UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 30 AND 21 TO

FACILITY OPERATING LICENSE NOS. NPF-76 AND NPF-80

HOUSTON LIGHTING & POWER COMPANY

CITY PUBLIC SERVICE BOARD OF SAN ANTONIO

CENTRAL POWER AND LIGHT COMPANY

CITY OF AUSTIN, TEXAS

DOCKET NOS. 50-498 AND 50-499

SOUTH TEXAS PROJECT, UNITS 1 AND 2

1.0 INTRODUCTION

By application dated October 30, 1990 (ST-HL-AE-3378), as supplemented by letter dated September 25, 1991 (ST-HL-AE-3879), Houston Lighting & Power Company, et. al., (the licensee) requested changes to the Technical Specifications (Appendix A to Facility Operating License Nos. NPF-76 and NPF-80) for the South Texas Project, Units 1 and 2. The proposed changes would replace Technical Specification (TS) 3/4.6.2.2 "Spray Additive System" with a new specification entitled "Recirculation Fluid pH Control System" to be consistent with a planned plant modification which would eliminate the containment spray additive system for Unit 2. The September 25, 1991, letter informed the staff that the proposed plant modification related to the TS change would be made to Unit 2 during the current refueling outage (2RE02). The Unit 1 change will be made during its fourth refueling outage (1RE04) which is scheduled to begin in October 1992. Until then, the TS regarding the Spray Additive System will be applicable to Unit 1 only and has been identified as TS 3/4.6.2.4. The September 25, 1991, submittal provided additional clarifying information and did not change the initial no significant hazards consideration determination.

2.0 BACKGROUND

In the original design of the South Texas Project (STP) sodium hydroxide additive was used to control pH of the containment spray solution in order to enhance removal of elemental iodine from the post-accident containment atmosphere and prevent stress corrosion cracking of austenitic steel components. The pH was maintained at 7.5 to 10.5 in the sprays and 7.5 to 10 in the sump. At the time the plant was designed, it was believed that these high pH values were required to remove elemental iodine.

As more information was developed about iodine removal, it was found that in an iodine free solution the pH could be maintained at much lower values and still be effective in removing elemental iodine from the containment atmosphere. In addition, it was found that most of the iodine would be in a cesium iodide form and could dissolve in water regardless of its pH. Therefore, it was not necessary to control the pH of the spray water as long as it was free of dissolved iodine. However, when iodine containing water is used, as for example during the recirculation phase spraying, pH would have to be maintained above seven in order to retain the iodine in solution. A pH higher than seven would also have to be maintained to prevent chloride induced stress corrosion cracking of austenitic steel components exposed to spray water and minimize evolution of hydrogen from the corrosion of zinc on galvanized surfaces and in zinc-based paints. These requirements are reflected in Sections 6.1.1 and 6.5.2 of the Standard Review Plan (SRP). In the submittal, the licensee proposed to use borated water with the lowest pH of 4.5 and control sump water pH between 7 and 9.5 with trisodium phosphate from the baskets placed in the containment sump.

3.0 EVALUATION

The staff reviewed the licensee's analysis, the information included in WCAP-12477, "Spray Additive Elimination Analysis for the South Texas Project", and performed its own independent verification as part of the evaluation.

3.1 Chemical Considerations for the Removal of the Spray Additive System

During the injection phase, the licensee proposed to operate the containment sprays with borated water without sodium hydroxide additive. The pH of this borated water could be as low as 4.5. Using the information currently available on iodine removal and the guidance provided in Section 6.5.2 of the SRP, the licensee has demonstrated that this low value of pH would not affect removal rates of the elemental and particulate iodine from the post-accident containment atmosphere. These rates are determined by the first-order removal coefficients which for elemental iodine removal by spray water and by deposition on the containment walls are independent of pH and, therefore, not affected by elimination of the pH controlling additive. The same applies to the removal coefficient for particulate iodine which is controlled by the hydrodynamic characteristics of the sprays. The licensee calculated these coefficients using the methods given in Section 6.5.2 of the SRP and found them not to differ significantly from the values used in the previous evaluation.

During the recirculation phase spray, water will come from the sump and will contain dissolved iodine removed from the containment atmosphere during the injection phase. In a radiation environment this iodine could be desorbed from the water and released to the containment atmosphere if the pH of the solution is too low. In order to prevent that from happening, the pH of the sump solution should be kept above seven. The licensee proposed to control pH by having solid trisodium phosphate in the sump which will dissolve as soon as it comes in contact with the sump water and will buffer the pH to a value above seven.

