

## LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS  
INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD  
COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION  
AND RECORDS MANAGEMENT BRANCH (MNEB 7714), U.S. NUCLEAR  
REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO  
THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF  
MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

Fort Calhoun Station Unit No. 1

DOCKET NUMBER (2)

05000285

PAGE (3)

1 OF 8

TITLE (4)

Inoperability of Fire Suppression Water System

EVENT DATE (5)			LER NUMBER (6)			REPORT NUMBER (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
12	03	92	92	-- 031 --	01	02	26	93		05000
									FACILITY NAME	DOCKET NUMBER
										05000
OPERATING MODE (9)		1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)		100	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)	X OTHER
			20.405(a)(1)(iii)		X	50.73(a)(2)(i)			50.73(a)(2)(vii)(A)	(Specify in Abstract below and in Text, NRC Form 385A)
			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)	TS 2.19(4)b(ii)

## LICENSEE CONTACT FOR THIS LER (12)

NAME

David J. Buell, Operations Engineer

TELEPHONE NUMBER (Include Area Code)

(402) 533-6895

## 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
E	WI	V	G255	N					
B	KP	P	F010	N					

## SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
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## ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On December 3, 1992, following the clearance of Danger Tagout 92-2455 on the Steam Generator Blowdown System (SGBS), a steam leak developed on a drain valve in the Steam Generator Blowdown Processing System (SGBPS). The steam leak resulted in fire detector alarms and an automatic start of Electric Fire Pump FP-1A. Control Room Operators took action to isolate the steam leak. Later, the water plant operator reported water in the lower motor bearing of FP-1A. FP-1A was then declared inoperable. Diesel Driven Fire Pump FP-1B was inoperable at the time due to maintenance. Technical Specification (TS) 2.19(4)b was entered. This report is submitted pursuant to TS 2.19(4)b(ii).

This report is also submitted pursuant to 10 CFR 50.73(a)(2)(i)(B) as it was determined following the event that actions specified in TS 2.19(5) should have been implemented in addition to those specified in TS 2.19(4)b.

The root cause of the event has been determined to be a lack of control over the SGBPS and the system interface valves. The root cause of the violation of TS 2.19(5) was found to be a poorly understood specification.

Corrective actions included review of SGBPS interface valves, evaluation of a portion of SGBPS piping, revision of the equipment tagging procedure, and review of TS 2.19.

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TEXT CONTINUATION**

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

**BACKGROUND**

The Steam Generator Blowdown Processing System (SGBPS) is a system that was installed, but never placed in service at Fort Calhoun Station (FCS). This system was installed under Design Change Request DCR-74A-021 during 1980, but was never completed or accepted by the System Acceptance Committee (SAC). After the secondary system boric acid addition program was established to mitigate steam generator tube denting, the completion and operation of the system was deemed to be not cost effective. Early in 1982, Danger Tagout 82-0006 was generated to isolate the SGBPS to address High Energy Line Break (HELB) concerns that were identified by Engineering. This tagout has been in place since 1982.

**EVENT DESCRIPTION**

The FCS Fire Suppression System includes an electric motor driven fire pump (FP-1A) and a diesel driven fire pump (FP-1B). The diesel driven pump was removed from service on November 30, 1992 at 0326, to allow maintenance to be performed on traveling screens in the intake structure (FP-1B takes suction from the intake cell which was drained down for screen maintenance).

On December 3, 1992 at approximately 0900, with the plant in Mode 1 at 100% power, Danger Tagout 92-2455 was generated by Operations to isolate Steam Generator Blowdown Flow Transmitter FT-1392 and the electric/pneumatic controller on valve HCV-1390 for maintenance. This tagout was reviewed and approved by the Licensed Senior Operator (LSO) and was issued to the field for isolation. These components are located in Room 13 of the Auxiliary Building. After maintenance on the components was completed, at approximately 1715, an Instrument & Control (I&C) Technician requested that the danger tagout be cleared and the system be placed in service for post-maintenance testing.

To clear his portion of the tagout first, the Equipment Operator Nuclear Auxiliary (EONA) called the Control Room to determine the return-to-service position of the four valves associated with the tags that he was to clear. In accordance with the tagout sheet, the Control Room Operator told him that all four of the valves (FW-1055, FW-183, FW-605, and FW-606) were to be placed in the open position. The EONA then cleared the tags, opened each of the four valves and called the Control Room to inform them that the tags were clear. The Control Room Operator then cleared the final two tags of the tagout, which were hanging on HCV-1388A and HCV-1388B valve control switches in the Control Room. The I&C Technician then performed the post-maintenance testing satisfactorily and reported the results to the Control Room.

