TENNESSEE VALLEY AUTHORITY

6N 38A Lookout Place
September 1, 1989

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

TENNESSEE VALLEY AUTHORITY - SEQUOYAH NUCLEAR PLANT UNITS 1 AND 2 - DOCKET NOS. 50-327 AND 50-328 - FACILITY OPERATING LICENSE DPR-77 AND 79 - LICENSEE EVENT REPORT (LER) 50-327/88007, REVISION 4

The enclosed LER has been revised to describe the results of the design evaluation considering alternatives to ensure that the auxiliary building gas treatment system can perform its design function during various modes of 2-unit operation.

This event was originally reported in accordance with 10 CFR 50.73, paragraph a.2.i.b, on February 23, 1988, and revised on August 25, 1988; September 15, 1988; and February 9, 1989.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

J. R. Bynum, Vice President
Nuclear Power Production

Enclosure
cc (Enclosure):
Regional Administration
U.S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region II
101 Marietta Street, Suite 2900
Atlanta, Georgia 30323

INPO Records Center
Institute of Nuclear Power Operations
1100 Circle 75 Parkway, Suite 1500
Atlanta, Georgia 30339

NRC Resident Inspector
Sequoyah Nuclear Plant
2600 Igou Ferry Road
Soddy Daisy, Tennessee 37379

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NRC Form 366
(9-83)

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

LICENSEE EVENT REPORT (LER)

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Sequoyah, Unit 1	0 5 0 0 0 3 2 7	1 OF 0 7

TITLE (4) Opening Of Unit 1 Containment Results In Secondary Containment Envelope Outside The Boundary Set For Surveillance Testing Of Auxiliary Building Gas Treatment System

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 1	2 4	8 8	8 8	— 0 0 7	— 0 4	0 9	0 1	8 9	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)	XX 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
Geof Hipp, Compliance Licensing Engineer	6 1 5 8 4 3 - 7 7 6 6

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)	X NO				

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

This LER has been revised to describe the results of the design evaluation considering alternatives to ensure that the auxiliary building gas treatment system can perform its design function during various modes of 2-unit operation. On January 24, 1988, with units 1 and 2 in mode 5 (cold shutdown), it was discovered that the Auxiliary Building secondary containment enclosure (ABSCE) was not being maintained within the configuration set during the technical specification (TS) surveillance testing used to verify ABGTS operability. On August 24, 1988, with unit 1 in mode 5 and unit 2 in mode 1 (approximately 98 percent power), it was determined that the unit 1 containment purge system was in operation without the required compensatory measures being properly documented. These conditions were caused by (1) the lack of adequate controls to ensure the ABSCE boundary was maintained within the condition set by surveillance testing, (2) an inappropriate design assumption made during plant construction on how ABSCE breaches would be controlled, and (3) an incomplete compensatory measures program. As short-term corrective actions, the blast door was closed (before unit 2 entered mode 4 on February 6, 1988), the procedure governing ABSCE breaches was changed, and the unit 1 containment purge system was tagged out of service. Following subsequent leak testing of the unit 1 annulus, the unit 1 blast door was reopened. As long-term corrective action, TVA has evaluated design alternatives to ensure the ABGTS can perform its design function during various modes of 2-unit operation and has selected the alternative to be implemented. The modification will be implemented in accordance with SQN's Integrated Living Schedule.

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

This LER has been revised to describe the results of the design evaluation considering alternatives to ensure that the ABGTS can perform its design function during various modes of 2-unit operation.

DESCRIPTION OF CONDITION

On January 24, 1988, with units 1 and 2 in mode 5 (0 percent power, 4 psig, 121 degrees F and 0 percent power, 310 psig, 118 degrees F, respectively), a potential deficiency in the Auxiliary Building secondary containment enclosure (ABSCE) (EIIS Code WF) was discovered during a tour of the refueling area and subsequent discussions with test personnel. The plant configuration used when testing the ABSCE in accordance with Technical Specification (TS) Surveillance Requirement (SR) 4.7.8.d.3 was not consistent with allowable plant configurations during various modes of two unit operation. As a result, operability of the ABGTS could not be assured, and Condition Adverse to Quality Report (CAQR) SQP 880090 was issued.

The ABGTS and the ABSCE are common to units 1 and 2, which share a common Auxiliary Building (EIIS Code NF). Both trains of the ABGTS are required to be operable before either unit can enter mode 4 from a mode 5 condition. The ABGTS maintains negative pressure in the ABSCE and filters the ABSCE air before it is released to the environment. One ABGTS train is required to be operable for unrestricted fuel handling operations while irradiated fuel is in the spent fuel pool (although the ABGTS is not required to maintain a negative pressure in the ABSCE during plant operations in modes 5 and 6).

