NRC Form 366
(9-83)

U.S. Nuclear Regulatory Commission
Approved OMB No. 3150-0104
Expires: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Arkansas Nuclear One, Unit Two	0 5 0 0 0 3 6 8	1 OF 0 6

TITLE (4) Plant Modification Design Deficiencies Resulting in Incorrect Installation of Solenoid Operated Valves and Degradation of Containment Isolation Capability

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 Names	Docket Number(s)
0 4	2 9	8 5	8 8	-- 0 0 1	-- 0 0	0 3	2 8	8 8	ANO-1	0 5 0 0 0 3 1 3
									N/A	0 5 0 0 0

OPERATING MODE (9): 5

POWER LEVEL (10): 0 0 0

THIS REPORT IS 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)	__ 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
__ 20.405(a)(1)(iii)	__ 50.73(a)(2)(i)	__ 50.73(a)(2)(viii)(A)	Abstract below and
__ 20.405(a)(1)(iv)	X 50.73(a)(2)(ii)	__ 50.73(a)(2)(viii)(B)	in Text, NRC Form
__ 20.405(a)(1)(v)	__ 50.73(a)(2)(iii)	__ 50.73(a)(2)(x)	366A)

LICENSEE CONTACT FOR THIS LER (12)

Name	Telephone Number (Area Code)
Patricia L. Michalk, Nuclear Safety and Licensing Specialist	5 0 1 9 6 4 - 3 1 0 0

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
B	B	D I S V	T 0 2 0	N					

SUPPLEMENT 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 April 29, 1985, while performing a containment integrated leak rate test (ILRT) on the ANO-2 containment building, leakage through two solenoid operated containment isolation valves (SOVs) in a post accident sampling system (PASS) was discovered. The type of SOV utilized is designed to provide positive isolation capability in only one direction with respect to flow through the valve. However, in the originally installed condition, the SOVs were not capable of remaining fully closed any time system pressure on the downstream side of the SOV exceeded pressure on the upstream side of the SOV by approximately 5 psi. AP&L promptly responded by isolating the affected line (closing a manual isolation valve) and subsequently completed the ILRT. AP&L initially reported the condition at the time per 10CFR50.72(b)(2)(i). The affected valves were later removed and reinstalled in a reverse configuration, i.e., reversed valve position with respect to normal flow direction through valve, to correct the deficiency. The valves were then leak rate tested and verified acceptable. Similar incorrectly configured SOVs subsequently discovered at ANO-1 are discussed in LER 313/88-001. AP&L does not consider the as-found configuration to be safety significant in that: 1) the required post accident function of the PASS system was not impaired and 2) a redundant ECCS recirculation isolation valve could have been utilized to isolate the containment penetration.

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

I. Description of Event

A. Plant Status

At the time of discovery of this event, the unit was in Mode 5, Cold Shutdown, nearing completion of refueling outage number four (2R4) for Arkansas Nuclear One, Unit Two (ANO-2). The reactor coolant system (RCS) was at atmospheric pressure with a RCS temperature of approximately 92 degrees Fahrenheit.

B. Component Identification

The components involved in this event are two (2) one-inch, 125 volt DC solenoid operated valves (SOVs), 2SV-5633-1 and 2SV-5633-2 (see figure 1) used in the ANO-2 Post Accident Sampling System (PASS). The valves are used for system isolation under normal and post accident conditions and are designed to close automatically upon receipt of a containment isolation actuation signal (CIAS) or safety injection actuation signal (SIAS). Both valves are model 80E-001 valves manufactured by Target Rock (TR) Corporation. Design pressure for the valves is 2500 pounds per square inch. The EIIS identifier is BD-ISV and the manufacturer code is T020.

C. Sequence of Events

In accordance with the requirements of 10CFR50, Appendix J, Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors, a type A test for measuring the primary reactor containment overall integrated leakage rate (ILRT) for ANO-2 was initiated April 27, 1985. After full test pressure (54 psig) was reached April 28, an unidentified source of leakage from the containment was noted. A search was initiated to determine the source of leakage. On April 29, 1985, during this search, a drain valve on the PASS sample return line to the containment sump was opened and water flow was observed. This indicated that in the installed configuration, isolation valves 2SV-5633-1 and 2SV-5633-2 would not provide positive isolation when subjected to elevated containment pressure. The affected line was isolated by closing a manual isolation valve located between the containment sump line and the two isolation valves. The source of containment leakage was identified and corrected and the ILRT was completed. Following completion of the ILRT, AP&L took prompt corrective action to determine the cause of valve leakage. The valves were then removed, reinstalled correctly and sucessfully leak tested.

