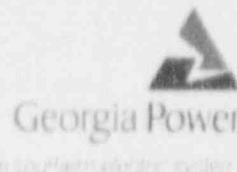


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HL-2342  
003784

July 30, 1992

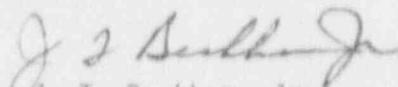
U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, D.C. 20555

PLANT HATCH - UNIT 1  
NRC DOCKET 50-321  
OPERATING LICENSE DPR-57  
LICENSEE EVENT REPORT  
FAILURE OF SOLENOID OPERATED VALVES  
CAUSES LOSS OF EMERGENCY EQUIPMENT ROOM COOLERS

Gentlemen:

Georgia Power Company is submitting the enclosed, revised, voluntary Licensee Event Report (LER) due to the potential industry interest in the event. This event occurred at Plant Hatch - Unit 1.

Sincerely,

  
J. T. Beckham, Jr.

JKB/cr

Enclosure: LER 50-321/1992-003, Revision 1

cc: Georgia Power Company  
Mr. H. L. Sumner, General Manager - Nuclear Plant  
NORMS

U.S. Nuclear Regulatory Commission, Washington, D.C.  
Mr. K. Jabbour, Licensing Project Manager - Hatch

U.S. Nuclear Regulatory Commission, Region II  
Mr. S. D. Ebnetter, Regional Administrator  
Mr. L. D. Wert, Senior Resident Inspector - Hatch

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*Handwritten initials/signature*

**LICENSEE EVENT REPORT (LER)**

FACILITY NAME (1) **PLANT HATCH, UNIT 1** DOCKET NUMBER (2) **05000321** PART (3) **1** OF **6**

TITLE (4) **FAILURE OF SOLENOID OPERATED VALVES CAUSES LOSS OF EMERGENCY EQUIPMENT ROOM COOLERS**

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQ NUM	REV	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
01	21	92	92	003	01	07	30	92		05000
										05000

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR (11)

OPERATING MODE (9)	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
1	20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
POWER LEVEL 100	20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(viii)	X OTHER (Specify in Abstract below) VOLUNTARY
	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)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
STEVEN B. TIPPS, MANAGER NUCLEAR SAFETY AND COMPLIANCE, HATCH	912 367-7851

COMPLETE ONE LINE FOR EACH FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORT TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORT TO NPRDS
B	BI	FSV	A610	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

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

ABSTRACT (16)

On 1/21/92 at 0900 CST, Unit 1 was in the Run mode at a power level of 2436 CMWT (100% rated thermal power). At that time, valves 1P41-F039A and B, air operated cooling water supply valves to Emergency Equipment Room coolers 1T41-B002A and B, failed to open automatically as required during the routine performance of the Core Spray pump operability test. These valves are designed to open automatically to provide cooling water to the room coolers to maintain the temperature below 148 degrees F when the Core Spray and/or Residual Heat Removal pumps are in operation. With both the normal and standby coolers for this room inoperable, Core Spray pump 1E21-C001A and Residual Heat Removal pumps 1E11-C002A and C were declared inoperable. Limiting Condition for Operation (LCO) 1-92-045 was initiated per Unit 1 Technical Specifications sections 3.5.A.3 and 3.5.B.3. At 1535 CST, a temporary modification was implemented to place valves 1P41-F039A and B in the open position to assure a supply of cooling water to the Emergency Equipment Room coolers. This restored the coolers to an operable status and LCO 1-92-045 was then terminated.

The cause of this event has not been determined conclusively. However, it appears an unanticipated breakdown of a material used in the manufacturing process may have been a contributing factor. The solenoid operated valves (SOVs) in the air supply lines to valves 1P41-F039A and B failed to reposition as required. Consequently, valves 1P41-F039A and B could not open. It appears the SOVs failed because their solenoid cores stuck to the top of the core housings, perhaps as a result of the gelling of a lubricant used in the assembly process. Corrective actions include replacing the SOVs, increasing the cycling of SOVs of this type, and changing these valves to another type of SOV.

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PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor  
Energy Industry Identification System codes are identified in the text as (EIIIS Code XX).

DESCRIPTION OF EVENT

On 1/21/92 at 0900 CST, Unit 1 was in the Run mode at a power level of 2436 CMWT (100% rated thermal power). At that time, valves 1P41-F039A and B, the air operated Plant Service Water (EIIIS Code BI) supply valves to Emergency Equipment Room coolers 1T41-B002A and B, failed to open automatically as required. These valves, one per room cooler, are designed to open automatically to supply cooling water to the room coolers to maintain the ambient temperature in the room below 148 degrees F when the Core Spray (EIIIS Code BM) and/or Residual Heat Removal (EIIIS Code BO) pumps are in operation. However, they failed to open as required when Core Spray pump 1E21-C001A was manually started per surveillance procedure 34SV-E21-001-1S, "Core Spray Pump Operability."

