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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10 CFR 50.90

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50-364

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

Joseph M. Farley Nuclear Plant
Request For Technical Specification Changes
Elimination of Containment Spray Additive System

Ladies and Gentlemen:

In accordance with the provisions of 10 CFR 50.90, Southern Nuclear Operating Company (SNC) proposes to amend the Farley Nuclear Plant (FNP) Unit 1 and Unit 2 Technical Specifications, Appendix A to Operating Licenses NPF-2 and NPF-8. This amendment will result in the deletion of containment systems specification 3.6.2.2, "Spray Additive System." This specification will be replaced with a new emergency core cooling system specification 3.5.6, "ECCS Recirculation Fluid pH Control System." The spray additive system will be spared in place or removed. The spray additive system will be replaced with an alternate means of pH control of the ECCS recirculation fluid. For Unit 2 Technical Specifications, the spray additive tank discharge valves will be deleted from specification table 3.8-2 for thermal overload bypass devices of safety-related motor-operated valves.

The containment spray system (CSS) is an engineered safety features system that functions to reduce reactor containment building pressure and temperature and the quantity of airborne fission products in the containment atmosphere subsequent to a loss of coolant accident (LOCA). Pressure and temperature reduction is accomplished by spraying water into the containment atmosphere. Sodium hydroxide is currently added to the containment spray water to increase the pH which enhances absorption of the airborne fission product iodine, retains the iodine in the containment sump solution, minimizes hydrogen production, and inhibits chloride induced stress corrosion cracking. The CSS currently uses the spray additive tank (SAT) to provide the caustic containment spray. Technical Specifications require SAT related tests and maintenance to be performed. This testing and maintenance is resource intensive, and the handling of concentrated sodium hydroxide solution requires special precautions due to its hazardous nature.

Draft revision 2 to the Standard Review Plan (SRP) section 6.5.2, "Containment Spray as a Fission Product Cleanup System," and industry precedence have made it possible to eliminate the spray additive portion of the CSS. The methodology of SRP 6.5.2 states that post-accident injection phase removal of elemental iodine (the predominant form) from the LOCA containment atmosphere is essentially independent of spray pH. This provides the basis for the elimination of the spray additive portion of the CSS, including the SAT, as well as the basis for the attendant Technical Specifications changes.

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The removal of the spray additive does not eliminate the need for adjusting the pH of the ECCS recirculation solution. To assure that the iodine removed by the sprays is retained in solution, to minimize chloride induced stress corrosion cracking on mechanical systems and components, and to minimize the hydrogen produced by the corrosion of galvanized surfaces and zinc-based paints, the long-term pH of the ECCS solution should be no less than 7.5. Since the initial pH of the boric acid ECCS solution, without spray additive, will be approximately 4.5, a chemical additive must be utilized to raise the pH of the solution in the containment building sump.

The proposed replacement for the liquid sodium hydroxide (NaOH) spray additive system consists of trisodium phosphate (TSP) stored in baskets located in the post-LOCA flooded region of the containment building. The initial containment spray (injection phase) will be a boric acid (2,300 to 2,500 ppm range) solution from the refueling water storage tank (RWST), which has a pH of approximately 4.5. As the initial spray solution, and subsequently, the recirculation solution comes in contact with the TSP, the TSP dissolves, raising the pH of the sump solution to an equilibrium value of 7.5 or greater.

The proposed recirculation fluid pH control system will have the same function as the present spray additive system; that is, to mitigate the effects of a LOCA. The change to a passive pH control system will eliminate the possibility of an active spray additive component failure.

SNC plans to replace the spray additive system during the next Unit 1 refueling outage in the Spring of 1997. The same change will be implemented during the Unit 2 refueling outage in the Spring of 1998. The Technical Specification changes are requested to be approved by March 8, 1997, in order to facilitate the replacement of the spray additive system during the next Unit 1 refueling outage. SNC requests implementation of the FNP Unit 1 Technical Specification changes prior to Mode 4 following the Spring of 1997 refueling outage. SNC requests implementation of the FNP Unit 2 Technical Specification changes prior to Mode 4 following the Spring of 1998 refueling outage.

This requested change is a Cost Beneficial Licensing Action (CBLA). The estimated savings over the life of both units is approximately $500,000.

