7-2-79

MEMORANDUM FOR: Commissioner Kennedy

THRU: Lee V. Gossick, Executive Director for Operations

FROM: Victor Stello, Jr., Director, Office of Inspection and Enforcement

SUBJECT: FAILURE OF BACKUP CORE COOLING SYSTEMS AT HATCH UNIT NO. 2 - PNO-79-139

In your memo of June 7, 1979, regarding PNO-79-139, you requested more information concerning the failure of the High Pressure Coolant Injection (HPCI) and the Reactor Core Isolation Cooling (RCIC) systems to perform as designed following a reactor trip. A response has been prepared by Region II and is enclosed with this memo.

Since the issuance of PNO-79-139, there has been another failure of the HPCI and RCIC (PNO-79-196) to operate. This failure is not related to the failures described in the response to this memo. Our Region II office has sent an Immediate Action Letter (IAL) to the licensee confirming steps that are to be taken by the licensee and reviewed by our Region II inspectors prior to the restart of either unit. The IAL was sent on June 28, 1979, at which time both units were in a shutdown status.

We consider the problems that have occurred with the HPCI and RCIC systems to be serious, and are closely following the licensee's program of corrective measures to assure that both systems can attain a reliable state of operational readiness.

Original Signed by

Victor Stello, Jr.
Director
Office of Inspection
and Enforcement

Enclosures:
(See next page)

CONTACT: G. Klingler, IE
49-28019

ENCLOSURE

Facility: Georgia Power Company
Hatch Unit No. 2
Docket No. 50-366
Baxley, Georgia

Subject: FAILURE OF BACKUP CORE COOLING SYSTEMS

On June 3, 1979, a condensate system malfunction resulted in a reactor trip from a low water level in the reactor vessel. The High Pressure Coolant Injection (HPCI) and the Reactor Core Isolation Cooling (RCIC) systems failed to perform as designed following the reactor trip. The following is a detailed description of the initiating event and the failure of the HPCI and RCIC systems.

1. Initial Condition

The reactor was operating at full power, conducting power ascension testing following a maintenance outage.

2. Reactor Trip

A condensate booster pump tripped, on low suction pressure, at approximately 6:50 p.m. on June 3. The low suction pressure appears to have been caused by operation of the condensate demineralizers in manual flow control instead of automatic flow control. Tripping of the condensate booster pump resulted in a decrease in condensate header pressure which caused one of the two operating feedwater pumps to trip on low suction pressure. The remaining feedwater pump continued to operate but the resulting mismatch between steam flow and feedwater flow resulted in the reactor vessel water level decreasing and a reactor trip occurred on low water level.

3. HPCI and RCIC Actuation

Approximately five minutes after the reactor trip, the reactor vessel water level low low setpoint was reached and an automatic actuation signal for the HPCI and RCIC systems was initiated.

The HPCI steam turbine driven pump received the initiation signal but did not start because the turbine stop valve failed to open. Water was present in the HPCI turbine oil system and the auxiliary oil pump apparently did not develop sufficient control oil pressure to open the turbine stop valve.

Investigation has revealed two sources of water that may have entered the turbine oil system. One source of water inleakage was a water cooled oil cooler which, following the event, was identified to be leaking. A second source of water inleakage was from a leak in a seal injection pipe. A closed valve in the HPCI pump seal cooling cavity drain pipe allowed the leaking seal injection pipe to fill the drain cavity to a

level above the pump shaft. This allowed water to enter the bearing housing. The drain line valve was not included in the system valve lineup procedure due to an error on the as-built plant drawings. The Unit 1 HPCI system has been verified not to have an isolation valve in the cavity drain pipe.

The RCIC system started as designed and operated for one minute, then tripped due to a failed (ruptured) turbine exhaust diaphragm on the RCIC pump turbine. A check valve linkage stub broke, which caused the ten-inch check valve disc in the turbine exhaust line to come loose. This disc blocked the valve outlet, causing a high pressure in the turbine exhaust line and rupturing the turbine exhaust diaphragm.