II. Event Cause

A. Event Analysis

NUREG-0578, TMI-2 Lessons Learned Task Force Status Report and Short-Term Recommendations, and NUREG-0737, Clarification of TMI Action Plan Requirements, required licensees to perform a design and operational review of the reactor coolant and containment atmosphere sampling systems to determine the capability to promptly obtain samples under accident conditions without incurring excessive exposure to personnel. As a result of these reviews, AP&L designed and installed a post-accident sampling system (PASS) to meet these functional requirements. In addition to providing the capability of sampling the reactor coolant system and containment atmosphere, the PASS design also incorporated provisions to obtain liquid samples from the reactor building sump located inside the reactor building. Sampling of the sump was accomplished by connecting sampling system piping to existing drain lines located outside the containment on the sump recirculation piping for the two independent trains of the emergency core cooling system (ECCS) (See Figure 1). This design provided a flowpath to supply sump water to the PASS for analysis and return of the sample flow to the containment building without necessitating separate or additional penetrations of the containment boundary. TR SOVs were installed as isolation valves in the flowpath with valve 2SV-5633-1 and 2SV-5633-2 being installed in series in the sample return line to the containment sump.

The recirculation piping (see Figure 1) penetrates the containment building at two penetrations. Each train of piping is 24-inch, seismic category I and contains one normally open motor-operated valve (MOV) located inside the containment and a motor operated valve outside containment which is closed until recirculation begins. The PASS design utilized connections located between the containment penetrations and the outside motor-operated valves in each line. The piping up to and including the TR SOVs is seismic category I. Beyond these valves, the piping is non-seismic.

Due to design characteristics of the valve, the type of TR solenoid valve installed as isolation valves during implementation of the PASS modifications will provide positive isolation capability in only one direction with respect to flow through the valve. In the installed condition, the TR SOVs were not capable of remaining fully closed to provide isolation any time system pressure on the downstream side of the valve exceeded pressure on the upstream side of the valve by approximately 5 psi. A reverse delta pressure of this magnitude would cause the valve disc to lift from its seat and allow flow through the valve.

B. Safety Significance

The as-found configuration of the two SOVs discussed above was of minimal safety significance with respect to the capability to isolate the affected system during postulated design basis events (including earthquakes, loss of coolant accidents and main steam line breaks). The unlikelihood of occurrence of postulated design basis events, coupled with additional failures that could lead to system degradation, and the fact that a redundant isolation valve existed, presents an adequate basis to conclude that this event was not safety significant.

The portion of the PASS affected by the incorrectly configured SOVs is used for returning water to the containment sump after analysis and is normally unused except for periodic testing to verify sampling capability. The valves are required to be open to allow return of PASS samples to containment during post accident conditions. Therefore, a failure of these valves to provide positive isolation would not prevent PASS from performing its intended function. The SOVs and associated containment penetration piping are designed as seismic Category I to assure isolation capability during a seismic event. Even though the as-found condition represented a degradation of defense-in-depth isolation capability during a seismic event concurrent with a postulated loss of the non-seimsic portion of the PASS, a motor operated valve located inside containment on the ECCS recirculation line could have been used to isolate the affected containment penetration. It should be noted that, even assuming a failure of the non-seismic portion of PASS, isolation of the PASS line is not critical unless a seismic event occurs concurrently with an accident requiring containment isolation.

The capability to isolate this line could also have been adversely affected under conditions expected to exist as a result of a LOCA or a MSLB event significant enough to produce high containment pressure. However, this system was specifically designed and installed for post accident usage and review of the design of the non-seismic portion of the PASS indicates that LOCA or MSLB containment pressures would not significantly challenge the piping integrity.

