Dave Morey
Vice President
Farley Project

Southern Nuclear
Operating Company
P.O. Box 1295
Birmingham, Alabama 35201
Tel 205.992.5131

SOUTHERN COMPANY
Energy to Serve Your World℠

January 27, 1997

Docket Nos.: 50-348
50-364

10 CFR 50.4

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Joseph M. Farley Nuclear Plant
<u>120-Day Response to Generic Letter 96-06</u>

Ladies and Gentlemen:

On September 30, 1996, the Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions." The GL requires a 30-day initial response and requests a written summary report within 120 days.

Southern Nuclear provided a 30-day response dated October 24, 1996.

The 120-day response requires a written summary report stating the following information:

1) Actions taken in response to the requested actions

2) Conclusions that were reached relative to susceptibility for waterhammer and two-phase flow in the containment air cooler cooling water system

3) Conclusions that were reached relative to overpressurization of piping that penetrates containment

4) The basis for continued operability of affected systems and components as applicable

5) Corrective actions that were implemented or are planned to be implemented

6) If systems were found to be susceptible to the conditions that are discussed in GL 96-06, identify the systems affected and describe the specific circumstances involved.

A072 1/1

SNC has determined that the containment air cooler cooling water system (SW) is not susceptible to either waterhammer or two phase flow conditions during postulated accident conditions. Those penetrations determined to be potentially susceptible to thermally-induced overpressurization have been sufficiently reviewed and an adequate near-term basis for acceptability established. SNC has enclosed a written summary report detailing the applicability of this generic letter, the basis for continued operability of associated systems, and a summary of corrective actions implemented and planned.

Should you require any additional information regarding this response, please contact my office.

Respectfully submitted,

SOUTHERN NUCLEAR OPERATING COMPANY

DM Morey

Dave Morey

Sworn to and subscribed before me this 24th *day of* January, *1997.*

Martha Gayle Dow
Notary Public

My Commission Expires: November 1, 1997

CHM/clt:GL9606-2.doc

Enclosures:

I. Waterhammer in Containment Coolers and Two-Phase Flow in Safety Related Piping and Components
II. Overpressurization of Isolated Piping

cc: Mr. L. A. Reyes, Region II Administrator
Mr. J. I. Zimmerman, NRR Project Manager
Mr. T. M. Ross, Plant Sr. Resident Inspector
Mr. T. A. Reed, NRR - Materials and Chemical Engineering Branch
Dr. D. E. Williamson, State Department of Public Health

Enclosure I

Waterhammer in Containment Coolers
and
Two-Phase Flow in Safety Related Piping and Components

Requested Action from GL 96-06

1) "Determine if containment air cooler cooling water systems are susceptible to either waterhammer or two phase flow conditions during postulated accident conditions."

SNC Response

The Farley Containment Coolers are supplied with Service Water (SW) as the cooling media. In order to address concerns about possible waterhammer in the SW system, SNC has performed a waterhammer analysis of the SW system along with a waterhammer piping region temperature analysis following a Loss Of Coolant Accident (LOCA) coincident with a Loss of Offsite Power (LOSP).

The Service Water Pond is maintained at a minimum elevation of 184 ft. The Containment coolers are located at elevation 155 ft. with the SW discharge piping being the highest point. The Service Water system is discharged to the river at an elevation of 77 ft. Calculations have shown that this design allows for a substantial flow of SW through the Containment coolers to continue during the LOSP event until the Service Water Pumps are restarted.

The waterhammer analysis identified that the region of the SW piping that is most susceptible to waterhammer is the Containment Cooler return piping. However, this analysis showed that no waterhammer will occur within this piping. Following a LOCA coincident with a LOSP, both the containment cooler fans and SW pumps are de-energized resulting in reduced air and SW flows through the coolers. Therefore, the heat transfer from the containment atmosphere will be less than the full capacity of the containment coolers. In the time interval of interest (25 seconds or less) following initiation of this event, the SW downstream of the containment coolers has been calculated to reach a maximum of 119° F. This is less than the 164° F temperature required to form a vapor cavity, thus no vapor cavity will exist immediately prior to pump restart. Since a vapor cavity will not form, waterhammer will not occur when the system is repressurized due to pump restart.