4. Supplemental Licensee Actions

The reactor remained shutdown until investigation, repair and corrective actions to the HPCI and RCIC systems were completed as follows:

a. The leaking HPCI seal injection pipe was repaired by replacing a section of the leaking pipe. The seal injection pipes are being evaluated to determine if additional structural supports are required to prevent vibration induced failure.

b. The HPCI oil system was drained, flushed and refilled twice.

c. The HPCI oil cooler in the system was identified as a possible source of water inleakage and subsequent testing with nitrogen confirmed the existence of a leak. A study has been initiated by the licensee to identify a method whereby water in the oil systems of the HPCI and RCIC turbines may be readily identified. In the interim, the HPCI oil is being sampled on a weekly schedule.

d. The HPCI turbine bearings were inspected for possible damage. The inspection revealed no deficiencies.

e. The valve in the bracket drain pipe was locked open prior to startup and an evaluation was initiated to determine if the valve could be removed. The valve has been added to the system valve lineup procedure.

f. The RCIC ten-inch valve was repaired and modified to prevent recurrence. A design engineer and service representative of the valve vendor (Walworth) were onsite to determine the cause of failure and the proper corrective action. The failure was attributed to cycling of the swing check valve disc against its stop and failure of the stub where the stub locking pin in inserted. This was corrected by welding the nut to the replacement disc instead of drilling a hole for pinning. The valve was reassembled and leak tested satisfactorily. The vendor representatives informed the licensee that, to their knowledge, this was the first instance of this particular failure mechanism experienced on this type of Walworth check valve. The licensee evaluated the service application of other Walworth check valves utilized in plant safety systems and verified their acceptability.

g. The licensee verified that the Unit 1 RCIC turbine exhaust valve was supplied by a different vendor.

h. The RCIC turbine exhaust diaphragm was replaced.

i. The RCIC and HPCI systems were tested and verified to be fully operational following the maintenance activities.

j. The plant safety review board reviewed the occurrence including all investigative actions, repairs and other corrective actions prior to the Unit returning to service. The IE Resident Inspector verified the adequacy of this review.

5. Unit Restart

The unit was returned to operation on June 7, 1979.

6. Significance of the Occurrence

The staff considers the loss or failure to function of any core cooling system to be a significant event. With the failure of the HPCI and RCIC systems, the capability of the Unit to sustain any further transient was not seriously compromised. The RCIC is not part of the emergency core cooling systems. In this particular event, it should be noted that one feedwater pump continued to supply water to the reactor vessel and maintained water level approximately ten feet above the top of the core. The lowest water level reached during the event was minus forty-five inches for a duration of approximately one minute. Had the water level continued to decrease the Low Pressure Coolant Injection System and the Core Spray System would have been automatically actuated at the reactor vessel low low low water level setpoint of minus 135 inches. (The top of the fuel bundles is at minus 168 inches.) Each of these systems was operable at the time of the event.

The staff considers the two failures to be completely unrelated. There is no evidence to indicate any cause/effect relationship between the RCIC and HPCI failures.

7. Generic Implications

The staff considers the failure of the RCIC turbine exhaust valve and the contamination of the HPCI turbine oil system with water as having possible generic implications.

The Region IV Vendor Inspection Program has been informed of the failure of the Walworth check valve and information is being sought on any similar type failures of these valves. Information is also being collected from the other Regional Offices concerning any similar instance of water contamination of the turbine oil system and recommended practices of periodic sampling of the oil systems for evidence of water inleakage.

A decision will be made as to the generic significance of each of the failures and if appropriate, an IE Bulletin, Circular or Information Notice will be issued.

8. NRC Staff Actions

a. The Regional Director discussed the seriousness of this event and the failure to meet written reporting requirements with the licensee's Senior Vice President in two telephone conversations on June 5, 1979.

b. A Preliminary Notification (PNO 79-139) of this event was issued on June 6, 1979. The State of Georgia was also informed.

c. As a result of the Regional Director's communications with the Senior Vice President, the Manager of Nuclear Generation from the Georgia Power Company met with the Regional Director and responsible staff in the Region II office on June 7, 1979. The seriousness of the event and the failure to meet written reporting requirements were discussed.

d. Following the Regional Director's discussion with Georgia Power Company the licensee issued a press release on June 7, 1979.

e. The Resident Inspector at the site reviewed these failures and the corrective actions taken prior to reactor restart.

f. The confirming written twenty-four hour report was one day late in arriving in the Region II office and will be the subject of enforcement action. The Regional Director called the Senior Vice President within one hour after receipt of the written reports from the Georgia Power Company. The matter was immediately discussed by the Regional Director with members of the Region II staff and has been the subject of extensive followup.

