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 2	0 5 0 0 0 3 2 8	1 OF 0 5

TITLE (4)
Electromagnetic Interference Spike Initiating A Containment Ventilation Isolation As A Result Of The Detector Cable Ground

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)
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1 1	2 7	8 7	8 7	— 0 0 8	— 0 1	1 2	3 0	8 7		0 5 0 0 0

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
5	20.402(b)	20.405(c)	XX 50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10) 0 0 0	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
	AREA CODE
B. E. Kilgore, Plant Operations Review Staff	6 1 5 8 7 0 - 7 0 8 7

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)

This LER is being revised to provide additional information in the corrective action.

On November 27, 1987, with unit 2 in mode 5 (0 percent power, 75 psig, 114 degrees F), a train "A" containment ventilation isolation (CVI) occurred on unit 2. At approximately 0320 EST, with an instrument malfunction alarm present on the containment lower compartment air radiation monitor (RM), Operations personnel determined that a spurious high radiation spike had occurred at approximately 0230 EST. Since the spurious radiation spike exceeded the RM trip criteria, a CVI and instrument malfunction alarm were generated. Instrument Maintenance (IM) personnel determined that the most probable cause of the spurious high radiation spike was an electromagnetic pulse generated by the actuation of the low sample flow switch that was transferred to the RM detector cable. Investigation into this and three subsequent CVIs revealed that the detector cable did not have a good ground. As the result of a recent trend of CVI actuations (six within the interval of November 27 to December 21), TVA has established a special task group to investigate the root cause of the subject CVIs. TVA believes this investigation will provide an overview of the events and allow for a determination as to the possibilities of a common or event specific root cause. Once a root cause is established, corrective action will be decided and implemented to ensure that the potential for CVI occurrences will not recur as the result of the found root cause.

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

This LER is being revised to provide additional information in the corrective action.

DESCRIPTION OF EVENT

On November 27, 1987, with unit 2 in mode 5 (0 percent power, 75 psig, 114 degrees F), a train "A" containment ventilation isolation (CVI) (EIIS Code JM) occurred on unit 2.

At approximately 0245 EST, an instrument malfunction alarm (window 4 on panel XA-12A-55D) was present in the control room on containment lower compartment air Radiation Monitor 2-RM-90-106 (EIIS Code IL). Past experience of the subject radiation monitor (RM) has shown that instrument malfunction alarms are frequently the result of clogged sample gas prefilters. Operations personnel blocked the RM output signals, dispatched Chemical Laboratory personnel to the RM, and instructed them to change the RM sample gas prefilters. The sample gas prefilters were changed (approximately 0255 EST); however, the instrument malfunction alarm would not clear. Further investigation by Operations personnel determined that the alarm was a result of low air flow through the RM. This was verified by checking the local low flow indicator on the RM. Instrument Maintenance (IM) was then notified, and at 0300 EST, the RM was declared inoperable and the RM air pump was shut down to allow IM personnel to investigate the cause of the low RM air flow condition. Operations personnel initiated Surveillance Instruction (SI)-6.1, "Containment Building Ventilation Isolation," to comply with the action requirements of Limiting Condition for Operation (LCO) 3.3.3.1.

While SI-6.1 was in progress, Operations personnel inspected the RM control panel and discovered that the RM chart recorder indicated a high radiation spike [3.5 E5 counts per minute (cpm)] had occurred at approximately 0230 EST. Since the spike exceeded the high radiation trip criteria (1.19 E5 cpm) of 2-RM-90-106, a CVI was generated; however, Operations personnel noted that only the train "A" RM containment isolation valves had closed. Operations also noted during this inspection that the RM had tripped (i.e., its red trip light had illuminated) but the high radiation alarm in the control room (window 3 on panel XA-55-12D) had not annunciated.

At approximately 0320 EST, Operations personnel initiated System Operating Instruction (SOI)-88.1, "Containment Isolation System," to recover from the CVI. During the performance of SOI-88.1, it was verified that train "A" RM containment isolation valves 2-FCV-90-107, -111, -113, and -117 (all located outside containment) were closed while train "B" RM containment isolation valves 2-FCV-90-108, -109 ,-110, -114, -115, and -116 (all located inside containment) did not close. Operations personnel then attempted to open the train "A" isolation valves using the handswitches in the control room. Although the train "A" isolation valves could be opened, the valves would not remain in the open position. This is in accordance with the design since when a trip signal is present, the valves will remain in the closed position. This action verifies that a train "A" CVI had been generated but had not generated a train "B" CVI.

Operations personnel then reset the RM, opened the train "A" valves, and returned the system to normal at approximately 0330 EST. The event duration was approximately 60 minutes.

