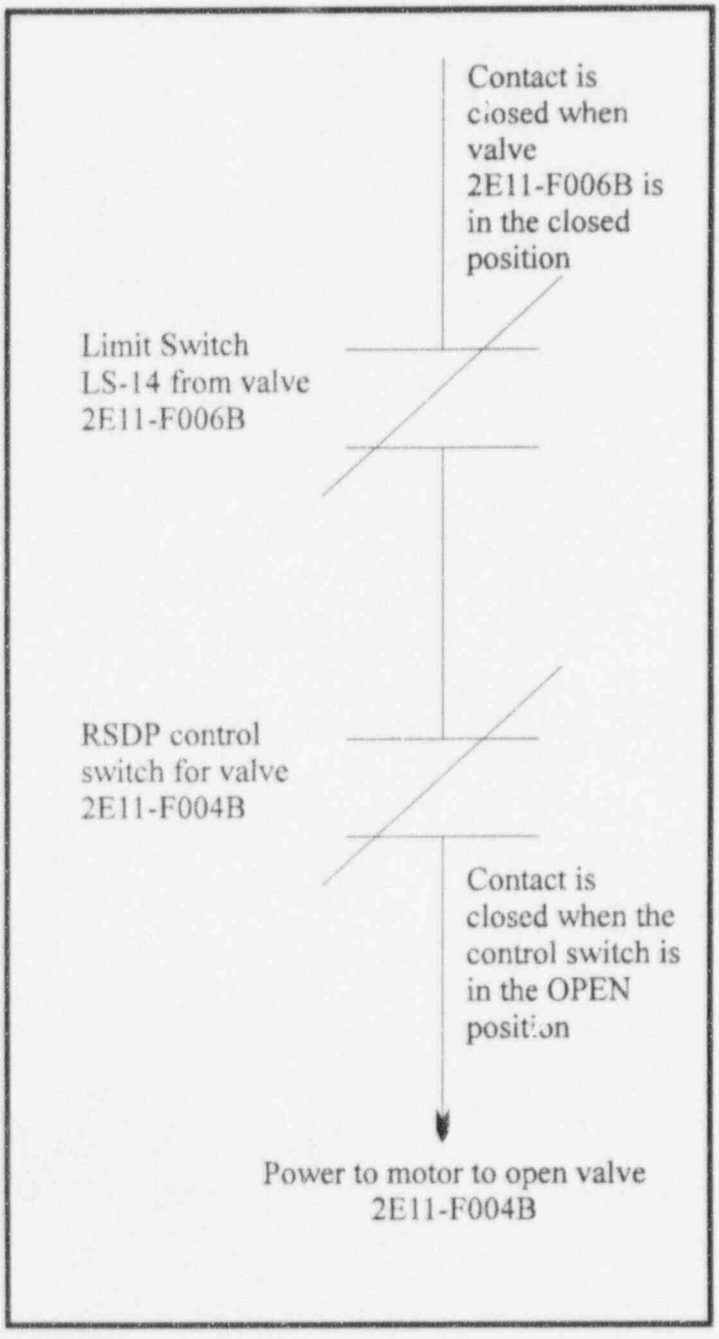

Figure 1: As-Designed RSDP Opening Circuit for Valve 2E11-F004B

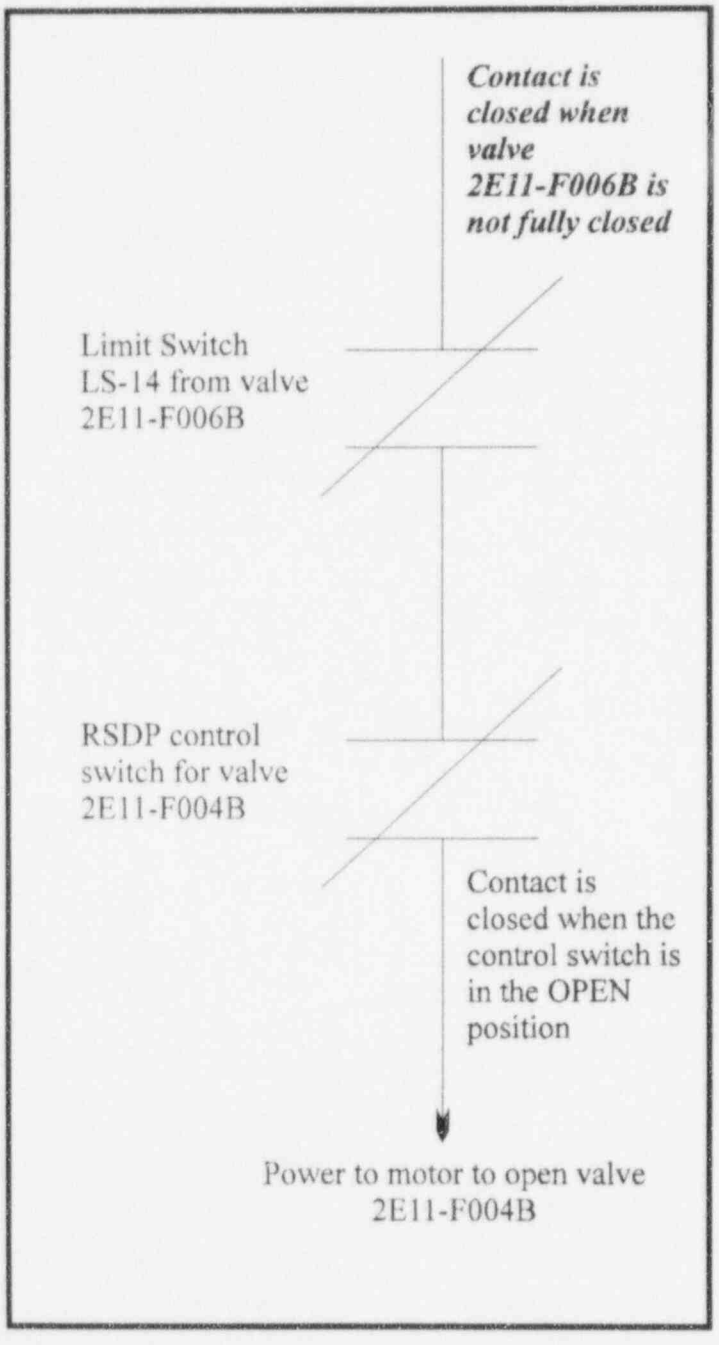

