NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Sequoyah, Unit 1	0 5 0 0 0 3 2 7	1 OF 0 5

TITLE (4) Inadequate Design Of The Containment Isolation System For The Hydrogen Analyzers Could Result In Bypass Leakage Following A Loss Of Coolant Accident

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)
1 2	0 7	8 7	8 7	— 0 7 7	— 0 0	1 2	3 0	8 7	Sequoyah, Unit 2	0 5 0 0 0 3 2 8
										0 5 0 0 0

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 0 0	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 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)	XX 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
K. E. Meade, Plant Operations Review Staff	6 1 5 8 7 0 - 6 2 5 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	

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

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

On December 7, 1987, with units 1 and 2 in mode 5 (0 percent power, 4 psig, 123 degrees F and 0 percent power, 115 psig, 120 degrees F, respectively), a condition was identified which could have resulted in bypass leakage following a design basis loss of coolant accident (LOCA). The hydrogen analyzer system (HAS) installed in each unit of the Sequoyah Nuclear Plant (SQN) utilizes a small amount of control air to act as a reagent gas. A sample from the containment atmosphere is mixed with the reagent gas in the hydrogen analyzer module (located in the annulus inside the Reactor Building), analyzed for hydrogen content, and returned to containment. During the review of an HAS related engineering change notice (ECN), TVA discovered that the current HAS design represented a potential pathway for radionuclides to escape to the environment. The HAS isolation valves located inside containment are air operated valves which fail in the open position. If a LOCA occurred concurrent with a single failure of one train of control air, the containment pressure would eventually exceed the pressure in the control air line feeding reagent air to the hydrogen analyzer module. Radionuclides from the containment atmosphere could then be forced back through the control air line and be released to areas of the Auxiliary Building not covered by the Auxiliary Building gas treatment system (ABGTS). The event was caused by an inadequate design control process that was in place when the HAS containment isolation system was installed at SQN. TVA has subsequently implemented a design change improvement program at SQN that has resulted in significant improvements to the design change process. In addition, TVA will replace the HAS isolation valves inside containment with fail closed, solenoid operated valves, and replace the control air supply with air bottles which will maintain the reagent air pressure greater than the maximum predicted containment pressure.

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

DESCRIPTION OF EVENT

On December 7, 1987, with units 1 and 2 in mode 5 (0 percent power, 4 psig, 123 degrees F and 0 percent power, 115 psig, 120 degrees F, respectively), a condition was identified which could have resulted in bypass leakage following a design basis loss of coolant accident (LOCA).

The Sequoyah Nuclear Plant (SQN) has two independent hydrogen analyzer systems (HAS) (EIIS Code IK) per unit with each system drawing samples from both the upper and lower containment compartments. In order for the HAS to operate, the hydrogen analyzer module (located in the annulus inside the Reactor Building shield wall) must be constantly supplied with a small amount of control air (EIIS Code LE) to act as a reagent gas. A sample from the containment atmosphere passes through HAS isolation valves FCV-43-201 (train A) and FCV-43-207 (train B) and enters the hydrogen analyzer module (see figure 1) where it is mixed with the reagent gas (control air). The sample is analyzed for hydrogen content, then returned to containment through the train "A" and train "B" isolation valves FCV-43-202 and FCV-43-208, respectively. All four HAS isolation valves are inside containment, operated by control air, and designed to fail open on a loss of control air.

During the review of an engineering change notice (ECN), issued to enhance the HAS calibration process, TVA discovered that the current HAS design represented a potential pathway for radionuclides to be released to areas of the Auxiliary Building that were outside of the Auxiliary Building secondary containment enclosure (ABSCE). Following a LOCA, control air to the containment is isolated, and HAS isolation valves FCV-43-201, -202, -207, and -208 (which are air operated) will fail open. If the HAS is in the "analyze" mode, electrically operated solenoid valve FSV-43-200A (train A) and/or FSV-43-210A (train B) will remain in the open position, as designed. If a single failure of one train of control air is then postulated, the pressure in the control air line feeding the hydrogen analyzer module will eventually drop below the containment pressure. Since the hydrogen analyzer module is in direct contact with the containment atmosphere, radionuclides could be forced back through the control air line and potentially released to areas of the Auxiliary Building not covered by the Auxiliary Building gas treatment system (i.e., outside of the ABSCE). Hence, a direct pathway for bypass leakage could be available following a LOCA.

