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) An Inadequate Review Of A Work Package Resulted In A Spurious High Steam Flow Signal And Subsequent Unplanned Main Steam Line Isolation Signal

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 3	2 4	8 8	8 8	0 1 6	0 1	0 5	2 6	8 8		0 5 0 0 0
										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)	XX 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
Don Siska K. W. Fenn , Plant Operations Review Staff	AREA CODE: 6 1 5 — 8 7 0 - 6 5 1 1

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 regarding (1) an investigation into the cause of the event described herein and (2) the corrective action to be taken by TVA to prevent recurrence of this event.

On March 24, 1988, at approximately 1021 EST with unit 1 in mode 5, an unplanned main steam line isolation signal (MSIS) occurred. This signal was generated when an inadvertent actuation of high steam flow bistable 1-FS-1-10B occurred. At the time of this event, another high steam flow bistable (1-FS-1-21A) was already in the tripped condition because of ongoing maintenance work. Also, the lo-lo Tavg (reactor coolant system (RCS) average temperature below 540 degrees F) and low steam line pressure (below 600 psig) signals were present because of the plant being in moue 5. Therefore, all the required logic was completed (high steam flow in two out of four loops coincident with lo-lo Tavg or low steam line pressure in two out of four loops) to give the engineered safety feature (ESF) actuation signal. The safety injection (SI) signal also generated from this logic was blocked as allowed by Technical Specification (TS) 3.3.2.1 below permissive P-12 (Tavg below 540 degrees F). Therefore, since the main steam isolation valves were already closed for mode 5 and the automatic SI circuitry was blocked as allowed by TS, no equipment was actuated, and no immediate recovery or reset actions were necessary.

The event was caused by an inadequate review of the work package that was issued to replace flexible sense lines on steam flow transmitter 1-FT-1-10B. To prevent recurrence of this event, TVA will review the content of this LER with personnel responsible for reviewing work packages. In addition, TVA will issue a memorandum to SQN Operations personnel stating that ESF actuations, regardless of plant operating mode, represent challenges to plant safety systems and should be avoided.

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

DESCRIPTION OF EVENT

This LER is being revised to provide additional information regarding (1) an investigation into the cause of the event described herein and (2) the corrective action to be taken by TVA to prevent recurrence of this event.

On March 24, 1988, at 1021 EST while unit 1 was in mode 5 (0 percent power, 6 psig, 124 degrees F), an engineered safety feature (ESF) actuation (EIIS Code JE) signal (main steam line isolation signal (MSIS)) was generated on unit 1 by the reactor protection system logic (EIIS Code JC).

Before this event, on March 3, 1988, the steam generator No. 3, channel 1, high steam flow bistable 1-FS-1-21A was placed in the tripped condition under Work Requests (WRs) B293684 and B293685 because flow transmitter 1-FT-1-21A and power supply 1-PX-1-21A were removed to be used on unit 2. This condition still existed at the time of this event.

On March 12, 1988, Operations personnel authorized work to begin on WR B292542 to replace instrument flexible sense lines on S/G No. 2, channel 2, steam flow transmitter 1-FT-1-10B. Operations closed the root valves (1-1-288A and 1-1-289A) for each sense line on the flow transmitter in accordance with Hold Order 1-88-425. The sense line replacement was then performed which required a portion of the sense line to be cut out and a partial draining of the transmitter sense lines. A review of the work document (WR B292542) showed that the sense line replacement work was nearly completed when the unplanned MSIS occurred. The 1-FS-1-10B high steam flow bistable status light illuminated, and annunciator XA-55-6B-9 (S/G loop 2 high steam line flow) was received. This actuation also completed the required logic for the main steam line isolation signal which is any two out of four high steam flow signals from the four loops coincident with either lo-lo Tavg (reactor coolant system (RCS) (EIIS Code AB) average temperature below 540 degrees F) or low steam line pressure (any two out of four loops below 600 psig).

Because of the unit being in mode 5, the low steam line pressure and the lo-lo Tavg portions of the logic were already present. One of the required two high steam flow signals was present because of the 1-FS-1-21A being placed in the tripped condition for maintenance on March 3, 1988. When the inadvertent high steam flow signal was received from 1-FS-1-10B, the required logic was present for the steam line isolation signal. The main steam isolation valves (MSIVs) did not actuate because the valves were already closed for mode 5. Immediately after the unplanned signal was received, Operations personnel began an investigation into possible causes but did not immediately recognize that the work being performed under WR B292542 was a potential cause of the MSIS. Not recognizing the subject WR as a potential cause resulted from no tag being placed on the loop (1-F-1-10B) indicator (in the main control room) when the WR was approved on March 12, 1988. WR B267481 was subsequently issued to investigate the event.

CAUSE OF EVENT

The immediate cause of the unplanned MSIS was the inadvertent actuation of high steam flow bistable 1-FS-1-10B concurrent with 1-FS-1-21A already being tripped for maintenance work. Two high steam flow signals coincident with the already existing lo-lo Tavg and low steam line pressure signals completed the logic necessary to generate an MSIS.

Further investigation into this event revealed that the bistable tripped when the steam flow transmitter (1-FT-1-10B) output went high. Although the exact cause of the transmitter output signal going high could not be determined, TVA believes that when the transmitter's sense lines were drained (before the work was started), the water did not drain out completely because of a syphon effect. As a result, there was sufficient head on the low side of the delta-pressure transmitter to cause the transmitter output signal to remain below the high steam flow setpoint. When the final flexible sense line was being replaced (on the low side of the transmitter), the cutting of the sense line allowed the remaining water to drain out thereby causing the transmitter output signal to exceed the high steam flow setpoint.