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ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 60.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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

At approximately 1745, the Control Room received fire detector alarms on the XL-3 fire alarm panel for Zone 4 which covers the Air Compressor Bay, Room 19. Major equipment located in Room 19 consists of the plant air compressors, air dryers/receivers, two auxiliary feedwater pumps, and the steam generator blowdown heat exchanger. In addition to the fire detector alarms on the XL-3 panel, FP-1A automatically started due to a decrease in the fire protection system pressure and annunciator "Turbine Room Sprinkler System Flow" (A11, B-5) alarmed on Control Board CB-10/11.

The fire brigade leader, the Equipment Operator Nuclear Turbine (EONT) and an additional operator responded to Room 19 to investigate the fire alarms. Upon arrival at the north stairway down to Room 19, they encountered a significant amount of steam in the room and could not determine its origin, nor were they able to determine if the fire protection system was spraying down an actual fire. They reported the situation to the Control Room. Realizing that steam generator blowdown had just been placed in service, the Control Room Operators suspected this as the source of the steam and isolated blowdown from both steam generators at 1747. The steam leak-rate diminished and the operators in Room 19 saw that the source of the steam was a blown diaphragm on FW-1314 (a SGBPS drain valve). The condition of FW-1314 was reported to the Control Room. The Control Room Operators then directed the EONA to close valve FW-1055 to further isolate the leak.

Shortly after FP-1A started, a Control Room Operator directed the water plant operator to close the pump recirculation valve, FP-300. This action was based on Operations Memorandum 92-09 Rev. 1, dated October 15, 1992. FP-300 is normally locked open, but is to be closed under certain circumstances specified in the Operations Memorandum. This memorandum was implemented as an interim measure to address a potential concern regarding the ability of FP-1A to provide adequate flow to the sprinkler systems under certain unique conditions. The Operations Memorandum indicated that FP-300 is to be closed if FP-1B is inoperable, river level is below 986.5 feet elevation, and FP-1A is started and flow of 1000 gallons per minute is initiated through sprinkler actuation or hose demand. As FP-1B was inoperable, river level was reported as 984'-3", and the Control Room had indication of "Turbine Room Sprinkler System Flow", the decision to close FP-300 was considered conservative and in accordance with the Operations Memorandum.

The steam and high humidity conditions in Room 19 had activated the fire detectors which signaled the deluge valve on the pre-action sprinkler system to trip and fill the sprinkler piping. This caused a decrease in the fire protection system pressure which automatically started FP-1A. The filling of the sprinkler piping actuated the turbine building flow alarm which annunciated in the Control Room. Because there was no fire present, the sprinkler head fusible links remained intact and no sprinkler flow was discharged to the room.

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TEXT (If more space is required, use additional copies of NRC Form 368A) (17)

After it became apparent that there was no actual fire in Room 19, FP-1A was secured from the Control Room by placing the control switch in pull-out. The pump ran for approximately seven minutes under no flow conditions.

Actions were taken to establish ventilation from Room 19 to remove the steam/humidity and clear the fire detector alarms. After the fire alarms were cleared, the Room 19 deluge valve was reset and ventilation was returned to normal. FP-300 was locked open and the fire protection system was returned to normal at 2048.

At approximately 2215, the water plant operator reported to the Control Room that he had found water in the lower motor bearing for FP-1A. The Shift Supervisor declared the pump inoperable, and because FP-1B was also inoperable, this placed the plant in Technical Specification (TS) 2.19(4)b, which applies to situations "With no fire suppression water system operable". This TS requires that a backup fire suppression water system be established within 24 hours or a reactor shutdown is to be initiated. TS 2.19(4)b(ii) specifies that the NRC is to be notified of the cause of the malfunction, the actions taken, and the plans and schedule for restoring the system to operable status.

Upon declaring both fire pumps inoperable, the fire protection system was immediately cross-tied to the station demineralized water system to provide a partial backup fire suppression system. Maintenance and System Engineering personnel began efforts to restore both fire pumps to an operable status. FP-1B was declared operable at 1730 on December 4, 1992, and TS 2.19(4)b was exited. The FP-1A pump stuffing box was repacked and the motor bearing oil was flushed and inspected several times. The pump was then started and successfully passed vibration testing in accordance with a preventive maintenance order. FP-1A was declared operable at 1810, allowing the plant to clear all Limiting Conditions for Operation (LCOs) associated with TS 2.19(4).