Figure 2: As-Found RSDP Opening Circuit For Valve 2E11-F004B

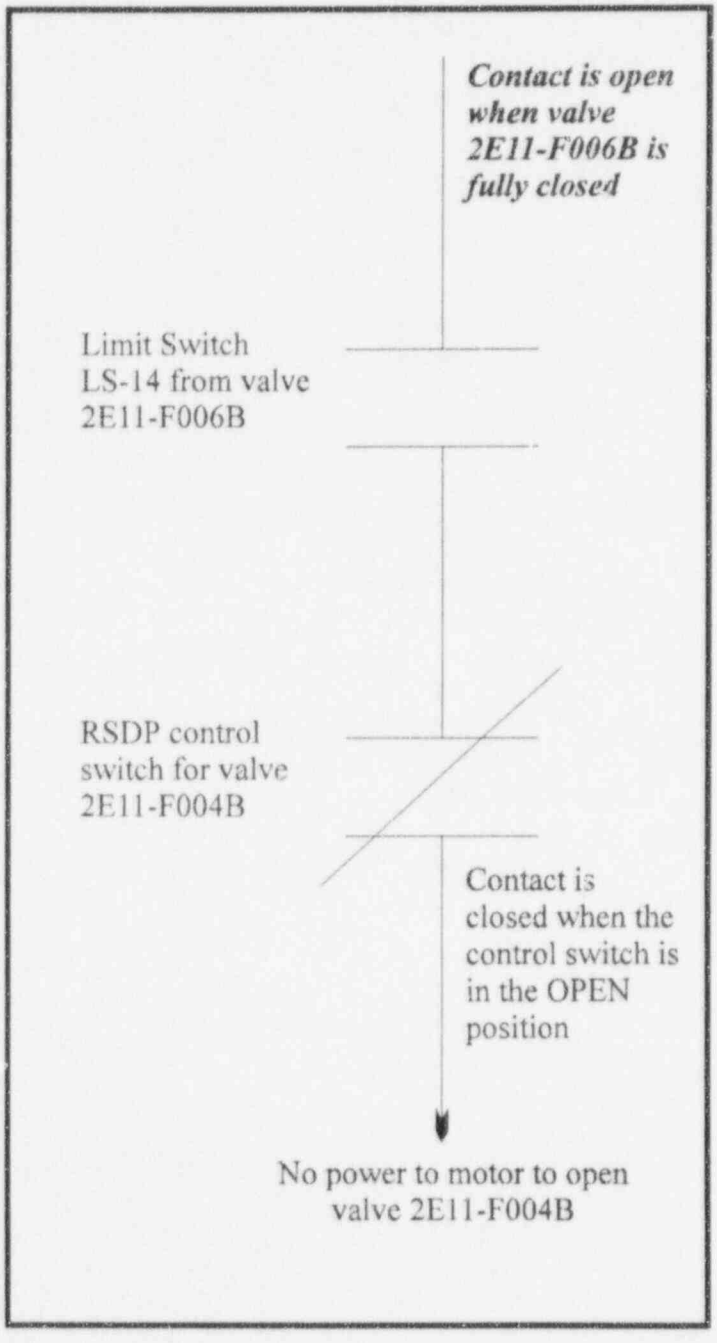

Figure 3: Status of RSDP Opening Circuit For Valve 2E11-F004B Prior to Opening Valve 2E11-F006B

