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Joseph R. Bynum
Vice President, Nuclear Operations

February 25, 1991

U.S. Nuclear Regulatory Commission
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Gentlemen:

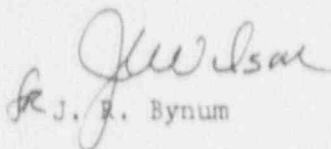
TENNESSEE VALLEY AUTHORITY - SEQUOYAH NUCLEAR PLANT UNIT 1 - DOCKET
NO. 50-327 - FACILITY OPERATING LICENSE DPR-77 - LICENSEE EVENT REPORT
(LER) 50-327/91002

The enclosed LER provides details concerning an entry into Limiting
Conditions for Operation (LCOs) 3.0.5 and 3.8.1.1 when both trains of the
emergency gas treatment system (EGTS) were declared inoperable. The
"A" train EGTS was out of service for testing when the "B" train diesel
generator was declared inoperable resulting in the B train EGTS being
declared inoperable.

This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B)
as an operation prohibited by the plant technical specifications.

Very truly yours,

TENNESSEE VALLEY AUTHORITY


J. R. Bynum

Enclosure
cc: See page 2

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U.S. Nuclear Regulatory Commission
February 25, 1991

cc (Enclosure):

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Sequoyah Nuclear Plant, Unit 1										DOCKET NUMBER (2) PAGE (3) 051001312171101015														
TITLE (4) Emergency gas treatment system (EGTS) inoperable because of A train EGTS being out of service for filter testing and B train diesel generator being declared inoperable resulting in B train EGTS being declared inoperable																								
EVENT DAY (5)					LER NUMBER (6)					REPORT DATE (7)					OTHER FACILITIES INVOLVED (8)									
MONTH DAY YEAR YEAR					SEQUENTIAL REVISION NUMBER NUMBER					FACILITY NAMES DOCKET NUMBER(S)														
0 1 2 4 9 1 9 1					0 0 2 0 0 2 5 9 1					Sequoyah, Unit 2 05100131218														
OPERATING MODE (9)					THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more of the following) (11)																			
POWER LEVEL (10) 1 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)(vi)					OTHER (Specify in				
					20.405(a)(1)(iii)					50.73(a)(2)(i)					50.73(a)(2)(vii)(A)					Abstract below and in				
					20.405(a)(1)(iv)					XX 50.73(a)(2)(ii)					50.73(a)(2)(vii)(B)					Text, NRC Form 366A)				
					20.405(a)(1)(v)					50.73(a)(2)(iii)					50.73(a)(2)(x)									

LICENSEE CONTACT FOR THIS LER (12)

NAME C. H. Whittemore, Compliance Licensing										TELEPHONE NUMBER AREA CODE 6 1 5 8 4 3 - 7 2 1 0									
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRDs	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRDs
JA	615	FU151E	B15169	NO					

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE) X NO										EXPECTED SUBMISSION DATE (15)									
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ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On January 24, 1991, at 0945 Eastern standard time (EST) with Units 1 and 2 in Mode 1, Limiting Condition for Operations (LCO) 3.0.5 and 3.8.1.1 were entered when both trains of the emergency gas treatment system (EGTS) were declared inoperable. The "A" train EGTS was out of service for a filter test when it was discovered that the "B" train diesel generator (D/G) automatic air start system was inoperable with below minimum starting air pressure for five starts in the air accumulator tank; this resulted in the B train EGTS being declared inoperable. The air compressor for the D/G starting air system was manually started and the minimum air pressure was reestablished. Troubleshooting revealed the failure of the air compressor to automatically start was caused by a blown fuse (Type NON 10). The cause of inoperable status was excessive cycling of the air start system leading to premature fuse failure and the failure of operational personnel to identify and respond to an annunciator in the main control room. The blown fuse was replaced and the normal automatic function of the system was restored. LCOs 3.0.5 and 3.8.1.1 were exited at 1005 EST on January 24, 1991.

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TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
Sequoyah Nuclear Plant Unit 1	050003121791	0	2	0	0	0	2 OF 0

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

DESCRIPTION OF EVENT

On January 24, 1991, at 0945 Eastern standard time (EST) with Units 1 and 2 operating in Mode 1 (100 percent power, 2,235 pounds per square inch gauge [psig], and 578 degrees Fahrenheit), Limiting Condition for Operations (LCOs) 3.0.5 and 3.8.1.1 were entered when both trains of the emergency gas treatment system (EGTS) (EIS Code BH) were declared inoperable. The "A" train EGTS had been removed from service at 1324 EST on January 23, 1991, for a filter test to be conducted in accordance with O-SI-SFT-065-001.A, "EGTS Filter Train." During the time A train was out of service, it was discovered that the 2B-B diesel generator (D/G) (EIS Code EK) automatic air start system (EIS Code LC) accumulator tank No. 1 contained less than the required 180 psig minimum starting pressure considered necessary to ensure capability for five D/G starts. This resulted in the 2B-B D/G being considered inoperable and the "B" train EGTS being declared inoperable in accordance with LCO 3.0.5.