CAUSE OF EVENT

The train "A" CVI was caused by a spurious high radiation spike in RM 2-RM-90-106 that exceeded the RM trip criteria. The most probable cause of the high radiation spike has been determined to be electromagnetic interference (EMI) in the RM cables. Previous experience with the subject radiation monitors has shown that high radiation spikes can be caused by electrical noise generated from low sample flow switch actuations and/or annunciation of the instrument malfunction alarm. Subsequent to this event, three (3) additional CVIs occurred, all from the same RM. Investigation of this and the three subsequent events by IM personnel revealed that the ground wire did not provide a good ground for the detector cable. Before resecuring the ground wire, IM personnel have been able to recreate the EMI-induced radiation spike by alternately opening and closing the low sample flow switch. However, once the ground wire was resecured, the EMI-induced radiation spike could not be recreated. Therefore, TVA believes that the root cause of this event is attributable to the lack of a good ground on the detector cable.

The actuation of the train "A" CVI in the absence of a train "B" CVI is believed to have been caused by the short duration of the EMI-induced high radiation spike. On a high radiation condition, RM 2-RM-90-106 is designed to initiate both a train "A" and train "B" CVI; however, since different contacts in the RM circuitry feed different engineered safety feature (ESF) trains, the train "A" and train "B" CVI ESF signals are not transmitted from the RM simultaneously. An intermittent delay exists as train "A" and train "B" are separated by an isolation relay (K106C).

When a high radiation signal exceeds the 2-RM-90-106 high trip criteria, the radiation analyzer module on the RM trips and the red trip light on the analyzer module illuminates in the control room. If the high radiation condition lasts for more than 2.5 seconds, trip relay K2-R106B times out and energizes two sets of contacts. One set of contacts feeds train "A" of the solid state protection system (SSPS) (EIIS Code JC) and generates a train "A" CVI while the other set of contacts actuates separation relay K106C. When the K106C relay trips, two additional sets of contacts are energized. One set of contacts actuates the high radiation alarm in the control room (window 3 of XA-55-I2D) while the other set of K106C contacts actuates separation relay K106B. A set of contacts off the K106B relay is then input to train "B" of the SSPS, and a train "B" CVI is generated.

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

TVA believes that an EMI-induced radiation spike tripped RM 2-RM-90-106 and time delay relay K2-R106B timed out (approximately 2.5 seconds) but reset before separation relays K106C and K106B could trip. On December 6, 1987, TVA measured the response times of trip relays K106C and K106B. After time delay relay K2-R106B timed out, the time for relay K106C to trip was 20 milliseconds (msec) while the time for relay K106B to trip was 30 msec. Since the signal that tripped 2-RM-90-106 was an EMI-induced spike, TVA believes that the radiation monitor was in the trip condition long enough to trip time delay relay K2-R106B (for the train "A" CVI) but not long enough to trip separation relay K106C (for the high radiation alarm in the control room) or separation relay K106B (for the train "B" CVI).

ANALYSIS OF EVENT

A CVI is an ESF actuation which is reportable for all modes of operation in accordance with 10 CFR 50.73, paragraph a.2.iv.

There were no safety consequences associated with this event. The operators were alerted by the instrument malfunction alarm of potential RM problems and took appropriate actions (e.g., performance of SI-6.1 and SOI-88.1) to diagnose the event and verify that the plant was in a safe condition. After recovery from the train "A" CVI, plant operators reperformed SI-6.1 to verify that both CVI trains were operable. SI-6.1 simulates a high radiation condition by initiating a test signal to the RM. All train "A" and train "B" RM containment isolation valves were verified to have closed as a result of this simulated high radiation condition. A high radiation condition would create a spike of duration such that the aforementioned relay K2R106B would not have time to reset. Thus a train "B" isolation would be initiated. Thus, if this event had occurred in another operational mode or as a result of an actual high radiation condition, all required equipment would have performed its designed safety function.

CORRECTIVE ACTION

Previous improvements to the RM process electronics, such as incorporating a time delay trip relay, noise reduction techniques, the addition of upper and lower discriminators, and better training of personnel working on the monitors has significantly reduced the number of RM generated CVIs. However, as the result of a recent trend of CVI actuations (six within the interval of November 27 to December 21), TVA has established a special task group to investigate the root cause of the subject CVIs. TVA believes this investigation will provide an overview of the events and allow for a determination as to the possibilities of a common or event specific root cause. Once a root cause is established, corrective action will be decided and implemented to ensure that the potential for CVI occurrences will not recur as the result of the found root cause. TVA anticipates the Special Task Group's overview and suggested corrective action to be completed by February 27, 1988.

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

ADDITIONAL INFORMATION

The subject RMs are manufactured by General Atomic, Model Number RP-30.

There have been 30 previous LERs reporting one or more CVIs; however, none of these were due to a lack of good detector cable ground.

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TENNESSEE VALLEY AUTHORITY
Sequoyah Nuclear Plant
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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 2 - DOCKET NO. 50-328 - FACILITY OPERATING LICENSE DPR-79 - REPORTABLE OCCURRENCE REPORT SQRO-50-328/87008 REVISION 1

The enclosed licensee event report has been revised to provide additional information in the corrective action. This event was previously reported in accordance with 10 CFR 50.73, paragraph a.2.iv, on December 22, 1987.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

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Plant Manager

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