Enclosure 1 provides a safety assessment for the proposed changes. Enclosure 2 provides the basis for a determination that the proposed changes do not involve significant hazards considerations pursuant to 10 CFR 50.92. Enclosure 3 provides the proposed changes to the Unit 1 Technical Specifications. Enclosure 4 provides the proposed changes to the Unit 2 Technical Specifications. Enclosure 5 provides the Units 1 and 2 marked-up Technical Specification pages.

As denoted in 10 CFR 50.92(c), SNC has determined the proposed changes to the FNP Technical Specifications do not involve a significant hazards consideration. The basis for this evaluation is provided in Enclosure 2. SNC has also determined that the proposed changes will not significantly affected the quality of the human environment. A copy of the proposed changes has been sent to Dr. D. E. Williams, the Alabama State Designee, in accordance with 10 CFR 50.91(b)(i).

Mr. D. N. Morey states that he is a vice president of Southern Nuclear Operating Company, and is authorized to execute this oath on behalf of Southern Nuclear Operating Company and that, to the best of his knowledge and belief, the facts set forth in this letter and enclosures are true.

Respectfully submitted,

SOUTHERN NUCLEAR OPERATING COMPANY

DN Morey

Dave Morey

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SWORN TO AND SUBSCRIBED BEFORE ME

THIS 15th DAY OF November, 1996

Martha Gayle Dow
Notary Public

MY COMMISSION EXPIRES: November 1, 1997

Enclosures:

1. Safety Assessment
2. 10 CFR 50.92 Evaluation
3. Unit 1 Technical Specification Pages
4. Unit 2 Technical Specification Pages
5. Units 1 & 2 Marked-Up Technical Specification Pages

cc: U. S. Nuclear Regulatory Commission
Mr. S. D. Ebneter, Regional Administrator
Mr. J. I. Zimmerman, Licensing Project Manager, NRR
Mr. T. M. Ross, Senior Resident Inspector, Farley

State of Alabama
Dr. D. E. Williams

Enclosure 1

Joseph M. Farley Nuclear Plant
Elimination of Containment Spray Additive System
Technical Specification Changes

Safety Assessment

Enclosure 1

Joseph M. Farley Nuclear Plant
Elimination of Containment Spray Additive System
Technical Specification Changes

Safety Assessment

Introduction

The Farley Nuclear Plant NPF-2 and NPF-8 Technical Specifications for the emergency core cooling systems (Technical Specification 3/4.5) and the containment spray additive system (Technical Specification 3/4.6.2.2) are proposed to be revised. The Farley Nuclear Plant NPF-8 Technical Specifications for the electrical protection devices (Technical Specification 3/4.8.3) are also proposed to be revised. The following is a summary of these proposed changes:

1. Add a new specification 3/4.5.6 for recirculating solution pH control to provide a means for raising the pH of the recirculated sump solution into the range of 7.5 to 10.5.
2. Delete the current specification 3/4.6.2.2 for limiting conditions for operations and surveillance requirements in its entirety.
3. For NPF-8 license, delete the spray additive tank discharge valves 2HV-8836A, B from the current specification table 3.8-2 for thermal overload bypass devices of safety-related motor-operated valves.
4. Revise specification bases 3/4.1.2 and 3/4.5.5 to indicate the range in pH for the ECCS recirculation fluid to be from 7.5 to 10.5 to minimize the potential for chloride and caustic induced stress corrosion cracking on mechanical systems and components, and ensure retention of iodine in the sump solution.
5. Add the bases for new specification 3/4.5.6 describing the requirement to raise the pH of the recirculated sump solution into the range of 7.5 to 10.5 to minimize the potential for chloride and caustic induced stress corrosion cracking on mechanical systems and components, and ensure retention of iodine in the sump solution.
6. Delete the bases for 3/4.6.2.2.

Safety Analysis Discussion and Evaluation

Draft Revision 2 to the Standard Review Plan (SRP) Section 6.5.2, "Containment Spray as a Fission Product Cleanup System," and industry precedence have made it possible to eliminate the spray additive portion of the containment spray system. The methodology of SRP 6.5.2 identifies that post-accident injection phase removal of elemental iodine (the predominant form) from the LOCA containment atmosphere is essentially independent of spray pH. Thus, this change eliminates the spray additive portion of the containment spray system, including the spray additive tank (SAT).