The root cause of this event has been attributed to an inadequate review of the work package associated with WR B292542. Operations personnel authorized work on instrumentation loop 1-F-1-10B when loop 1-F-1-21A was already out of service and the associated bistable was in the tripped condition. A contributing cause of this event was the belief by personnel responsible for reviewing the work package that a potential ESF actuation in mode 5 would not represent a significant event since the MSIVs were already closed and the SI signal was blocked.

ANALYSIS OF EVENT

This event is being reported under 10 CFR 50.73, paragraph a.2.iv, as an event that resulted in a signal for automatic actuation of an ESF.

The main steam isolation signal generated in the event is not considered to have an adverse affect on the health and safety of the public. The signal generated for the closure of the main steam isolation valves was not required to isolate a main steam line break during this event but was a result of conditions symptomatic of a main steam line break. The design function of the main steam isolation signal is to close the main steam isolation valves on a main steam line break. By design, the ESF actuation system senses this condition by a high steam line flow and a lo-lo RCS average loop temperature or a low steam line pressure. The main steam line isolation logic requires high inputs from one of the two steam flow sensors in two of the four loop steam line flows (measured flow greater than program setpoint) coincident with two of the four loop steam

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line pressures low (less than 600 psig) or a lo-lo RCS average temperature (less than 540 degrees F). Since the plant temperature at the time was 124 degrees F, half of the required logic was satisfied. The remaining half of the logic required for signal generation was two of the four high steam lines with a high steam flow input. One of these high steam flow inputs was already present from loop 3 because the 1-FS-1-21A protection bistable was tripped during the removal of the transmitter for its placement in unit 2. When the 1-FS-1-10B protection bistable tripped, the ESF actuation system received a high steam flow input from loop 2, and thus, the logic was satisfied to produce a main steam line actuation signal.

Closure of the main steam isolation valve did not occur from the ESF actuation system because they were closed before receiving the actuation signal. The safety injection (SI) signal which is also initiated from the same conditions as a steam line isolation signal was blocked as allowed by TS 3.3.2.1 in modes 3-6. This blocking feature is accomplished during normal shutdown, cooldown, and depressurization of the plant by the control room operator using handswitches HS-63-125A (train A) and HS-63-125B (train B) when permissive P-12 is satisfied (RCS average temperature below 540 degrees F). This feature is required to prevent ESF actuation that would result from low plant pressures and temperatures caused by controlled plant evolutions. During this event, automatic SI actuation was also blocked via an installed jumper cable in the Solid State Protection System (SSPS) (EIIS Code JG) logic. The jumper cable is installed to block automatic actuation during extended outages as stipulated in General Operating Instruction (GOI)-3, "Plant Shutdown from Minimum Load to Cold shutdown," and Special Maintenance Instruction (SMI)-0-99-2, "Reactor Protection System Temporary Alteration to Clear Annunciation," when going from hot standby to cold shutdown. Removal of this jumper cable is required by GOI-1, "Plant Startup from Cold Shutdown to Hot Standby," before entering hot shutdown (mode 4). Since the jumper is removed before entering mode 4 and since an operator induced manual block is automatically unblocked when RCS temperature exceeds the P-12 setpoint, a block of the automatic actuation of engineered safety equipment would not have occurred at RCS temperatures greater than 540 degrees F. The main steam line isolation signal generated during this event indicated that the ESF actuation system would have correctly diagnosed an actual main steam line break and provided the necessary signals to isolate the break, trip the reactor, and start the required ESF equipment if the unit was operating.

CORRECTIVE ACTION

Immediate corrective action was to initiate an investigation into the cause of the inadvertent high steam flow signal from 1-FS-1-10B. Since no equipment actuated, no immediate recovery or reset actions were required.

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To prevent recurrence of this event, TVA will review the content of this LER with those personnel in the work control group that are responsible for reviewing work packages. This review will emphasize the importance of taking the necessary actions (including the deferment of scheduled work) to preclude a potential ESF actuation (an ESF actuation being defined as actuation of enough channels to complete the minimum actuation logic). In addition, TVA will issue a memorandum to SQN Operations personnel stating that satisfying the ESF logic, regardless of plant operating mode, represents a challenge to plant safety systems and, therefore, is an event that must be reported as an ESF actuation in accordance with 10 CFR 50.73. Thus, TVA must continue to report spurious ESF actuations (even if no equipment actually operates) until a clarification of 10 CFR 50.73 is issued by NRC.

ADDITIONAL INFORMATION

The NRC duty officer was notified of this event at 1228 EST on March 24, 1988.

There have been no previous occurrences of a inadvertent main steam line isolation signal with the main steam isolation valves already closed and the automatic SI logic blocked.

COMMITMENTS

1. TVA will review the content of this LER with those personnel in the work control group that are responsible for reviewing work packages by June 30, 1988.

2. TVA will issue a memorandum to SQN Operations personnel stating that satisfying the minimum ESF logic, regardless of plant operating mode, represents a challenge to plant safety systems and, therefore, is an event that must be reported as an ESF actuation in accordance with 10 CFR 50.73. This memorandum will be issued no later than June 30, 1988.

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TENNESSEE VALLEY AUTHORITY
Sequoyah Nuclear Plant
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May 26, 1988

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-50-327/88016 REVISION 1

The enclosed revised licensee event report provides additional information regarding (1) an investigation into the cause of the event and (2) the corrective action to be taken by TVA to prevent recurrence of this event. This event was originally reported in accordance with 10 CFR 50.73, paragraph a.2.iv, on April 15, 1988.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

S. J. Smith
Plant Manager

Enclosure
cc (Enclosure):

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