TS SR 4.7.8.d.3 requires verification that the ABGTS can maintain the spent fuel storage area and the engineered safety feature (ESF) pump rooms within the ABSCE at a pressure equal to or more negative than minus 1/4-inch water gage (wg) while maintaining a vacuum relief flow rate greater than 2000 cubic feet per minute (cfm) and a total system flow rate of 9000 cfm $\pm$ 10 percent. This SR is satisfied by the performance of Surveillance Instruction (SI)-149, "Auxiliary Building Gas Treatment System Vacuum Test." Past performances of SI-149 had both the unit 1 and unit 2 blast doors (refueling floor to containment annulus doors on the 734 feet elevation) in the Reactor Building shield walls closed, and containment purge on both units shut down.

During plant operation in modes 5 or 6, however, it is normal for that unit to have its blast door and/or equipment hatch open. Opening the blast door increases the ABSCE, boundary by the addition of the annulus. If the equipment hatch or personnel access doors are also open, the ABSCE boundary is increased further by the addition of the primary containment. The increased boundary causes additional leakage into the ABSCE that was not accounted for during the previous performances of SI-149.

Thus, if one unit is in mode 5 or 6 with the blast door/equipment hatch open, and the opposite unit is in modes 1, 2, 3, or 4 (i.e., an operational mode that requires the ABGTS to be operable), the actual plant configuration would not be the same as the configuration that was tested during the performance of SI-149.

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DESCRIPTION OF CONDITION (continued)

A second concern that has been identified as potentially affecting the performance of the ABGTS during an accident relates to the operation of the containment purge system on a unit with the blast door and equipment hatch open. The containment purge system, when it is operating, provides a large amount of air into the Reactor Building (EIIS Code NH). Air contributed from the containment purge system was not accounted for during the performance of SI-149, and its operational status was not being controlled with the opening of the blast doors and the equipment hatch. Thus, there was no assurance that TS SR 4.7.8.d.3 could be satisfied if the blast door and equipment hatch were open, and the containment purge system for that unit was in operation.

In order to allow unit 2 to enter mode 4 (which occurred on February 6, 1988), TVA administratively prohibited the operation of the unit 1 containment purge system whenever the equipment hatch and blast door were open by implementing the provisions of temporary alteration change form (TACF) 1-88-02-030. This TACF, which was approved on January 28, 1988, placed hold order 1-88-240 on the unit 1 containment purge fans, thereby preventing their operation. In addition to implementing the TACF, TVA performed SI-264, "EGTS Annulus Vacuum Draw Down Test," to measure the leakage into the unit 1 annulus. This leakage was then conservatively added to the previously measured ABSCE leakage to verify that the ABGTS could perform its intended function with the blast door open.

Following further investigation into this event, it was determined that there was a need to demonstrate that operation of the containment purge system in a unit that had established containment integrity would not have an adverse effect on the ability of the ABGTS to draw down the ABSCE to minus 1/4-inch wg within the 1-minute time interval specified in the Final Safety Analysis Report (FSAR). That is, even with containment integrity established, it was postulated that the containment purge system duct work in the Auxiliary Building could leak and prevent the ABGTS from performing its design function.

To verify the integrity of the purge system duct work, TVA performed smoke tests and visual inspections of the subject duct work in accordance with SI-506.7, "Containment Purge Air Exhaust Filter Train Test." However, performance of this test required operation of the containment purge system which had been tagged out of service by TACF 1-88-02-030. In order to operate the purge system, a compensatory measure was approved to allow operation of the system as long as operator action was taken within four minutes of an Auxiliary Building Isolation (ABI) signal (EIIS Code JE) to shutdown the system. Temporary Instruction Change Form (ICF) 88-890 and permanent ICF 88-0977 were subsequently approved to incorporate this compensatory measure into SI-506.7.

A similar (but temporary) ICF was written against SOI-30.2, "Containment Purge System Operation, to allow a one-time operation of the purge system to reduce an unexpected increase in the containment airborne radiation level on July 25, 1988.

On August 24, 1988, a revision to TACF 1-88-02-030 was presented to the Shift Operations Supervisor (SOS) for implementation. This revision changed the tagging boundary from both trains of containment purge isolation valves to only one train of valves to allow SI-26, "Loss of Offsite Power with Safety Injection - D/G Containment Isolation Test," to be performed.

