

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Sequoyah, Unit 2	DOCKET NUMBER (2) 05000328	PAGE (3) 1 OF 04
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Electromagnetic Interference Caused Spurious High Radiation Spikes Resulting In Two Containment Ventilation Isolations

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)
12	05	87	87	009	01	02	18	88			05000
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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) 0.00	20.402(b)	20.405(c)	<input checked="" type="checkbox"/>	50.73(a)(2)(iv)	73.71(b)					
	20.405(a)(1)(i)	50.38(c)(1)	<input type="checkbox"/>	50.73(a)(2)(v)	73.71(c)					
	20.405(a)(1)(ii)	50.38(c)(2)	<input type="checkbox"/>	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)	<input type="checkbox"/>	50.73(a)(2)(viii)(A)						
	20.405(a)(1)(iv)	50.73(a)(2)(ii)	<input type="checkbox"/>	50.73(a)(2)(viii)(B)						
20.405(a)(1)(v)	50.73(a)(2)(iii)	<input type="checkbox"/>	50.73(a)(2)(ix)							

LICENSEE CONTACT FOR THIS LER (12)		TELEPHONE NUMBER
NAME D. P. Siska B. E. Kilgore, Plant Operations Review Staff		AREA CODE 615 870-7087

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)									
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)	<input checked="" type="checkbox"/> NO				

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

This LER is being revised to provide additional information relating to the cause of these events and the specific corrections to be taken by TVA.

On December 5, 1987, with unit 2 in mode 5 (cold shutdown), two containment ventilation isolations (CVIs) occurred; the first at approximately 0911 EST and the second at approximately 1553 EST. An investigation into the events revealed that welding and grinding work was being performed in unit 2 containment. As a result of this work, the containment atmosphere in the vicinity of the radiation monitors contained a high concentration of particulates. The particulates clogged the radiation monitor (RM) sample gas prefilters and created a low flow condition which activated the low flow switch of RM 2-RM-90-106. TVA believed that actuation of this switch induced a electromagnetic interference (EMI) spike to the RM detector cable and caused a spurious radiation spike. Since this radiation spike exceeded the RM trip criteria, the subject CVIs were generated. Further investigation into these events by a special task group has determined that the EMI was caused by a chattering reed switch in the RM low flow alarm circuit. TVA will issue a design change and will modify the RM alarm circuits to seal in the low flow alarm the first time it is actuated, thereby eliminating the reed switch chatter and significantly reducing EMI. This design change will also deenergize the local audible alarm on the RM panel to eliminate another known source of EMI, and take actions to ensure the RMs are adequately grounded.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) Sequoyah, Unit 2	DOCKET NUMBER (2) 0 5 0 0 0 3 2 8	LER NUMBER (5)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		8 7	- 0 0 9	- 0 1	0 2	OF 0 4

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

This LER is being revised to provide additional information relating to the cause of these events and the specific corrective actions to be taken by TVA.

DESCRIPTION OF EVENT

On December 5, 1987, with unit 2 in mode 5 (0 percent power, 75 psig, 114 degrees F), two containment ventilation isolations (CVIs) (EIIS Code JM) occurred.

At approximately 0911 EST, unit 2 received a CVI as a result of a spurious high radiation spike from lower containment radiation monitor (RM) 2-RM-90-106 (EIIS Code IL). Operations notified Radiological Control to monitor unit 2 containment for a potential increase in activity level. At 1013 EST, Radiological Control confirmed that there had been no increased activity level in the unit 2 containment, and the systems were returned to normal.

At approximately 1553 EST, unit 2 received a second CVI as the result of another spurious high radiation spike. Both upper (2-RM-90-112) and lower (2-RM-90-106) containment RM had recorded spurious high radiation spikes. It could not be determined which RM initiated the CVI. At approximately 1554 EST, the CVI was reset and operations returned to normal.

CAUSE OF EVENT

Both CVIs which occurred on December 5, 1987 (at 0911 EST and 1553 EST) were the result of electromagnetic interference (EMI) induced to the RM detector cable. An investigation into the event found that dirty air conditions (particulate suspension) resulting from welding and grinding inside the unit 2 containment clogged the RM sample gas prefilters resulting in a low flow condition for the RM. Further investigation concluded that as a result of the low flow condition, the RM low flow switch actuated and generated an EMI spike. During an investigation of these CVIs and a similar CVI which occurred on November 27, 1987 (reference LER 328/87008), IM personnel found that the RM detector cable appeared to not have a good ground. Before tightening the ground wire, IM personnel were able to recreate the EMI-induced spike by actuating the low sample flow switch. However, once a good ground was established, the EMI-induced spike could not be detected. Therefore, TVA believed that the most probable cause of these events was the RM detector cable not having a good ground.