It should be noted that this penetration is normally in service post accident (ECCS recirculation) and is not directly exposed to containment atmosphere due to the expected water level in the sump. A review of such configurations per current guidance (ANSI/ANS 56.2-1984) indicate, that the SOVs are not required to be classified as containment isolation valves. Notwithstanding the above, periodic leak testing of the SOVs will continue.

In sum, because (1) the non-seismic portion of the PASS containment sump return line is the only part of the system that could have been challenged sufficiently to require system isolation, (2) design basis accidents such as a LOCA or MSLB would have to be considered concurrent with a seismic event which breaches the non-seismic line (concurrent consideration of these events in not part of the design basis for ANO-2), (3) a motor operated ECCS recirculation line valve could also be used to isolate this penetration and (4) the SOVs are designed to be open during accident conditions, there was minimal safety significance associated with the incorrect configuration.

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

C. Root Cause

AP&L investigations concluded the root causes of the improperly configured valves were (1) failure during the design process to recognize the directional characteristics of the TR SOVs resulting in lack of specific guidance for valve installation and (2) inadequate post-installation verification testing.

D. Basis for Reportability

After initial discovery, this condition was evaluated and reported per the requirements of 10CFR50.72(b)(2)(i) on May 1, 1985, at 1120 hours. Further evaluation of the details of the event were performed and it was determined that the event should also be reported per 10CFR50.73 (a)(2)(ii)(B). The time period between the date of discovery of this event and the submittal of this report is greater than that allowed by 10CFR50.73 for submittal of LERs. The delay in reporting this event was due to an administrative oversight in the process used for ensuring LERs are issued.

III. Corrective Actions

A. Immediate

Upon discovery that the PASS TR solenoid valves would not function properly as isolation valves in their installed configuration, the affected line was isolated by closing a manual valve located between the containment sump line and the two valves. Actions were initiated to develop a plant design change package (DCP) to correct the discrepancy. Additionally, a review of the ANO-1 PASS design was initiated to determine if a similar problem existed.

B. Subsequent

TR solenoid valves 2SV-5633-1 and 2SV-5633-2 were removed and reinstalled in a reverse direction from their as-found condition. Appropriate modifications were made to the piping system to improve leak rate testing capability of the isolation valves after modification. A leak rate test was performed and leakage was verified to be within allowable limits. Modifications and testing were completed prior to plant heatup following the refueling outage.

A memorandum was issued in 1985 to inform design engineers of discovery of the incorrect TR valve installation and flow characteristics of the Target Rock solenoid valves to prevent misapplication of these valves in future design changes.

As a result of this event, reviews were conducted on the ANO-1 PASS. A TR solenoid valve used as an isolation valve in this system was also identified as being installed incorrectly. The details of the discovery and subsequent actions related to the ANO-1 PASS valve problem are contained in a separate ANO-1 LER (50-313/88-001). Additional corrective actions of broader scope are discussed in the ANO-1 LER and are applicable to both units.

The effect on the final results of the ILRT performed on ANO-2 in 1985 due to the incorrect installation of the ANO-2 PASS TR valves is currently being reevaluated. Any necessary revisions or modifications to the report submitted providing the results of this test will be submitted per the requirements of 10CFR50, Appendix J, as appropriate.

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

IV. Additional Information

A. Similar Events

Other events involving design deficiencies were as follows:

313/84-006 Potential Reactor Building Liner Plant Degradation Due to Hydrogen Purge Pipe Support Design Deficiency

313/85-001 Steam Driven Emergency Feedwater Pump Inoperable Due to Inadequate Plant Modification

313/86-001 Inadequate 10CFR50.59 Design Change Review Resulting in a Design Deficiency in Emergency Feedwater System

313/87-008 Inadequate Design Modification Created a Pathway for Unfiltered Air Inleakage in Excess of the Design Basis for Control Room Habitability Following a Loss-of-Coolant Accident

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POST ACCIDENT SAMPLING SYSTEM SIMPLIFIED SCHEMATIC
NORMAL OPERATING CONDITIONS VALVE LINE-UP
★ DENOTES VALVES INSTALLED INCORRECTLY