DESCRIPTION OF CONDITION (continued)

Upon receiving the revision to TACF 1-88-02-030, the SOS realized that the unit 1 containment purge system was being run at that time (in accordance with SOI-30.2) to reduce the temperature inside the unit 1 containment. However, since the ICF to SOI-30.2 had expired, the subject SOI did not have the appropriate compensatory measure for purge system operation. The SOS immediately suspended purge system operation, reissued the hold order on the system, and requested an investigation be initiated. This investigation revealed that, although most operators were aware of the compensatory measures necessary for operating the unit 1 purge system, these measures had not been adequately documented in SOI-30.2, nor were they formally communicated to Operations personnel. Thus, there was no assurance that plant operators would have shut down the unit 1 containment purge system following an ABI signal, and as a result, there was no assurance that the ABGTS would have been able to perform its design function.

CAUSE OF CONDITION

The immediate cause of this condition was the failure to ensure the ABSCE configuration was maintained in the same configuration that was set during surveillance testing of the ABGTS in accordance with SI-149. TS 3.6.1.1 requires primary containment integrity only for a unit that is in modes 1 through 4. TS 3.7.8 requires the ABGTS to be operable whenever either unit is in modes 1 through 4. However, operability of the ABGTS was verified only with the blast doors closed. Breaches of the ABSCE are controlled by Technical Instruction (TI)-77, "Breaching the Shield Building, ABSCE, or Control Room Boundaries." However, this TI did not properly evaluate the condition when (1) the Shield Building boundary becomes part of the ABSCE (through an open blast door), (2) the primary containment becomes part of the ABSCE (if the equipment hatch and blast door are open), or (3) the containment purge system is in operation.

The root cause of this event was improper design assumptions that were made during the period of plant construction to address breaches in the ABSCE. The need for an interim ABSCE was recognized (and provided) during the time one unit was in operation and the other unit was still under construction. At that time, it was also recognized that upon completion of both units, there would be times when the need to breach the ABSCE would exist. However, it was believed at that time that most ABSCE breaches would be of short duration and could be justified based on the low probability of an accident during that time.

It was expected that long duration breaches for major modifications would be compensated for by establishing an interim ABSCE similar to that established during construction. However, this design philosophy was not documented at that time because no formal procedure existed that required this type of documentation.

Running the containment purge system without formal compensatory measures established was caused by an incomplete compensatory measures (CM) program instituted by Administrative Instruction (AI)-49, "Control and Tracking of Compensatory Measures." A review of the compensatory measures program has shown that, although the program appears to be appropriate for tracking and evaluating the effectiveness of CMs once they are identified, there are no specific guidelines that require CMs to be considered.

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CAUSE OF CONDITION (continued)

Specifically, a review of implementing documents for (1) performing safety evaluations, (2) performing procedure changes, and (3) performing temporary facility changes (TACFs) failed to identify any requirements for evaluating these changes for necessary CMs.

Further review of the CM program revealed that, once a CM has been deemed appropriate, there is only one step in AI-49 which requires the CM program manager to ensure that the implementing organization is aware of the CM. Although this step is certainly appropriate, there was no clear method for it to be accomplished. Specifically, administrative measures to disseminate information to shift operating crews concerning CMs were not standardized, and consequently, were inadequate. In addition, there was no administrative control in place that required existing CM information to be passed on during shift turnover.

ANALYSIS OF CONDITION

This condition was originally reported under 10 CFR 50.73, paragraph a.2.i.b, as a condition prohibited by TS.

TS SR 4.7.8.d.3 is performed as a partial verification that the ABGTS is operable and capable of performing its design function. Since the actual plant configuration was nonconservatively different from the configuration used when testing the ABGTS in accordance with TS SR 4.7.8.d.3, there was no assurance that the ABGTS would have satisfied its design function.

The condition as discovered, however, was not considered to have had a significant safety consequence to the health and safety of the public because units 1 and 2 were in cold shutdown, and the ABGTS was not required to satisfy TS SR 4.7.8.d.3 during plant operation in modes 5 or 6. In addition, no fuel handling operations were in progress in the spent fuel pool area.

However, there have been occasions when a blast door has been open while the opposite unit was not in modes 5 or 6.

If a LOCA had occurred while a unit was in modes 1, 2, 3, or 4, fission products could have been released to the ABSCE. If the fission products were released to the ABSCE while the blast door and equipment hatch were open (and that unit was operating its containment purge system), there would be no assurance that all radioactive materials leaking from the ESF equipment or from primary containment into the ABSCE would be filtered by the ABGTS filters before reaching the environment. This postulated event would then be outside the assumptions made in the offsite dose calculations for accident analysis. However, the ABGTS filters were available for filtration of air released from the ABSCE, and containment exhaust filters are used to filter air released from the primary containment when the containment purge system is operating.