In addition to retaining the iodine in solution, the sump water must be maintained in an alkaline condition in order to minimize corrosion of metallic surfaces. Chloride induced stress corrosion cracking of austenitic stainless steel components is considerably reduced if the pH of the solution is maintained above seven. Short exposure to water with a pH of 4.5 during the injection phase will not cause significant stress corrosion cracking, but more extended exposure during the recirculation phase or in the sump may result in significant damage. Section 6.1.1 of the SRP (Branch Technical Position MTEB 6-1) recommends that pH be maintained in the 7 to 9.5 range.

Control of sump pH is also required to minimize hydrogen generation by corrosion of aluminum and zinc on galvanized surfaces and in the organic coatings on containment surfaces. The licensee has shown that the proposed lowering of the spray pH will have no significant effect on the corrosion rates of aluminum as long as the pH stays above 4.5. Zinc in paints and in organic coatings will corrode and produce hydrogen. However, the licensee, using the results from the NRC sponsored studies performed at Sandia, has demonstrated that with controlled pH these corrosion rates will be low and no significant amounts of hydrogen would be produced.

Change of pH will have no significant effect on seals and insulation materials in the electrical equipment located in the containment. This equipment has been environmentally qualified for long term exposure at high pH and will not be adversely affected by short term exposure to low pH solution.

In order to control the sump pH, the licensee intends to have between 11500 and 15100 lbs. of trisodium phosphate in six sump baskets. This amount of salt, when dissolved in sump water, will maintain its pH between 7 and 9.5. Trisodium phosphate is an easily soluble substance and in warm sump water its dissolution should take no more than 1.5 hours. The licensee in the proposed TS proposed to verify the integrity of the trisodium phosphate containing baskets and the level of the salt in individual baskets during each refueling outage.

3.2 Dose Considerations for the Removal of the Spray Additive System

The licensee presented an evaluation, "Spray Additive Elimination Analysis for the South Texas Project," (WCAP 12477), in their submittal, which indicated that utilization of the methodology of SRP 6.5.2 would result in a containment spray removal rate constant for elemental iodine of 20/hr. Using the information in SRP Section 6.5.2, the licensee calculated an iodine particulate removal rate constant of 6.9/hr for the period of time in which the ratio of the initial concentration to the concentration at a time t (C_o/C_t) was less than or equal to 50 and a removal rate constant of 0.7/hr for C_o^t/C_t^t greater than 50.

In the accident evaluation orginally approved by the staff, the licensee assumed that 50 percent of the airborne radioiodine plated out immediately. In the licensee's analysis which accompanied the removal of the spray additive tanks, a time dependent deposition model was used. The licensee utilized a

deposition removal rate of 4.5/hr for the period of time until the initial airborne concentration (C_o) had been reduced by a factor of 100. After this time period, the removal rate was assumed to continue at five percent of the initial value until a decontamination factor of 200 was reached. After that time, no credit was taken for iodine deposition.

The licensee calculated the decontamination factor for elemental radioiodine in the sump solution. For the South Texas units this value was determined to be approximately 60. With this decontamination factor, the licensee estimated that 98.3 percent of the iodine released to the containment would be retained in the sump solution.

The staff has evaluated the proposed licensing change and determined that the impact of these changes upon the doses associated with the various design basis accidents. The safety evaluation supporting license amendments 28 (Unit 1) and 19 (Unit 2) provided the results of its review of the dose consequences associated with a large break LOCA and the impact of a heater failure in the control room or fuel handling building HVAC systems on the control room operator doses, in addition to other analyses. The staff determined in that evaluation that the control room operator doses were within the requirements of GDC 19 and that the offsite exposures at the site boundary and at the low population zone were within the requirements of 10 CFR Part 100. Based upon this most recent evaluation and the South Texas Project SER, "SER Related to the Operation of South Texas Units 1 and 2", NUREG-0781, April 1986, the staff has determined that the radiological doses as a result of the removal of the spray additive tanks are less than the doses discussed in the safety evaluation supporting the aforementioned license amendments and are still within the requirements of GDC 19 and 10 CFR Part 100.

4.0 SUMMARY

Based on the above evaluation, the staff concludes that: (1) the modifications to the South Texas Project containment spray system proposed by the licensee meet the requirements of General Design Criterion 41 for providing a satisfactory means of post-accident containment atmosphere cleanup; (2) the proposed revised technical specifications for surveillance of trisodium phosphate in the containment sump meet the requirements of General Design Criterion 42 for inspection of the containment atmosphere cleanup systems, (3) the offsite doses at the site boundary or the low population zone will not exceed that allowed by 10 CFR Part 100 and (4) the doses to the control room operators would still be within the requirements of GDC 19.

5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Texas State official was notified of the proposed issuance of the amendment. The State official had no comments.

6.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (56 FR 47971). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

7.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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