The removal of the spray additive does not eliminate the need for adjusting the pH of the emergency core cooling system (ECCS) recirculation solution. To assure that the iodine removed by the sprays is retained in solution, to minimize chloride induced stress corrosion cracking on mechanical systems and components, and to minimize the hydrogen produced by the corrosion of galvanized surfaces and zinc-based paints, the long-term pH of the ECCS solution should be no less than 7.5. Since the initial pH of the boric acid ECCS solution, without spray additive, will be approximately 4.5, a chemical additive must be utilized to raise the pH of the solution in the containment building sump.

The replacement for the liquid sodium hydroxide (NaOH) spray additive system consists of trisodium phosphate (TSP) stored in baskets located in the post-LOCA flooded region of the containment building.

The initial containment spray (injection phase) will be a boric acid (2,300 to 2,500 ppm range) solution from the refueling water storage tank (RWST), which has a pH of approximately 4.5. As the initial spray solution and subsequently the recirculation solution comes in contact with the TSP, the TSP dissolves, raising the pH of the sump solution to an equilibrium value of 7.5 or greater.

The proposed recirculation fluid pH control system will have the same function as the present spray additive system; that is, to mitigate the effects of a LOCA. The change to a passive pH control system will eliminate the possibility of an active spray additive component failure. Eliminating spray additive will also minimize the exposure of plant personnel to the caustic NaOH and reduce plant testing and maintenance resources currently required for the system.

The components associated with the spray additive system are being either spared in place or removed. The blind flanges installed in the eductor lines will meet ASME Section III Class 3 requirements. The containment spray piping will continue to meet the plant seismic and ASME Section III Class 3 requirements.

Level indicators and flow indicators and the hand switches will be removed from the Main Control Board (MCB) and replaced with cover plates. These changes do not result in any significant mass variation when compared to the overall MCB mass. The MCB's response to seismic input will be unaffected by this change and can still be considered seismically qualified.

Three (3) TSP storage baskets will be located in the recirculation sump area with a total minimum capacity of approximately 10,000 pounds (185 cubic feet) of TSP compound as $Na_3PO_4 \cdot 12H_2O \cdot \frac{1}{4}NaOH$ (or appropriate weights/volumes for equivalent compounds). An equivalent amount of trisodium phosphate compound with a different chemical formula may be used. When equivalent compounds are used, the allowable weights/volumes may be different; however, the equivalent amount of trisodium phosphate compound must raise the pH of the recirculating solution into the range of 7.5 to 10.5. The baskets are designed to Seismic Category 1 standards and will be bolted (anchored) to the filler slab at elevation 105'-6". The seismic accelerations for the base slab were used in the seismic design of the baskets. The natural frequencies of each basket were used in determining the seismic loads for each basket.

The metal mass for the three TSP baskets and supports adds a heat sink to the containment, and the deletion of the SAT water inventory removes a heat sink. The impact of the additional metal heat sink on the peak clad temperature (PCT) has been reviewed and determined to be acceptably small, less than +1°F, so that the requirements of 10 CFR 50.46 continue to be met.

The high energy pipe break analysis described in FSAR Section 3.6 was reviewed for jet impingement on the TSP baskets. The results indicated that there is one case where a pipe break jet may impinge on one of the TSP baskets. A 1/4" plate was added to the two sides potentially impacted. This will not reduce the dissolution rate of the TSP as no credit is taken for dissolution of TSP from the basket sides. The basket loads were then evaluated and determined to be acceptable.

The flooded post-LOCA recirculation sump level will not be significantly changed (i.e., <1/2") due to the addition of the TSP and the TSP baskets and deletion of the SAT water volume, and thus does not warrant revision as the equipment located above the sump flood level would remain above the flooded post-accident environment. Further, the deletion of the unborated water volume in the SAT will result in a small, but insignificant, increase in the boron concentration of the recirculation fluid.

Analyses were conducted to ensure that effects such as vortexing, reduction of net positive suction head (NPSH), and screen blockage will not result in degraded residual heat removal (RHR) or containment spray pump/system performance. Containment sump hydraulic model studies were previously performed to determine if the intake velocities at the sump intakes were large enough to create pump suction vortex problems. The results of these studies indicated that there were no problems when the grating cage and trash-rack screen were installed over the sumps. The proposed change will not have an adverse impact on the function of the grating cage or the trash-rack screen to minimize pump suction vortex problems. Therefore, there is no adverse effect on the previous sump hydraulic model studied.