Southern Company Services, Inc.
Post Office Box 2625
Birmingham, Alabama 35202
Telephone 205 870-6131

Douglas L. McCrary
Executive Vice President

the southern electric system

April 15, 1980

Docket Number: 50-321

United States Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region II - Suite 3100
101 Marietta Street, N.W.
Atlanta, Georgia 30303

Attention: Mr. James P. O'Reilly

Gentlemen:

On April 11, 1980, it was reported to your office that a potential defect existed in the cooling water supply on the residual heat removal service water pump motors' lube oil coolers at the Edwin I. Hatch Nuclear Plant, Unit 1.

Southern Company Services, Inc., as architect engineer for Georgia Power Company, has conducted an evaluation for a substantial safety hazard. A conclusion was reached that a substantial safety hazard did exist.

This report contains no proprietary information and may be placed in the NRC Public Document Room upon receipt.

Very truly yours,

D. L. McCrary

lw
Enclosure
cc: U. S. Nuclear Regulatory Commission

~~8004250390~~

cc: Southern Company Services, Inc.
R. E. Conway
R. A. Thomas
E. L. Williamson
Ozen Batum
W. F. Garner
L. W. Williams

SUBSTANTIAL SAFETY HAZARD IN
RHR SERVICE WATER PUMP MOTORS COOLING WATER SUPPLY LINE

Initial Report:

On April 11, 1980 the following personnel at Southern Company Services reported to the NRC Region II Office the existence of a possible defect in the cooling water supply line to the residual heat removal service water pump motor's lube oil coolers at the Edwin I. Hatch Nuclear Plant - Unit 1.

Mr. Ozen Batum - Manager of Nuclear Safety & Licensing
Mr. William F. Garner - Manager of Nuclear Plant Support
Mr. Randy Dewberry - Project Engineer, Nuclear Plant Support

Address:

Southern Company Services, Inc.
800 Shades Creek Parkway
P.O. Box 2625
Birmingham, Alabama 35209

Background:

During a review of the Edwin I. Hatch-Unit 1 plant service water system, the following potential defect was identified. The RHR service water pump motors have a single cooling water supply line. This line supplies cooling water to the lube oil coolers. The source of cooling water is a intertie between Division I and Division II plant service water headers. In the event of a Division I or Division II failure, check valves are provided for isolation purposes at the connection to the Division I and Division II service water pipe. Additionally, a pressure regulator was installed in the supply line to regulate the water pressure to the lube oil coolers.

The problem that exists is that a single failure in the cooling water supply line could cause a failure of the Division I and Division II residual heat removal service water pumps for Edwin I. Hatch Nuclear Plant - Unit 1.

Evaluation:

A failure of the cooling water supply line would leave the RHR pump motor lube oil coolers without cooling water. All indications were that the motor bearings would be damaged if the motors run without the cooling water being supplied to the lube oil coolers. This loss of RHR cooling water would result in the exceeding of the safety limit in the facility technical specification.

Two potential modes of failure were identified. One mode was an active failure of the pressure regulator. Another mode was a pipe break.

Further investigation revealed that the pressure regulator and piping were seismically supported.

Corrective Action:

The internals were removed from the pressure regulator to make it a passive component, thereby alleviating the active failure concern (PR2-R41-D107). Additionally, a pressure gauge was installed on a utility outlet near the regulator. By manually throttling valve PV1-F440A, the pressure can be kept within acceptable limits. The pressure is being monitored on a 24-hour a day basis.

To correct against a potential failure, the motor cooling water system will be divided into two separate divisions. The discharge of the Division I Plant Service Water Pumps will be the source of cooling water for the Division I Plant Service Water Pump Motors and the Division I RHR Service Water Pump Motors. The discharge of the Division II Plant Service Water Pumps will be the source of cooling water for the Division II Plant Service Water Pump Motors and the Division II RHR Service Water Pump Motors. The existing water line will be modified and used to supply the cooling water to Division I pump motors. A new water line will be added to supply the cooling water to the Division II pump motors. This satisfies the license requirements.

The corrective action at Plant Hatch-Unit 1 will be the responsibility of Mr. M. Manry of Georgia Power Company. Georgia Power Company is procuring the items necessary to modify the cooling water supply lines. The systems will be connected and placed into operation during the first unit cold shutdown after receipt of the material.

However, to further improve the system a long-term fix will be implemented during a scheduled refueling outage after the necessary equipment and components are obtained. This fix will consist of supplying cooling water to each division of pumps separately as it is in Hatch-Unit 2.

Summary:

Southern Company Services, as the architect/engineer for Georgia Power Company, has evaluated this problem and has concluded that it does represent a substantial safety hazard since the failure of the cooling water supply could result in the exceeding of a safety limit as defined in the facility technical specification.