A follow-up review of the Technical Specifications concluded that a violation of TS 2.19(5) had occurred during this event. TS 2.19(5) requires a continuous fire watch with backup fire extinguishing equipment be established if the sprinkler/spray systems become inoperable in any of several specified areas (e.g., the Diesel Generator Rooms). While the demineralized water system could help mitigate a possible fire, it can not provide the same flow rate as a fire pump.

A conservative interpretation of Technical Specification 2.19 indicates that with no fire suppression water system operable (i.e., the condition specified in TS 2.19(4)b), the sprinkler/spray systems listed in TS 2.19(5) are also rendered inoperable, requiring continuous fire watches to be established in those areas. Since this action was not taken within one hour of declaring both fire pumps inoperable, TS 2.19(5) is considered to have been violated.



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TEXT (If more space is required, use additional copies of NRC Form 386A) (17)

This report is being submitted pursuant to TS 2.19(4)b(ii) and 10 CFR 50.73(a)(2)(i)(B).

**SAFETY ASSESSMENT**

This event did not result in any personnel injury or equipment damage, other than the blown diaphragm on FW-1314 and the degraded pump packing on FP-1A. The steam leak caused the Room 19 fire detection zone to alarm and be subsequently declared inoperable. An hourly fire watch was established in Room 19 when the fire detection zone was declared inoperable, in accordance with TS 2.19(1). The zone was returned to operability at 2048 on December 3, 1992.

The plant was placed in a 24-hour TS LCO at 2215 on December 3, 1992, as a result of declaring FP-1A inoperable and having no automatic fire suppression water systems operable. From this time until 1730 on December 4, 1992, when FP-1B was declared operable, the fire detection systems were operable in those areas listed in TS 2.19(5). Therefore, although continuous fire watches specified in TS 2.19(5) were not established, the Control Room would have been alerted in the event of a fire in any of these areas. In addition, the demineralized water system would have provided some suppression capability.

The safety significance of the SGBPS overpressurization was evaluated under Engineering Analysis EA-FC-93-010. The evaluation determined that only equipment in Room 19 had the potential for damage as a result of the overpressurization. It was further determined that there may have been the possibility of a steam induced failure of the motor driven auxiliary feedwater pump, had it been called upon to function during the peak steam environment. It was concluded, however, that the plant safe shutdown capability was not adversely affected, due to redundancy in the auxiliary feedwater system. (Note: Surveillance tests conducted after the event showed that both auxiliary feedwater pumps in Room 19 operated normally.)

**CONCLUSION**

A review of Danger Tagout 92-2455 by the Operations crew determined that the return-to-service position specified on the tagout sheet for FW-1055 was "open", but should have been "closed". This valve is an isolation valve between the SGBS and the SGBPS. The EONA had opened FW-1055 at the direction of the Control Room Operator (who was referring to the tagout sheet). Opening FW-1055 allowed the high temperature (500 degrees F)/high pressure (820 psia) blowdown water to fill and pressurize a portion of the SGBPS, which according to the P&ID is designed for 150 degrees F/150 psig service. Eventually the diaphragm on FW-1314 failed, which resulted in the steam leak in Room 19.

# LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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

A Root Cause Analysis found that the danger tagout generated in 1982 to isolate the SGBPS did not include either FW-1055 or FW-1054. FW-1054 and FW-1055 were installed under the SGBPS modification and should have been listed on this tagout. The tagout did, however, contain a list of the other main interface valves between the SGBPS, the SGBS and the condensate system. If FW-1055 had been listed on this tagout and tagged closed, the EONA would not have been able to open the valve without first calling the Control Room and obtaining a clearance on Tagout 82-0006.

The root cause of this event was therefore determined to be a lack of control over the SGBPS and the system interface valves. A major contributing cause is an inadequate danger tagout established in 1982 to isolate the SGBPS for HELB concerns.

Other contributing factors identified include:

- lack of attention to detail by the non-licensed operator making the tagout in that the operator who generated Danger Tagout 92-2455 did not notice that the return-to-service position for FW-1055 was printed on the tagout sheet (by the Control Room equipment tagging computer) as "open".
- lack of attention to detail by the LSO who reviewed and approved the danger tagout in that he did not notice or correct the return-to-service position of FW-1055.
- lack of sufficient knowledge, on the part of the EONA clearing the tagout of the SGBS and its interfaces.
- design of the SGBPS credits procedural controls only to avoid possible misalignment of the 500 degree F/820 psia steam generator blowdown water to a portion of the SGBPS that is only designed for 150 degrees F/150 psig service (by opening either FW-1054 or FW-1055 when SGBS is in service).