An auxiliary unit operator (AUO) in the D/G building heard an alarm and found a low air pressure alarm sounding. The AUO notified the Unit 2 reactor operator in the main control room (MCR) and received approval to manually start the compressor to recharge the tank. The AUO reported the No. 1 tank's pressure as 140 psig, and the No. 2 tank's pressure as 220 psig. The assistant shift operating supervisor (ASOS) checked the M26 vertical annunciator panel in the MCR and found the annunciator flashing. The air compressor is normally started automatically and recharges the air tank when the air pressure decreases to 250 psig. When the pressure decreases to 200 psig, the low air pressure annunciator window in the MCR is activated, and the operators in the MCR acknowledge the alarm and dispatch personnel to troubleshoot and correct the problem. However, before the AUO notified the operator in the MCR of the low pressure alarm, no audible or visual recognition of a low pressure annunciator has been noted by the MCR operators. The time required to respond to the low air pressure annunciator and correct the problem is less than the time it takes for the air tank to bleed down from the alarm setpoint of 200 psig to the inoperable setpoint of 180 psig.

Following notification by the AUO in the D/G building, the alarm was acknowledged and three ASOSs were dispatched to the diesel building to troubleshoot and correct the problem. LCOs 3.8.1.1 and 3.0.5 were entered in response to technical specifications (TSs) and operating instructions. The ASOSs discovered the failure of the compressor to function properly in automatic was because of a blown fuse (EIS Code FU) (Bussman Type NON 10) for the air dryer control circuit. The compressors when aligned in automatic will stop and will not restart with a control fuse blown. Following the replacement of the blown fuse, the compressors were determined to be functioning properly. LCOs 3.0.5 and 3.8.1.1 were exited at 1005 EST, when the No. 1 tank pressure exceeded 180 psig (the tank was pressurized to greater than 250 psig).

CAUSE OF EVENT

The initiating cause of the event was a blown fuse. The cause of the two EGTS trains being declared inoperable was excessive cycling of the air start system leading to premature fuse failure and the MCR operator failing to identify and acknowledge the low pressure annunciator and responding.

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Sequoyah Nuclear Plant Unit 1	050003127191	00	2	0	0	3	5

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

The cause of the entry into LCO 3.0.5 was the failure of the B train D/G air start system to maintain operable status concurrently with the A Train EGTS being out of service. The cause for the air start system failure was a blown fuse in the air compressor start circuitry. An indirect or contributing cause may have been the high leak rate of the 2B-B D/G No. 1 air start system. The high leak rate caused the compressor and dryers to cycle on and off at an abnormal frequency. This frequent cycling degraded the fuses at an undetermined rate resulting in failure on an uncommon frequency.

It could not be determined why the operator had not identified the alarm and annunciator. It is concluded that either the operator did not hear the alarm or heard the alarm but did not see the flashing annunciator and assumed the alarm originated from a Unit 2 panel.

A human performance enhancement system (HPES) evaluation was conducted and identified several potential causes for why the operator did not identify the alarm and annunciation. The existing design of the D/G panel, alarms, and annunciators creates some impediments from a human factors standpoint, e.g., visual perception difficulty created by red background annunciators, audibility of the alarm between the common panel and horseshoe and single alarms for multiple panels and conditions. Deficiencies in the panel design were previously been identified during the Detailed Control Room Design Review (DCRDR) as Human Engineering Deficiencies (HEDs). These HED items are being tracked in TVA's corrective action response to NRC NUREG-0737 and are briefly described as: (1) need for additional reset/test switches, (2) need for better auditory coding and (3) hard to read red annunciator windows. Also, a work request sticker on an adjacent window may have inhibited the operator from seeing the annunciator. Additionally, at the time of the event, a high activity level existed in the MCR, which may have impacted either audibility or operator vigilance. Irrespective of these contributors, it is clearly the responsibility of the operators to maintain full cognizance of annunciators and alarms.

ANALYSIS OF EVENT

This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B) as an operation prohibited by TSs. The design bases, as described in the Updated Final Safety Analysis Report, Section 6.2.3, for the EGTS are: (1) to keep the air pressure within each shield building annulus below atmospheric at all times in which the integrity of that particular containment is required and (2) to reduce the concentration of radioactive nuclides in the annulus air that is released to the environs during a loss of coolant accident (LOCA) in either reactor unit to levels sufficiently low to keep the site boundary dose rate below 10 CFR 100 guideline values.

In this event, although the A train EGTS was technically inoperable because of the scheduled performance of a filter test being conducted on this train, the system was available to perform its design function throughout the period that the 2B-B D/G experienced low start air pressure provided operator action to suspend the test and return the system to service was taken. The B train EGTS was administratively declared

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	050003 12 17	9 1 0 0 2 0 0 0	4 OF 5

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

inoperable because the Emergency Power Supply 2B-B D/G being declared inoperable as a result of the starting air system not having sufficient capacity for five starts. The air start system did contain sufficient capacity to start the D/G on an automatic start signal. Therefore, the D/G could have been started and B train EGTs would have been available to perform its designated function if it had been required. Accordingly, there were no adverse safety consequences associated with this event.