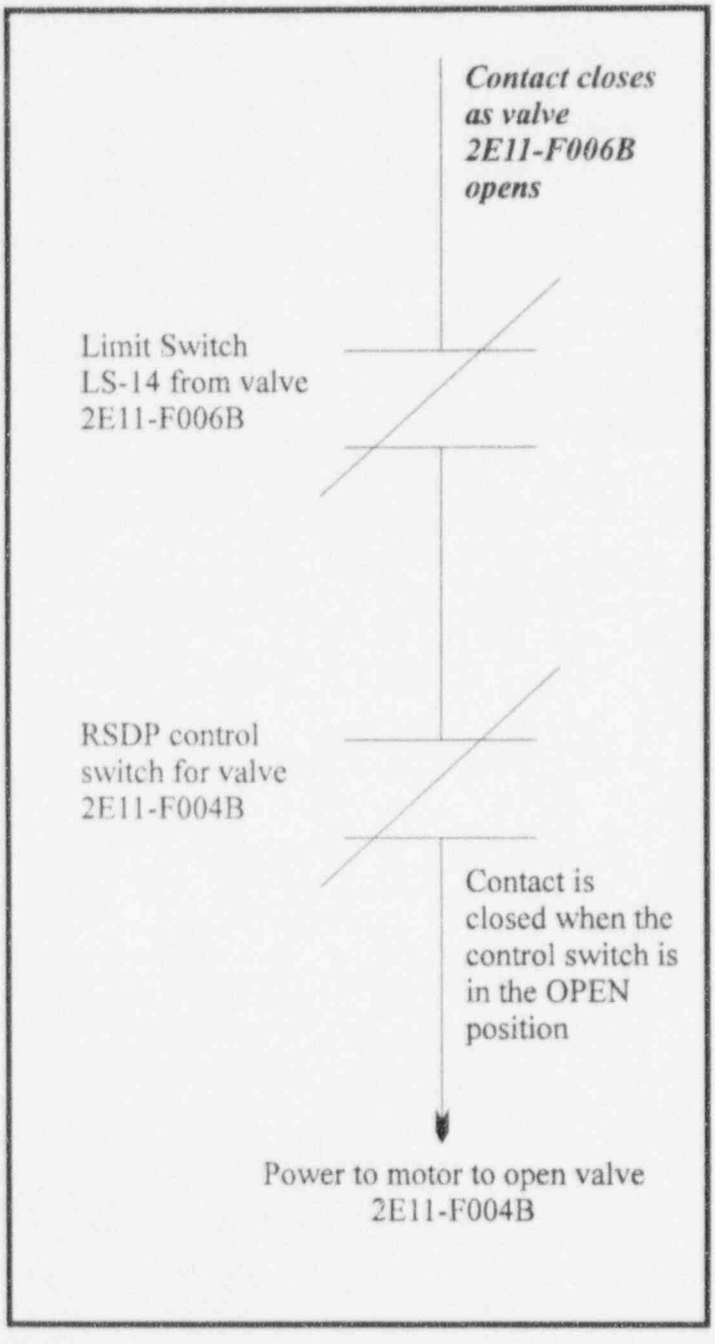

Figure 4: Status of RSDP Opening Circuit For Valve 2E11-F004B After Valve 2E11-F006B Began to Open