Following the completion of a special task group investigation into the recent CVIs that have occurred at SQN, it has been determined that the lack of a good ground was only a contributing cause to this event. Diagnostic tests performed on the subject RM and other similar RMs at SQN have identified the root cause of these events as EMI-induced radiation spikes from the RM iodine channel's low flow alarm circuit. Specifically, these tests concluded that the primary EMI source was a flow indicating switch.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) Sequoyah, Unit 2	DOCKET NUMBER (2) 0 5 0 0 0 3 2 8	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		8 7 -	0 0 9 -	0 1	0 3	OF 0 4

TEXT (if more space is required, use additional NRC Form 386A's) (17)

The flow indicating switch, which measures air flow rates through the RM iodine channel on the order to 1 to 3 cubic feet per minute (CFM), incorporates a reed switch magnetically coupled to a rotometer shaft. Characteristic of rotometer devices, the weight of the rotometer disk is counter-balanced by the drag produced by the opposing airflow through the channel. When the flow rate drops to approximately 1 CFM, the equilibrium between the reed switch and the disk cannot be maintained, and the reed switch chatters (i.e., alternately energizing and deenergizing the low flow alarm circuit). Chatter of the reed switch, in combination with a relay coil in the low flow alarm circuit, produces EMI of duration and amplitude sufficient to cause CVIs.

Further testing of the subject RM identified a second contributing cause to this event. All four alarm circuits on the RM (iodine and particulate low flow, high vacuum, pump trip and failed filter) were exercised and shown to produce some EMI. The testing also showed that the actuation of the local panel-mounted audible alarm exacerbated the EMI-induced spikes that were caused by the above RM alarm circuits. When the audible alarm was disabled, only the iodine and particulate low flow alarm actuations produced significant EMI-induced spikes. Moreover, only the iodine channel's low flow alarm produced EMI of duration and amplitude sufficient to cause CVIs. Thus, a contributing cause to this event was the actuation of the RMs local panel-mounted audible alarm.

ANALYSIS OF EVENT

A CVI is an engineered safety feature (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 took appropriate actions to recover from the CVIs and verify that the plant was in a safe condition. Since initiated trains performed their required isolation functions, TVA believes that if these events had occurred in another operational mode or as the result of a high radiation condition, all required equipment would have performed its designed safety function.

CORRECTIVE ACTION

As immediate corrective action, at approximately 1610 EST, Operations instructed Chemistry Laboratory personnel to increase the sample gas prefilter replacement from once every 24 hours to once every four hours. To provide evacuation of the particulate suspension within unit 2 containment, Operations performed System Operating Instruction (SOI)-30.2, "Containment Purge System Operation." Operations suspended all grinding and welding activities inside containment until Chemistry personnel analyzed the sample gas prefilter and verified that there was no activity on the filter that could indicate increased radiation inside containment.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) Sequoyah, Unit 2	DOCKET NUMBER (2) 0 5 0 0 0 3 2 8 8 7 - 0 0 9 - 0 1 0 4	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		

TEXT (If more space is required, use additional NRC Form 365A's) (17)

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. In order to further reduce the number of spurious CVIs, TVA has initiated work on several of the special task group's recommendations.

A design change to the iodine and particulate low flow alarm circuits is being initiated to "seal in" the low flow alarm the first time it is actuated. This change will eliminate the reed switch chatter thereby significantly reducing the EMI generated by the flow indicating switch. Following the implementation of this change, the instrument malfunction alarm will have to be reset locally at the monitor. However, this change will not be an administrative burden to the plant operators since personnel are routinely dispatched to investigate the cause of the malfunction alarm.

To eliminate another source of EMI, TVA will deenergize the local audible alarm on the RM panel. Low flow will still be indicated locally by a red light and annunciated in the main control room on panel O-M-12. Also, in order to ensure better grounding of the RM detector cables, TVA will reroute the existing ground cable from the side panel of the monitors and secure it to the frame on which the RM is mounted. The above described work will be performed on all RMs capable of actuating ESF equipment under Engineering Change Notice (ECN)-7344 (common and unit 2 RMs) and (ECN)-7343 (unit 1 RMs). TVA anticipates this work to be implemented by April 30, 1988.

In addition to the above short-term actions, TVA is investigating the possibility of extending the current 2.5-second time delay incorporated in the RM process electronics. Technical Specification (TS) 3.3.2 requires the CVI valves to be fully closed within 10 seconds of a high radiation signal (including instrument response times); however, it may be possible to extend the current 2.5-second delay time without exceeding the 10-second valve closure time required by the TSs. TVA is also investigating the feasibility and effectiveness of other design changes that would make the RMs less sensitive to EMI thereby decreasing the number of EMI-induced CVIs. It is expected that these investigations will be complete by October 1, 1988.

ADDITIONAL INFORMATION

The subject RMs are manufactured by General Atomic, Model Numbers RD-32, RD-35, and RD-36.

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TENNESSEE VALLEY AUTHORITY

Sequoyah Nuclear Plant
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February 19, 1988

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-50-328/87009 REVISION 1

The enclosed licensee event report is being revised to provide additional information relating to two similar containment ventilation isolations that occurred as the result of induced electromagnetic interference. This event was previously reported in accordance with 10 CFR 50.73, paragraph a.2.iv, on December 30, 1987.

Very truly yours,

TENNESSEE VALLEY AUTHORITY


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Plant Manager

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11