Southern Nuclear Operating Company
Post Office Box 1295
Birmingham, Alabama 35201
Telephone (205) 868-5131

Dave Morey
Vice President
Farley Project

Southern Nuclear Operating Company
the southern electric system

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ATTN: Document Control Desk
Washington, DC 20555

Joseph M. Farley Nuclear Plant - Unit 2
Special Report No. 96-001, RHR Relief Valve Lift

Ladies and Gentlemen:

In accordance with the requirements of Technical Specification 3.4.10.3, the enclosed Special Report No. 96-001, Unit 2, is submitted.

If you have any questions, please advise.

Respectfully submitted,

Dave Morey

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Enclosure

cc: Mr. S. D. Ebneter, Region II Administrator
Mr. J. I. Zimmerman, NRR Project Manager
Mr. T. M. Ross, Plant Sr. Resident Inspector

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ENCLOSURE 1

Joseph M. Farley Nuclear Plant
Special Report 96-001
RHR Relief Valve Lift

Enclosure 1
Joseph M. Farley Nuclear Plant
Special Report 96-001
RHR Relief Valve Lift

This Special Report is being submitted in accordance with Technical Specification 3.4.10.3 due to the lifting of the A and B train Residual Heat Removal (RHR) pump suction relief valves to mitigate a Reactor Coolant System (RCS) pressure transient.

Circumstances Initiating the Transient

On 10-15-96, Unit 2 was operating in solid plant pressure control in Mode 5 (Cold Shutdown), with an RCS temperature band of 175 to 180 degrees and an RCS pressure band of 325 to 375 psig. All three Reactor Coolant Pumps (RCPs) and both trains of RHR were in operation. Unit 2 had achieved solid plant conditions at approximately 2204 on 10-14-96. Plant conditions were stable and RCS pressure was being maintained at approximately 357 psig by balancing charging flow, seal injection flow, seal leakoff flow, and low pressure letdown flow. The charging flow control valve was being operated utilizing the controller in manual, and the low pressure letdown pressure control valve was being operated in automatic to assist in RCS pressure control. The controllers involved in this event had not been adjusted in several minutes and preparations were in progress to begin degassification of the RCS prior to the transient.

At approximately 0058 on 10-15-96, the Operator At The Controls (OATC) observed that RCS pressure was abnormally low at approximately 300 psig and also observed that charging flow had unexpectedly decreased from approximately 86 gpm to less than 40 gpm with no operator action. The low pressure letdown flow, which had been stable at approximately 100 gpm, was indicating less than 40 gpm. The OATC responded by increasing the demand on the charging flow control valve controller. After approximately 2 to 3 small magnitude adjustments, the demand on the controller was observed to go to the maximum output and the indicated charging flow rate was observed to increase to greater than 150 gpm (150 gpm is the maximum charging flow indication available on the main control board). Subsequently, the operator monitored RCS pressure to verify a rise in RCS pressure. After verifying RCS pressure was rising, the operator proceeded to decrease charging flow using the charging flow control valve controller in an effort to stabilize RCS pressure. As the operator adjusted the controller, the charging flow control valve responded unexpectedly by closing fully. It was subsequently determined that during the time period when charging flow was greater than letdown flow, the RCS pressure had increased until the A and B train RHR pump suction relief valves lifted to mitigate the transient. A subsequent review of plant process computer 10 second sampling history data concluded the maximum recorded value of RCS pressure had been at least 441 psig.

Enclosure 1
Special Report 96-001

Effect of RHR Relief Valves on the Transient

The A and B train RHR pump suction relief valves, connected to the C and A RCS loop hot legs respectively, lifted in response to the pressure increase. RCS pressure subsequently decreased to approximately 250 psig due to the lifting of the relief valves and operator efforts to reduce the charging flow rate. In response to the low RCS pressure and concern for maintaining the minimum required RCS pressure to support RCP operation, all three RCPs were secured. The Pressurizer Relief Tank (PRT) level was approximately 71% prior to the event but during the transient the level was observed to be indicating approximately 80% and was rising. The operating crew concluded that a relief valve had probably lifted and failed to completely re-seat. Personnel in containment reported that the piping downstream of each RHR pump suction relief valve was hot and the A train RHR pump suction relief valve was relieving to the PRT as indicated by flow noise. At approximately 0124, the 2A RHR pump was secured and the RHR loop suction isolation valves from the C RCS loop were closed to secure the flow into the PRT. Subsequently, RCS pressure was stabilized at approximately 350 psig with the 2B RHR loop in service. A review of plant process computer 10 second sampling history data showed that the lowest recorded RCS pressure during the transient was approximately 200 psig. The core remained covered at all times. During the transient, approximately 3000 gallons of RCS inventory were relieved to the PRT. Based on a review of the level response in the PRT, it has been concluded that the A RHR pump suction relief valve did not stick fully open but failed to completely re-seat.

Corrective Action Necessary to Prevent Recurrence

This event was caused by apparent binding of the charging flow control valve. The apparent binding resulted in an unexpected decrease in charging flow as well as an over response when the operator attempted to raise charging flow to restore RCS pressure to normal.

Charging flow control valve components have been replaced.

Periodic inspection requirements for the Unit 1 and 2 charging flow control valve internals will be determined and implemented as appropriate.

Additional Information

An investigation was conducted to determine the cause of the unexpected decrease in the charging flow rate with no operator action, and the failure of the A train RHR pump suction relief valve to completely re-seat.

The charging flow control valve and actuator performance were assessed prior to disassembly with no significant findings. This assessment was conducted with minimum differential pressure across the valve in that the valve had been removed from service (the differential pressure across the valve during the event was approximately 2200 psig). Internal valve inspections revealed scarring on the valve plug and valve cage probably due to binding during the valve stroke. FNP has concluded that the binding resulted in the difficulties experienced in controlling the charging flow control valve by preventing the valve from going to a demanded position in a controlled manner.

The A train RHR relief valve was removed and tested. The as found lift setting was determined to be 440 psig which met the Technical Specification acceptance criteria of $\leq$ 450 psig (the FNP test procedure acceptance criteria for RHR relief valves is 445 plus or minus 5 psig). The valve was subsequently disassembled in an effort to determine why it failed to completely re-seat during the RCS pressure transient. No significant deficiencies were identified. The valve was reinstalled after replacement of pressure sealing components, verification of the valve blowdown adjustment and verification of the proper lift setpoint.

The B train RHR relief valve was also removed and tested. The as found lift setting was determined to be 360 psig. Internal valve inspections indicated that the nozzle and disc insert were damaged and unsuitable for further service. It has been concluded that the observed damage resulted in the measured out of tolerance as found lift setting. Since the maximum RCS pressure while on RHR and during the approach to solid plant conditions was approximately 375 psig, the observed damage and the apparent out of tolerance lift setpoint were most probably the result of the RCS pressure transient and not conditions which have existed during the previous operating cycle. This valve was replaced with a refurbished valve which had been setup and tested at a vendor laboratory.