The pH of the sump solution will be adjusted to at least 7.5 to counteract the buildup of chloride concentrations to critical levels. Equipment in containment will be exposed to a low pH solution (approximately 4.5) for a short period of time during the spray injection phase. During this time, the TSP will begin to dissolve and the pH of the ECCS sump solution will be raised into the range of 7.5 to 10.5. The surfaces sprayed during the injection phase will eventually be re-sprayed during the recirculation phase with a high pH solution. Materials qualified for long term exposure to a high pH solution will not be adversely affect by short term exposure to a low pH solution.

Aluminum and zinc corrosion are sources of possible hydrogen generation affected by this change. The proposed change will affect the pH by introducing an initial pH of 4.5 (borated water spray) followed by a pH range of 7.5 to 10.5 using TSP. This is effectively a lower pH than the current range of 8.5 to 11.0, using sodium hydroxide. The corrosion of aluminum decreases with decreasing pH; therefore, the hydrogen generation resulting from aluminum corrosion will decrease with the use of TSP. The corrosion of zinc and zinc-based paints, which is highly dependent on temperature, has been shown to be similar for the pH ranges of sodium hydroxide and TSP sprays. Elimination of the spray additive will have little net effect on hydrogen generation due to the corrosion of aluminum and zinc in the post-LOCA containment environment.

The proposed change to a lower initial pH of 4.5 and a lower equilibrium pH of 7.5 to 10.5 is expected to have no effect on equipment qualification or protective coating, since both are currently analyzed for the more limiting condition of high pH for long term periods.

Offsite and Control Room thyroid doses were re-evaluated considering the impact of lower pH during the injection phase. The results are within 10 CFR 100 and General Design Criteria (GDC) 19 limits.

Enclosure 2

Joseph M. Farley Nuclear Plant
Elimination of Containment Spray Additive System
Technical Specification Changes

10 CFR 50.92 Evaluation

Enclosure 2

Joseph M. Farley Nuclear Plant
Elimination of Containment Spray Additive System
Technical Specification Changes

10 CFR 50.92 Evaluation

Pursuant to 10 CFR 50.92, SNC has evaluated the proposed amendments and has determined that operation of the facility in accordance with the proposed amendments would not involve a significant hazards consideration. The basis for this determination is as follows:

1. The proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated. The proposed change involves replacement of concentrated NaOH injected via the containment spray system with trisodium phosphate (TSP) stored in the containment and dissolved in the sump recirculation solution to maintain acceptable post accident spray/recirculation solution chemistry. Deletion of the concentrated NaOH will eliminate a personnel hazard. The pH control system functions in response to an accident and does not involve or have any effect on any initiating event for any accident previously evaluated. Operation under the proposed amendments will continue to ensure that iodine potentially released post-LOCA is retained in the sump solution, and resultant offsite and control room thyroid doses are within the limits of 10 CFR 100 and 10 CFR 50, Appendix A, General Design Criterion 19, respectively.

2. The proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated. The deleted equipment is isolated from the remaining equipment by cut-and-capped piping, determinated and/or spared cables; and interfaces are analyzed to ensure the remaining required equipment meets applicable original design requirements. The new equipment (TSP and baskets) is a passive pH control system and is supported and analyzed to ensure there are no adverse interfaces (e.g., pipe break, jet impingement, seismic) with existing equipment, system, or structures.

3. The proposed change does not involve a significant reduction in a margin of safety. The slight change in recirculation solution pH maintains adequate protection against chloride and caustic induced stress corrosion cracking on mechanical systems and components, and maintains the capability of the solution to retain iodine. It does not result in a change to the hydrogen generation analysis for containment. The increased mass inside containment will have no significant impact on post-accident flood levels, recirculation solution boron concentration, or peak clad temperatures. No other operating parameters for systems, structures, or components assumed to operate in the safety analysis are changed. The offsite and control room doses meet the limits of 10 CFR 100 and GDC 19, respectively. Because the trisodium phosphate is nonvolatile and the baskets are protected with solid covers and are located slightly above the floor in the containment where access is strictly controlled, a surveillance interval of once per refueling outage provides assurance that the TSP will be available

Conclusion

Based on the preceding analysis, SNC has determined that the proposed change to the Technical Specifications will not significantly increase the probability or consequences of an accident previously evaluated, create the possibility of a new or different kind of accident from any accident previously evaluated, or involve a significant reduction in a margin of safety. SNC therefore concludes that the proposed change meets the requirements of 10 CFR 50.92(c) and does not involve a significant hazards consideration.