The above described condition is applicable to SQN units 1 and 2 since both units have identical hydrogen monitoring systems.

CAUSE OF EVENT

The availability of a pathway for bypass leakage of radionuclides was caused by an inadequate design change control process that was in place when the HAS was installed. In response to NUREG-0737, "Post-TMI Requirements," TVA committed to the installation and operation of an HAS; however, because of an inadequate design change control process, the HAS containment isolation system did not account for the reagent gas (control air) being in direct contact with containment atmosphere. As a result, the HAS containment penetrations were incorrectly classified as TVA isolation class II (i.e., fluid systems open to the containment atmosphere but connected to a closed system outside containment). Also, the isolation valves inside containment were designed to fail open, and only one isolation valve was installed on each line that penetrated the containment.

ANALYSIS OF EVENT

This condition has been determined to be reportable under 10 CFR 50.73, paragraph a.2.ii.

The HAS is designed to detect hydrogen gas concentrations in the Containment Building following a postulated LOCA. However, with both units currently in cold shutdown (mode 5), containment integrity is not required and a design basis accident that could result in high radionuclide inventories in containment is not credible. Hence, there are no safety consequences associated with this condition while in mode 5.

If a LOCA occurred during power operation and this condition of potential bypass leakage existed, there exists the possibility of increasing the radiological consequences associated with the LOCA. TVA has performed a preliminary evaluation of the potential increase in both the onsite and offsite dose consequences associated with potential bypass leakage following a LOCA. This offsite dose evaluation showed a slight increase in the exclusion area boundary and low population zone doses; however, both doses remained well within the requirements of 10 CFR 100 (i.e., 25 rem to the whole body and 300 rem to the thyroid). Similarly, the onsite dose evaluation showed a slight increase in the doses to control room operators; however, whole body doses remained within the requirements of General Design Criteria 19 (5 rem to the whole body). Thus, the pathway for bypass leakage would not have significant safety consequences during power operation.

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

CORRECTIVE ACTION

The Design Baseline and Verification Program (DBVP) documented many deficiencies relative to the design change control process at SQN. Subsequently, TVA implemented a design change improvement program that provides appropriate methods (e.g., checklists for electrical design, mechanical design, effect on design documents, environmental qualification, 10 CFR 50 Appendix R requirements, additional testing requirements, etc.) to strengthen the design change process. Further, since the HAS deficiencies identified herein were discovered under the new design change process, there is evidence that the design change improvement program is successful.

TVA will replace the air operated HAS isolation valves (located inside containment) with fail close solenoid operated valves. These valves will be qualified for a harsh environment, powered by a class 1E power source, and capable of being opened from the main control room. In addition, TVA will add a temporary plug in the calibration and reagent gas lines between the hydrogen analyzer module and the ABSCE. This work will bring the HAS into compliance with General Design Criteria 56 (10 CFR 50, Appendix A) and will be complete before heatup (mode 4) of each respective unit.

TVA will designate outside containment solenoid operated valves FSV-43-200A and FSV-43-210A as containment isolation valves and add a test connection to allow local leak rate testing. In addition, TVA will replace the air supply to the HAS by removing the control air supply line and installing air bottles which will maintain air pressure in the reagent air line greater than the maximum predicted containment pressure. This work will be completed before startup (mode 2) of each respective unit.