CORRECTIVE ACTION

The immediate corrective action was to manually start the air compressor and reestablish a minimum 180 psig pressure in the air accumulator tank. Troubleshooting identified a blown fuse (Type NON 10) as the cause of the air compressor failing to start automatically. The blown fuse and seven other Type NON 10 fuses in similar applications were replaced. The Bussman NON 10 fuse installed in the dryer circuit prevents compressor operation in automatic mode when blown or failed. Replacing the blown fuse and subsequent postmaintenance testing (PMT) reestablished the automatic function to the diesel air start system. A high leak rate had allowed the pressure to decrease to approximately 140 psig. Troubleshooting located and resolved the high leak rate in the air start system. The high leak rate was apparently caused by crud accumulation on the discharge check valve. A preventative maintenance (PM) instruction will be written to routinely inspect and clean the D/G air start compressors discharge check valves on a periodic basis. Surveillance Instruction (SI) 166.36, "Diesel Starting Air Valve," will be revised to require any leakage greater than approximately 0.5 psig per minute on the D/G air start system to be resolved in a timely manner. This should reduce the frequent cycling of the compressors and dryers and thus, decrease the fuse failure rate.

The blown fuse and seven other fuses were sent to the fuse vendor for analysis. The vendor's report states that the failure of the blown fuse was caused by overheating probably because of poor clip contact. However, review and inspection of the clips eliminated this as a possible cause. The frequent cycling is the only logical cause for the fuse to overheat and fail. This particular fuse incorporates a silver link with a tin slug called the "M-spot." Under normal conditions, the M-spot will heat up and form an alloy with a melting temperature lower than the tin or silver alone. This ensures that the fuse opens in the center of the link at the M-spot. As the link alloys, the effective current carrying capacity of the fuse becomes lower. Eventually, normal load current may cause the fuse to open; this is termed aging or degrading. These 10-amp fuses would handle the normal full load of this circuit, which is 8 amps. It also has an instantaneous rating to handle the simultaneous start of both air dryer fans, a total of approximately 39 amperes. The fuse failure appear to be related to the heavy duty cycling on the fuses because of the compressors and dryers starting frequently. The frequent starting does not allow the fuse to cool down sufficiently. This particular fuse apparently failed when one compressor dryer started right after the other started. The No. 1 dryer was cycling approximately every 57 minutes running nine minutes while the No. 2 dryer was cycling approximately every 143 minutes running 25 minutes. TVA is evaluating the system to determine if a modification should be made to change the dryer circuit fuse to a dual element fuse with higher amperage ratings. If the evaluation determines that a design change is needed, the implementation will be completed by August 1, 1991. Additionally, the setting of the D/G start air flow pressure alarm switch will be evaluated to ensure adequate margin is given to allow operator response. Any necessary changes to the setting will be accomplished by July 1, 1991.

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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
Sequoyah Nuclear Plant Unit 1	015000032791	--	002	--	000	50F	05

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

The MCR panel M26 annunciator window for low air start pressure for the 2B-B D/G was functionally tested and found to be operating properly. The audible horn in the MCR was also functionally tested and found to be operating properly. The current scheduled completion date for resolution of the panel HEDs previously described is during the Cycle 6 refueling outages. Additionally, a letter from the Operations Superintendent to all licensed personnel will be issued by March 1, 1991, detailing the lessons learned from this event and emphasizing the responsibility and necessary vigilance to ensure full and continuous cognizance of plant status.

As a separate issue, an ongoing evaluation is being made of the annunciator setpoints and pressure for the D/G air start system needed for operability (five starts) of the D/G.

ADDITIONAL INFORMATION

A search of the LER and Nuclear Experience Review data base did not produce any previous or similar events.

COMMITMENTS

1. A PM instruction will be written to periodically inspect and clean the D/G air start compressor check valves. This instruction will be written by March 15, 1991.
2. SI-166.36 will be revised by March 15, 1991, to require any D/G air start system leakage rate exceeding approximately 0.5 psig per minute to be resolved in a timely manner.
3. A letter from the Operations Superintendent to all licensed personnel detailing the lessons learned from this event and emphasizing the responsibility and necessary vigilance to ensure full and continuous cognizance of plant status will be issued by March 1, 1991.
4. The setting of the D/G start air flow pressure alarm switch will be evaluated to ensure adequate margin is given to allow operator response. Any necessary changes to the setting will be accomplished by July 1, 1991.
5. TVA is evaluating the system to determine if a modification should be made to change the dryer circuit fuse to a dual element fuse with higher amperage ratings. If the evaluation determines that a design change is needed, the implementation will be completed by August 1, 1991.

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