SW temperature, along with its associated vapor pressure, will rise rapidly following containment cooler fan restart. However, the increase in the SW's vapor pressure, caused by the SW's temperature rise, will not reach the increased pressure in the containment cooler discharge piping. Therefore, two phase flow conditions will not occur.

The results of the waterhammer analysis were presented to the NRC on February 16, 1994, at the NRC Region II offices. This was in response to SWSOPI Unresolved Item 50-348, 364/93-13-02. In NRC Inspection Report 50-348, 364/94-21, dated September 29, 1994, the URI was closed.

Enclosure II

Overpressurization of Isolated Piping

Requested Action from GL 96-06

2) "Determine if piping systems that penetrate the containment are susceptible to thermal expansion of fluid so that overpressurization of piping could occur."

SNC Response

In response to information concerning the potential for thermally-induced overpressurization of water-filled, isolated piping inside the containment building, a system-by-system review of the associated configurations at Farley was performed. The review considered water-filled containment penetration piping and closed system piping within the containment. The purposes for this review process were: 1) to identify penetrations in which sections would potentially be susceptible to overpressurization occurrences, 2) to establish an immediate basis for acceptability of the potentially susceptible piping configurations, and 3) to establish, as appropriate, plans for long-term corrective actions to increase the level of functional assurance.

Using FSAR Table 6.2-31 and 6.2-32, and the P&IDs for Farley Units 1 and 2 as guidance, all penetrations (86/unit) were screened for susceptibility to thermally induced overpressurization. An initial screening was performed to reduce the number of penetrations to be reviewed. Penetrations that met any of the following criteria did not require a detailed engineering evaluation since they would not be susceptible to overpressurization:

1) Containment penetrations that had relief valves installed between the containment isolation valves.
2) Containment penetrations that had a check valve to relieve fluid expansion.
3) Containment penetrations that were not water filled.
4) Isolation valves which open on a safety injection signal.
5) Containment penetrations open to containment.
6) Containment penetrations that contained fluid at temperatures greater than, or equal to the MSLB/LOCA environment conditions.
7) Containment penetrations for instrumentation qualified for post-accident conditions.

Based on this screening, 8 penetrations per unit were determined to be potentially susceptible and required further evaluations. These penetrations are:

- Accumulator Test Line (1/unit)
- Accumulator Makeup Line (1/unit)
- Accumulator Sample Line (1/unit)
- CCW Return from RCP Thermal Barrier (1/unit)
- Reactor Coolant Drain Tank Drain (1/unit)
- Pressurizer Relief Tank Makeup (1/unit)
- Refueling Cavity Supply (1/unit)
- Demineralized Water (1/unit)

Accumulator Test Line (Penetration 29)
Accumulator Make-up Line (Penetration 49)

Penetration 29 is configured with air-operated isolation valves inside and outside the containment, and penetration 49 is configured with an air-operated valve outside and a check valve inside the containment. Based on a heat transfer analysis and subsequent pressurization analysis, the worst case expected pressure, assuming no valve leak-by, is within the allowable pressure range for the associated piping at the expected temperatures.

Therefore, containment integrity would be maintained and there would be no adverse impact to the function of any safety-related component as a result of this pressurization event.

Accumulator Sample Line (Penetration 50)
CCW Return from RCP Thermal Barrier (Penetration 43)

These penetrations are also equipped with an inside and an outside containment air-operated isolation valve. The valves are installed such that any pressure build-up in the piping section between the valves is applied to the under plug area of the outboard valve for penetration 50 and the inboard valve for penetration 43. The pressure required to lift the valve and relieve the pressure is less than the allowable pressure of the piping and components within the pressure boundary. Once unseated, penetration 50 will relieve to the Volume Control Tank (VCT) which will support the addition of this small amount of fluid with no adverse effect to the VCT. For penetration 43, the inboard valve is designed to reverse leak when pressure is applied under the seat to a section of CCW piping protected by pressure relief valves.

Therefore, containment integrity would be maintained, and there would be no adverse impact to the function of any safety-related component as a result of this pressurization event.