With respect to the inoperability of FP-1A, a review by System Engineering determined that operation of FP-1A in a no flow condition for up to 10 minutes should not cause any pump damage. It was concluded that a slight, preexisting packing leak was worsened when FP-1A was operated under no flow conditions, causing water to spray up into the motor housing.

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The root cause of the violation of TS 2.19(5) was determined to be a poorly understood specification. TS 2.19(4)b allows 24 hours to establish a backup fire water suppression system in the event that the entire fire suppression water system is declared inoperable. This allowance led the Shift Supervisor to believe that the 24-hour time limit specified for system inoperability would be the most limiting action statement. However, TS 2.19(5) specifies an action which is required to be implemented in only one hour (i.e., continuous fire watches in specified areas). This perceived conflict resulted in an interpretation that TS 2.19(5) was essentially superseded when the plant was in TS 2.19(4)b.

**CORRECTIVE ACTIONS**

The following corrective actions have been completed:

1. On December 3, 1992, FW-1055 and FW-1054 were added to Danger Tagout 82-0006 and tagged closed. This action, combined with a review of the other SGBPS interface valves, ensured that the SGBPS was properly tagged and isolated. On January 12, 1993, Danger Tagout 93-0033 was initiated to replace Danger Tagout 82-0006 in its entirety. Subsequently, Danger Tagout 93-0033 has been closed and all of its applicable valves incorporated into Revision 22 of Standing Order 0-44, "Administrative Controls for the Locking of Components." These valves have been locked closed and Danger Tagout 93-0033 removed.
2. Operations Memorandum 92-09 Rev. 1 was revised to provide more definitive guidance regarding adequate fire protection system flow and positioning of FP-300.
3. An initial engineering evaluation of piping between FW-1055/FW-1054 and the connection(s) to the 1000 psig rated SGBS piping was performed. The evaluation was performed to determine if this piping is acceptable for 1100 psig / 600 F design conditions per USAS B31.1 piping code. Results of this preliminary evaluation indicated that the piping is acceptable for this application.
4. An engineering evaluation has been completed to confirm that the piping between FW-1055/FW-1054 and the connections to the 1000 psig rated SGBS, are acceptable for the 1000 psig/600 degrees F design conditions. This evaluation is documented in Engineering Change Notice (ECN) 92-545.
5. A memorandum was sent to all Operations personnel to emphasize the importance of closely reviewing all danger tagouts (including special emphasis on reviewing the return-to-service positions).

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TEXT (If more space is required, use additional copies of NRC Form 305A) (17)

6. An Engineering Analysis, EA-FC-93-010, has determined that the plant safe shutdown capability was not adversely affected by the steam in Room 19.
7. Interim guidance on interpretation of Technical Specification 2.19 was provided to the Licensed Operators to ensure consistent interpretation of the specification. (Refer also to corrective action 2 below.)
8. The current EONA training program was reviewed to determine what actions were necessary to provide additional training on the SGBS to the non-licensed operators. As part of this review, Lesson Plan 4-43-17 "Steam Generator Blowdown System" was revised to include statements that the SGBPS is abandoned in place and the SGBPS isolation valves are to be closed at all times. The EONA Qualification Manual was revised to include a system checkout signature.
9. To enhance configuration control, Standing Order 0-20, "Equipment Tagging", has been revised to require a separate LSO or Shift Supervisor review and approval of the return-to-service positions, in addition to the LSO or Shift Supervisor review and approval of the tagged positions.

The following corrective actions will be completed:

1. A review will be performed by March 1, 1993 to identify other plant systems that are not used and consider the need to danger tag, lock closed, or remove these interfaces.
2. A review of Technical Specification 2.19 will be completed by March 1, 1993. This review will determine whether a Technical Specification Interpretation should be issued or a Technical Specification Change should be submitted to clarify applicability during Fire Suppression Water System inoperability.
3. Engineering Assistance Request EAR 92-199 was completed and recommended that a backpressure control valve be installed in addition to FP-300 to eliminate the dead heading of the FP-1A pump. This valve would provide the FP-1A flow for suppression purposes. The design and construction of this facility change is scheduled for completion by September 1, 1993, subject to availability of materials.

**PREVIOUS SIMILAR EVENTS**

LERs 90-001, 90-024, 90-027, 91-006, 92-003, 92-021 and 92-030 discuss other recent events involving TS 2.19 fire watch requirements. None of these events involved entry into TS 2.19(4)b (i.e., inoperability of the fire suppression water system).