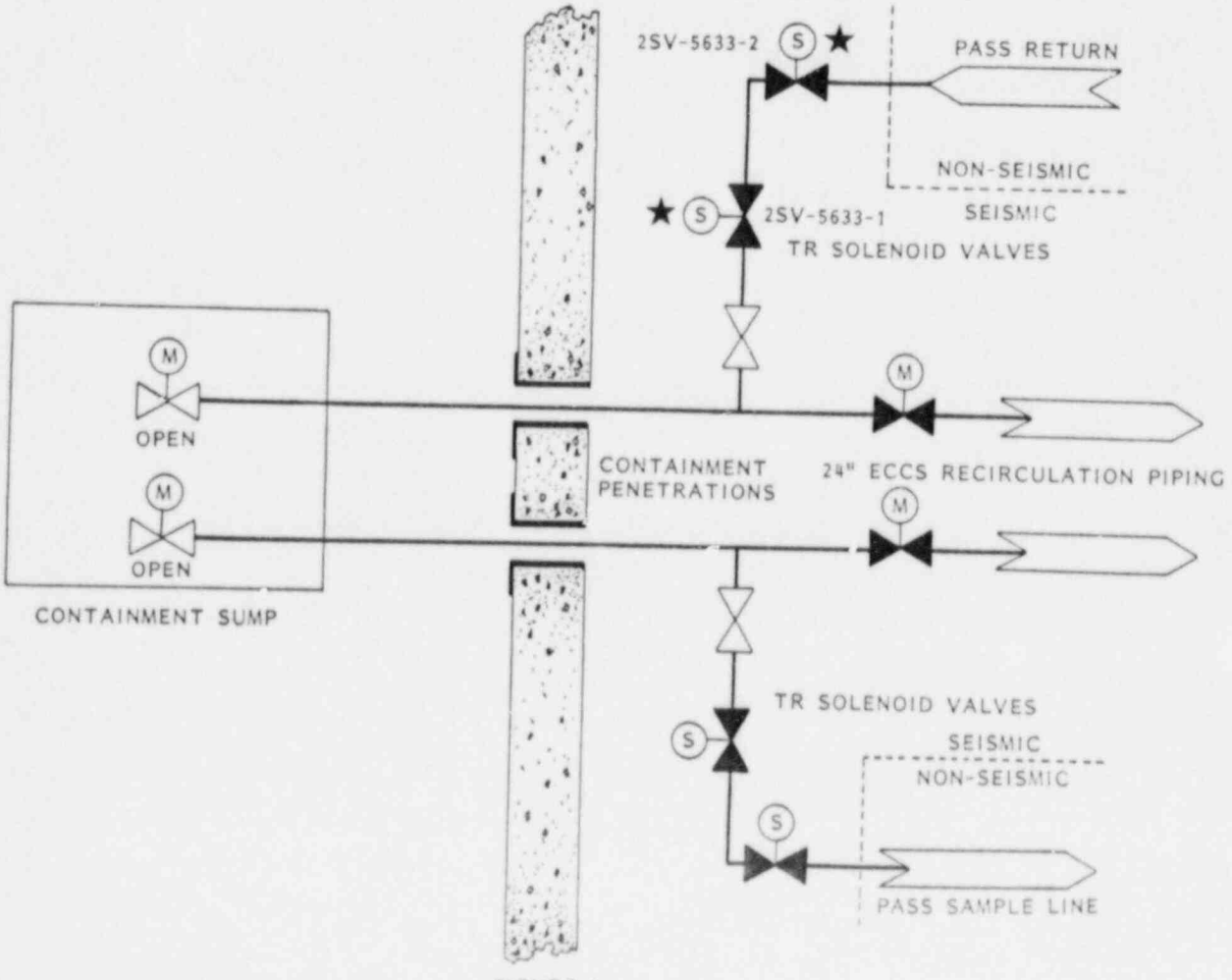

FIGURE 1

ARKANSAS POWER & LIGHT COMPANY

March 28, 1988

2CAN038804

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

SUBJECT: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License No. NPF-6
Licensee Event Report No. 368/88-001-00

Gentlemen:

In accordance with 10CFR50.73(a)(2)(ii), attached is the subject report concerning plant modification design deficiencies resulting in incorrect installation of solenoid operated valves and degradation of containment isolation capability.

Very truly yours,

J. M. Levine
Executive Director,
Nuclear Operations

JML:DJM:dm
attachment

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