Corrective Action

Short Term

None required

Long Term

None required

Reactor Coolant Drain Tank Drain (Penetration 31)

These penetrations include diaphragm-type valves. Penetrations configured with exposed valves of this design are passively protected from thermally-induced overpressurization. Because the outside containment isolation valve is of a soft-seat design, pressurization of the piping between the outside containment valve and the inside containment valves would lead to leakage past the seat before the pressure increased to a point where penetration piping would be damaged. The discharge of the inboard valve is directed to the Reactor Coolant Drain Tank and the outboard valve is directed to the Waste Processing piping system which are of a large enough volume that the addition of the small amount of water leaking past the soft seat would have no adverse effect.

A review of recent leak rate testing data for the outboard diaphragm valves showed these valves are not leak tight and consistently provide some leakage, thereby relieving the penetration to an open system.

Therefore, containment integrity would be maintained and there would be no adverse impact to the function of any safety-related component as a result of this pressurization event.

Pressurizer Relief Tank Makeup (Penetration 30)
Refueling Cavity Supply (Penetration 95)

These penetrations include an outboard diaphragm-type valve and an inboard check valve. Diaphragm valves are located downstream of the inboard containment isolation check valves which are outside the penetration boundary. Due to the amount of piping between the check valves and the diaphragm valves inside containment exposed to an accident environment being much larger than the piping between the check valves and the outside containment isolation diaphragm valves, the section of piping outside the pressure boundary would experience a greater pressure rise. Consequently, the diaphragm valves inside containment, but outside the pressure boundary, would be the weak link in this configuration. Leakage by the diaphragm will create a relief path to an open system.

Therefore, containment integrity would be maintained and there would be no adverse impact to the function of any safety-related component as a result of this pressurization event.

Corrective Action

Short Term

None required

Long Term

Additional reviews of the penetrations will be performed to identify other options to relieve thermal pressurization without reliance on diaphragm valve seat leakage. (Penetrations 31, 30, 95)

Demineralized Water (Penetration 82)

The Demineralized Water penetration is configured with an outside containment air-operated, globe valve and an inside containment check valve for isolation. During normal operation, this penetration is isolated. Further, the normal system alignment requires the closure of a manual globe valve downstream of the inside containment check valve. The closure of the manual globe valve effectively isolates the associated penetration piping from any appreciable volume that could be used for expansion of the fluid.

Therefore, this penetration is considered susceptible to thermal induced overpressurization.

Corrective Action

Short Term

To preclude concerns associated with this penetration, plant procedures have been revised to ensure this penetration is drained during normal operation.

Long Term

Additional review of this penetration will be performed to identify other options to relieve thermal pressurization.

Basis for Continued Operability

By performing the corrective actions identified above, containment integrity would be maintained, and there would be no adverse impact to the function of any safety-related component.

Reportability Review

A reportability evaluation was prepared for the Demineralized Water penetrations. This evaluation concluded the condition identified for this penetration does not constitute a reportable situation. The basis for this conclusion is that this penetration includes an outboard globe valve and an inboard check valve. There is also a globe valve located downstream of the inboard containment isolation check valve which is outside the penetration boundary. Due to the amount of piping between the check valve and the globe valve inside containment exposed to an accident environment being much larger than the piping between the check valve and the outside containment isolation globe valve, the section of piping outside the pressure boundary would experience a greater pressure rise. Consequently, the piping inside containment, but outside the pressure boundary, would be the weak link in this configuration.

Conclusion

In summary, the conditions and/or scenarios discussed in GL 96-06 are not considered to involve a significant safety concern for Farley Nuclear Plant. Those penetrations determined to be potentially susceptible to thermally-induced overpressurization have been sufficiently reviewed and an adequate near-term basis for acceptability established. Short-term corrective action was taken on 1 penetration per unit. To preclude concerns associated with this penetration, plant procedures have been revised to ensure this penetration is drained during normal operation. Long-term corrective action is necessary for 4 penetrations per unit. Analysis will continue to determine the appropriate action to alleviate the above conditions. This analysis is presently scheduled to be completed by June 30, 1997. Any identified modifications will be implemented prior to startup from the Fall 1998 refueling outage for Unit 1 and from the Spring 1998 outage for Unit 2.