Emergency Equipment Room coolers 1T41-B002A and B provide cooling to the pumps in the "A" loops of the Core Spray and Residual Heat Removal systems, pumps 1E21-C001A and 1E11-C002A and C, respectively. (Coolers 1T41-B003A and B provide cooling to the pumps in the "B" loops.) Each cooler is 100% capacity. Since both the coolers were not capable of performing their intended function because of the failure of their cooling water supply valves to open, Core Spray pump 1E21-C001A and Residual Heat Removal pumps 1E11-C002A and C were declared inoperable. Limiting Condition for Operation (LCO) 1-92-045 was initiated per the requirements of Unit 1 Technical Specifications sections 3.5.A.3 and 3.5.B.3.

Temporary modification TMM 1-92-007 was written to position valves 1P41-F039A and B in the open position in order to assure a supply of cooling water to Emergency Equipment Room coolers 1T41-B002A and B. These two valves are normally closed, fail open, air operated valves. Therefore, TMM 1-92-007 consisted simply of disconnecting the air supply lines at the air operators for the two valves. (It had been found earlier that valves 1P41-F039A and B would open when the air supply was interrupted indicating correct performance of the valves themselves.) With the air supply removed, the two valves would open per their design. At 1535 CST on 1/21/92, TMM 1-92-007 was implemented. Valves 1P41-F039A and B opened as expected thereby providing a supply of cooling water to coolers 1T41-B002A and B. This restored the coolers to an operable status and LCO 1-92-045 was terminated at that time.

Investigation of this event revealed the cooling water supply valves failed to open because the normally energized solenoid operated valves (SOVs) in the air supply lines to these valves failed to reposition when given a signal to do so, i.e., when they de-energized. As a result, air pressure was maintained on the air operators for valves 1P41-F039A and B and the valves could not actuate.

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Consequently, the two SOVs were replaced per Maintenance Work Order 1-92-336 on 1/22/97. The air supply lines were reconnected to the valve air operators.

CAUSE OF EVENT

The cause of this event has not been determined conclusively. However, it appears an unanticipated breakdown of a material used in the manufacturing process may have been a contributing factor. As stated above, valves 1P41-F039A and B failed to open because the SOVs in the air supply lines to the valves failed to reposition when de-energized. It appears the SOVs failed because their solenoid cores stuck to the top of the core housings, perhaps as a result of the gelling of a lubricant used in the assembly process.

Both SOVs were replaced and the old valves retained for inspection. One valve was disassembled by plant personnel and inspected. No obvious problems that would have resulted in the SOV not repositioning were found. The other SOV was disassembled and inspected by plant and Architect/Engineering personnel at off site testing and laboratory facilities. As with the first valve, no obvious problems were found. However, an infrared spectroscopic analysis of a clear, liquid substance found on the top of the solenoid core was performed. The substance was found to be a silicone based lubricant, probably Dow Corning 550. This lubricant is used by the SOV manufacturer in the valve assembly process. No other substance was found on the solenoid core or other SOV internals (e.g., o-rings, pilot disc seats).

Previous testing and failure analyses performed by others have indicated that Dow Corning 550 may gel when exposed to elevated temperatures over time. It appears the gelled lubricant may act to bond the solenoid core to the top of the core housing. In addition, the gelled lubricant would seal the top of the core from supply air pressure. This would prevent air pressure from equalizing around the core; therefore, the supply air would exert a net upward force on the core. The bonding force and the upward force from the air pressure would keep the SOV in its energized position when the coil is de-energized. Studies by the SOV manufacturer and others indicate that the SOV model which failed at Plant Hatch has a higher internal temperature caused by the heat dissipated from the energized coil ("self heating") than do other models. Thus, the lubricant in this model SOV may be more likely to break down (gel) before the end of the SOV's qualified life than other model SOVs.

Based on the results of the visual examination of the failed SOVs and the infrared spectroscopic analysis of the substance found in the SOVs, and the information available from previous analyses, it appears that a likely cause of this event was the breakdown (gelling) of the silicone based lubricant used in the manufacturing process. The gelled lubricant could have caused the solenoid core to stay in the energized position by a combination of bonding with the top of the core housing and preventing air pressure from equalizing around the core resulting in a net upward force. With the core restrained in the energized

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position, air pressure would have been maintained on the air operators for valves 1P41-F039A and B and the valves would not have actuated.