CORRECTIVE ACTIONS (continued)

As described previously, the short-term corrective action consisted of closing the unit 1 blast door and tagging the unit 1 containment purge system out of service before unit 2 entered operational mode 4 (which occurred on February 6, 1988). To allow opening the blast door of a unit in modes 5 or 6 while the opposite unit is in modes 1, 2, 3, or 4, TI-77 was changed in accordance with ICF 88-0191. This ICF ensures that the requirements of TS SR 4.7.8.d.3 are satisfied when one unit's blast door and/or equipment hatch is open and the other unit is in modes 1, 2, 3, or 4. To account for the additional leakage when the primary containment and annulus become part of the ABSCE, the maximum expected leakage of this area was calculated and subtracted from the tolerance by which the ABGTS flowrate required to satisfy TS SR 4.7.8.d.3 was exceeded. The remaining tolerance was then used to determine the cumulative area that can be breached and still satisfy TS SR 4.7.8.d.3.

The maximum expected leakage was based on the FSAR value of 500 cfm. Test data from the most recent performance of SI-264 verified that the leakage into the annulus was well within the 500 cfm limit. In addition, the majority of this leakage is from the Auxiliary Building which would not be classified as ABSCE leakage when a blast door is open.

To ensure adequate consideration is given to establishing necessary CMs, TVA has reviewed appropriate plant procedures (e.g., AI-4, "Preparation, Review, Approval, and the Use of Site Procedures/Instructions;" AI-9, "Control of Temporary Alterations Order;" AI-19, Part VI: "Modifications; Permanent Design Change Control Program;" and SQA-119, "Safety Evaluations") to determine if the subject procedures should be revised to require personnel using these procedures to determine if compensatory measures are involved. To ensure that the Auxiliary Building gas treatment system can perform its design function during various modes of two unit operations, TVA has enhanced SOI-30.2, Abnormal Operating Instruction (AOI)-6, "Small Reactor Coolant System Leak," AOI-31, "Abnormal Release of Radioactive Materials," and Emergency Operating Instruction E-0 "Reactor Trip or Safety Injection," such that a TACF will not be required to continuously remove the containment purge system from service during the unit 2 cycle 3 refueling outage. These enhancements ensure that adequate CMs will be taken to ensure that the ABGTS will perform its designed function if required and allows for operation of the containment purge system when required. In addition to the above described procedure changes, TVA has established requirements for a technical review of all active CMs on a periodic basis. This review will verify that all the assumptions that were originally used to justify a particular CM remain valid.

Since Operations personnel are responsible for implementing almost all CMs, TVA has established a CM log book in the main control room that contains all active CMs. In addition, AI-5, "Shift Relief and Turnover," has been revised to require appropriate Operations shift personnel to review the active CMs before they assume shift.

To prevent recurrence of this type of event in the future, TVA has implemented design control procedures which require documentation of quality information and communication between design organizations and/or operations groups on site. Specifically, Nuclear Engineering Procedure (NEP)-5.3, "External Interface Control," establishes controls for interactions between organizations outside the Division of Nuclear Engineering (DNE) to ensure the appropriate transfer of information necessary to accomplish engineering, design and related services for TVA.

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CORRECTIVE ACTIONS (continued)

In addition, NEP-5.2, "Review," ensures that reviews done within DNE include an appropriate Operation and Maintenance data review.

TVA has completed an evaluation of design alternatives for long-term corrective action to address the root cause of this event. TVA has selected the design alternative described below to be implemented as the long-term corrective action. This modification will be implemented in accordance with SQN's Integrated Living Schedule.

Interlock Containment Purge System (CPS) with ABI Signal in Auxiliary Instrument Room (AIR)

Interlock the Unit 1 and Unit 2 CPSs with the ABI signal to preclude the need for compensatory measures while operating the CPS. If the nonoperating unit's CPS is operating and an ABI signal is generated, the interlock will isolate the system. If the purge system is not operating and an ABI is generated, the interlock will prevent the system from starting. To ensure that automatic isolation of the purge system in an operating unit will not cause an inadvertent opening of the ice condenser doors, the interlock will have a manual arming switch. If all access openings to the operating unit's containment are closed, the interlock will be disarmed, thereby allowing the operating unit to continue to purge even in the presence of an ABI signal.

This modification would be accomplished by installing a handswitch and indicator in the AIR to bypass the ABI interlock on the operating unit to prevent inadvertent opening of the ice condenser doors. The ABI signal would be multiplied in auxiliary relay racks, and a contact would be wired into the circuits for each of the containment and annulus ventilation valves to close for an ABI. Also, the fans would be stopped in the same fashion to protect the air ducts.

ADDITIONAL INFORMATION

There has been one previous occurrence reported in the ABGTS failing to meet TS SR due to improper ABSCE boundary control - SQRO-50-327/84053.

COMMITMENTS

TVA has selected the design alternative to be implemented as long-term corrective action. This modification will be implemented in accordance with SQN's Integrated Living Schedule.