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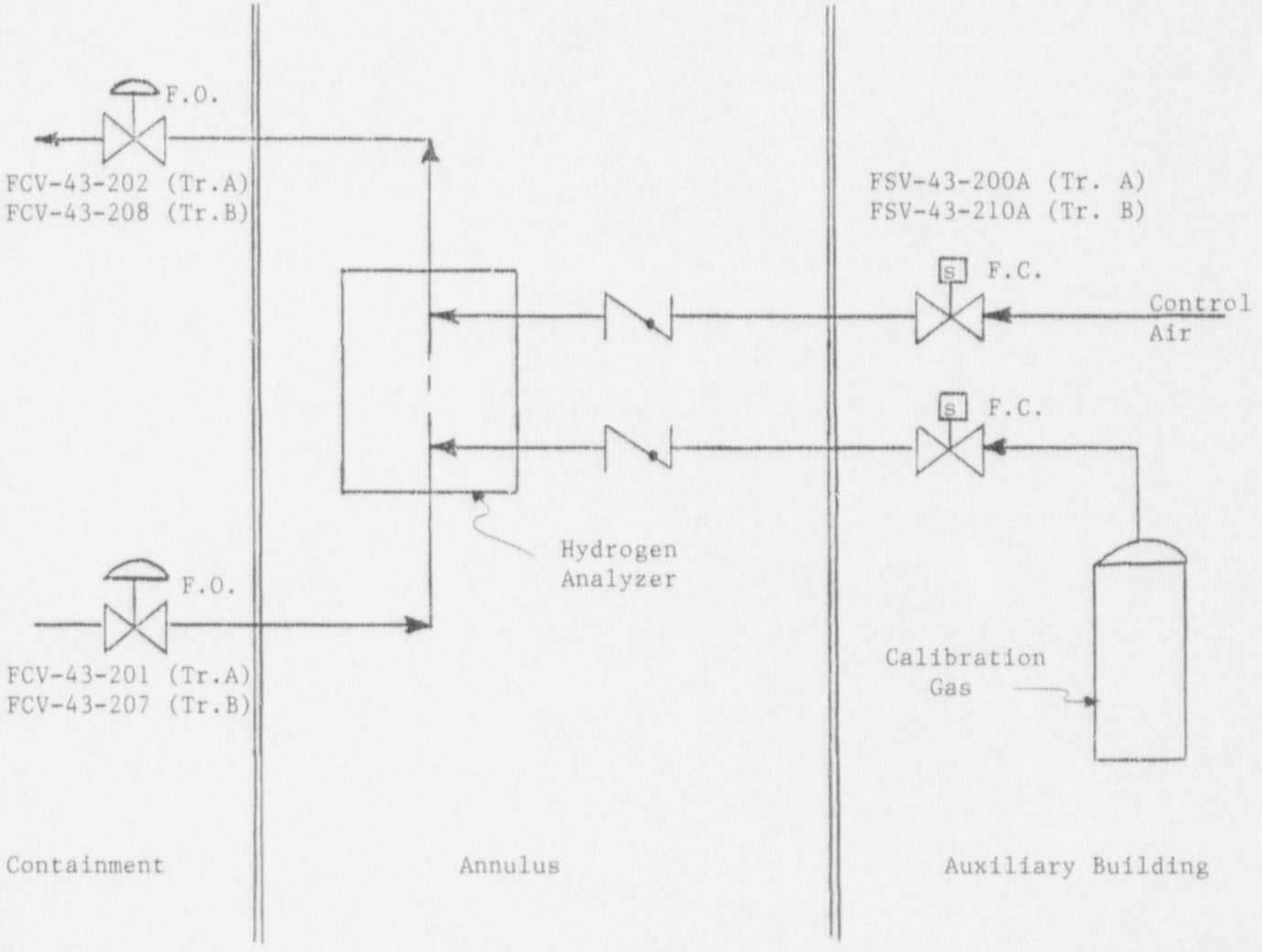
Figure 1

Hydrogen Analyzer System Schematic



TENNESSEE VALLEY AUTHORITY
Sequoyah Nuclear Plant
Post Office Box 2000
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December 30, 1987

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

Gentlemen:

TENNESSEE VALLEY AUTHORITY - SEQUOYAH NUCLEAR PLANT UNIT 1 - DOCKET NO. 50-327 - FACILITY OPERATING LICENSE DPR-77 - REPORTABLE OCCURRENCE REPORT SQRO-50-327/87077

The enclosed licensee event report provides details concerning an inadequate design of the containment isolation system for the hydrogen analyzers which could result in bypass leakage following a loss of coolant accident. This event is reported in accordance with 10 CFR 50.73, paragraph a.2.ii.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

J. J. Smith
Plant Manager

Enclosure
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