REPORTABILITY ANALYSIS AND SAFETY ASSESSMENT

This report is being submitted voluntarily because it may be of interest to other utilities using SOVs in this application.

Emergency Equipment Room coolers are provided to maintain the temperature in the room below a specified limit when the emergency equipment is in operation. This helps assure long-term operation of the equipment by keeping room temperatures at or below the maximum allowable component operating temperatures. Each Emergency Equipment Room has two, 100% capacity coolers. Each room cooler has a fan and cooling coils supplied by Plant Service Water. Core Spray pump 1E21-C001A and Residual Heat Removal pumps 1E11-C002A and C are located in one room cooled by Emergency Equipment Room coolers 1T41-B002A and B. These pumps comprise the 100% capacity "A" loops of the Core Spray and Residual Heat Removal systems, respectively. The redundant, 100% capacity "B" loop Core Spray and Residual Heat Removal system pumps are located in a separate room also cooled by two, 100% capacity coolers, 1T41-B003A and B.

Normally, the cooler fans are off with the cooling water supply valves closed. Upon automatic or manual start of one or more of the pumps in the room, the two Emergency Equipment Room cooler fans start. When the fans start, the SOVs for the cooling water supply valves de-energize. When the SOVs de-energize, the two SOV discs reposition, the air supply to the air operated cooling water supply valves is isolated and the air operator is vented. Spring force then opens the cooling water supply valves thereby providing Plant Service Water to the coolers.

In this event, the SOVs for cooling water supply valves 1P41-F039A and B failed to reposition when the solenoids de-energized. Consequently, valves 1P41-F039A and B could not open to supply cooling water to room coolers 1T41-B002A and B, respectively. This rendered inoperable the "A" loops of the Core Spray and Residual Heat Removal systems. However, the redundant, 100% capacity "B" loops of the Core Spray and Residual Heat Removal systems were unaffected by this event and were available to perform their intended function had they been required to do so. Their Emergency Equipment Room coolers are not supplied Plant Service Water through valves 1P41-F039A and B. Their cooling water is supplied through valves 1P41-F036A and B which were proven operable on 1/22/92 during the operability test of Core Spray pump 1E21-C001B. It is reasonable to conclude that they had been operable prior to this time as well.

Based on the above, it is concluded that this event had no adverse effect on nuclear safety. This analysis is applicable to all operating conditions.

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CORRECTIVE ACTIONS

Temporary modification TMM 1-92-007 was implemented to disconnect the air supply to valves 1P41-F039A and B so they would fail in the open position thereby supplying cooling water to the room coolers. This was done on 1/21/92 at 1535 CST, returning the coolers and their associated pumps to an operable status.

The SOVs for valves 1P41-F039A and B were replaced per Maintenance Work Order 1-92-366 on 1/22/92. The air supply to valves 1P41-F039A and B was reconnected.

Safety related valves with the same model, normally energized, SOV in their air supply lines are being cycled monthly as an interim action per procedures 34SP-042992-DC-1-1S, "ASCO Solenoid Valve Cycling," and 34SP-042992-DC-2-2S, "ASCO Solenoid Valve Cycling."

The affected SOVs will be replaced with another model. Completion of this action is dependent on several factors, including parts availability which is beyond the control of GPC. Therefore, a definitive completion date is not specified for this action. The interim corrective action, however, will remain in place until such time as this action can be completed.

ADDITIONAL INFORMATION

No systems other than those previously mentioned in this report were affected by this event.

There has been one previous similar event reported in the last two years in which SOVs failed to reposition when de-energized. That event was reported in LER 50-366/1991-019 dated 10/9/91. In that event, oil intrusion into the internals of two SOVs caused the ethylene propylene discs to swell and stick to the internals of the SOV valve body. The oil came from in-line lubricators designed to supply lubricating oil to the piston operators for the valves served by the SOVs. The discs for the SOVs for valves 1P41-F039A and B are composed entirely of metal. They are, therefore, not subject to swelling as are the ethylene propylene discs. Consequently, corrective actions to prevent ethylene propylene disc swelling could not have prevented this event.

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Failed Component Information:

Master Parts List Number: 1P41-F039A and B  
 Manufacturer: Automatic Switch Company  
 Model Number: NP2063803FMO  
 Type: Solenoid Operated Valve  
 Manufacturer Code: A610  
 EIIS System Code: BI  
 Reportable to NPRDS: Yes  
 Root Cause Code: B  
 EIIS Component Code: FSV