The Light company Houston Lighting & Power P.O. Box 1700 Houston, Texas 77001 (713) 228-9211

April 24, 1985
ST-HL-AE-1234
File No.:G12.188

Mr. Robert D. Martin
Regional Administrator, Region IV
Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76011

South Texas Project
Units 1 & 2
Docket Nos. STN 50-498, STN 50-499
Final Report Concerning
Containment Spray pH

Dear Mr. Martin:

On September 21, 1984, Houston Lighting & Power Company (HL&P) informed the Nuclear Regulatory commission (NRC) of a reportable deficiency pursuant to 10CFR50.55(e) concerning spray pH levels that exceed equipment qualification limits. Attached is the final report on this item.

If you should have any questions concerning this matter, please contact Mr. Michael E. Powell at (713) 993-1328.

Very truly yours,

J. H. Goldberg

J. H. Goldberg
Group Vice President, Nuclear

MEP:yd

Attachment: Final Report Concerning Containment Spray pH

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W2/NRC2/f

cc:

Hugh L. Thompson, Jr., Director
Division of Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

N. Prasad Kadambi, Project Manager
U.S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, MD 20814

Claude E. Johnson
Senior Resident Inspector/STP
c/o U.S. Nuclear Regulatory Commission
P. O. Box 910
Bay City, TX 77414

Dan Carpenter
Resident Inspector/South Texas Project
c/o U.S. Nuclear Regulatory Commission
P. O. Box 2010
Bay City, TX 77414

M. D. Schwarz, Jr., Esquire
Baker & Botts
One Shell Plaza
Houston, TX 77002

J. R. Newman, Esquire
Newman & Holtzinger, P.C.
1615 L Street N.W.
Washington, DC 20036

Director, Office of Inspection
and Enforcement
U.S. Nuclear Regulatory Commission
Washington, DC 20555

E. R. Brooks/R. L. Range
Central Power & Light Company
P. O. Box 2121
Corpus Christi, TX 78403

H. L. Peterson/G. Pokorny
City of Austin
P. O. Box 1088
Austin, TX 78767

J. B. Poston/A. vonRosenberg
City Public Service Board
P. O. Box 1771
San Antonio, TX 78296

Brian E. Berwick, Esquire
Assistant Attorney General for
the State of Texas
P. O. Box 12548, Capitol Station
Austin, TX 78711

Lanny A. Sinkin
3022 Porter Street, N.W. #304
Washington, D.C. 20008

Oreste R. Pirfo, Esquire
Hearing Attorney
Office of the Executive Legal Director
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Charles Bechhoefer, Esquire
Chairman, Atomic Safety & Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dr. James C. Lamb, III
313 Woodhaven Road
Chapel Hill, NC 27514

Judge Ernest E. Hill
Hill Associates
210 Montego Drive
Danville, CA 94526

Mr. Ray Goldstein, Esquire
1001 Vaughn Building
807 Brazos
Austin, TX 78701

Citizens for Equitable Utilities, Inc.
c/o Ms. Peggy Buchorn
Route 1, Box 1684
Brazoria, TX 77422

Docketing & Service Section
Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Attachment
ST-HL-AE-1234
File No.: G12.188

South Texas Project
Units 1 and 2
Final Report Concerning
Containment Spray pH

I. Summary

On August 7, 1984, Westinghouse informed Bechtel that the present containment spray system (CSS) design cannot maintain the spray pH less than 10.5 under all conditions. The pH value of 10.5 is the upper limit on the design bases for the South Texas Project (STP) CSS. The basis for equipment qualification of non-Westinghouse equipment for chemical spray is a pH range of 8.5 to 10.5. The Westinghouse WCAP 8587, "Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety Related Electrical Equipment," includes a specification of 10.5 pH for chemical spray environmental qualification.

The consequence of this condition if left uncorrected is that the environmental qualification envelope for safety-related equipment inside containment would be exceeded.

During the design review to correct this deficiency it was determined that under other conditions, a low pH and resulting offsite dose problem could exist. The design modifications described herein will correct both the high and low pH problems.

II. Description of Deficiency

On August 21, 1984, Houston Lighting & Power Company (HL&P) notified the NRC Region IV that the above item concerning the inability of the current CSS to maintain the pH less than 10.5 had been determined to be potentially reportable to 10CFR50.55(e). This item was discovered during a review of the CSS design.

Westinghouse has indicated that inappropriate modeling used in the analysis of containment spray pH for the STP was the source of this design deficiency. Specifically, during the recirculation phase, sodium hydroxide is still being added to the containment spray flow from the Spray Additive Tank (SAT). This sodium hydroxide, coupled with the additive already contained in the containment sump (which is being recirculated) determines the spray pH. The Westinghouse calculation neglected sodium hydroxide present in the sump in calculating recirculation mode spray pH. Modified calculations, performed by Westinghouse, indicate that the present system could allow the spray pH to be as high as 12.0 during the recirculation phase. The consequence of this deficiency if left uncorrected is that equipment qualification chemical environment limits for equipment inside containment would be exceeded.

Further evaluation of the existing system under assumptions which maximize calculated offsite doses identified a concern that 10CFR100 offsite dose limits may be exceeded using current analytical methods. The following design conditions contribute to this result. First, the spray additive eductors employed on STP are not designed to function at motive fluid temperatures exceeding 160°F, a condition which may exist during the early portion of the recirculation phase. Spray pH is assumed equal to sump pH during this period. Spray pH could be as low as 7.8 with conservative assumptions. Second, the CSS discharge piping arrangement may result in a low spray pH in one of the two spray risers in the event of a single failure of a spray additive tank isolation valve to open. As a result, spray pH on one side of the containment may be as low as 7.7 during the injection phase. Using current analytical methods, which require consideration of iodine re-evolution due to low sump pH (below 8.5), calculated offsite doses for the above described conditions may exceed 10CFR100 limits.

III. Corrective Action

The corrective action for high recirculation phase spray pH is to isolate the spray additive tanks at the end of the injection phase. The corrective action to ensure that offsite doses do not exceed 10CFR100 limits is to provide a sump additive tank that directs NaOH to the containment floor at switchover from the injection phase to the recirculation phase.

Direct addition of sodium hydroxide to the floor of containment will ensure that the containment sump pH, which becomes the spray pH during the recirculation mode, is high enough to meet design objectives of removal of iodine from the post-accident containment atmosphere and subsequent retention of iodine in the containment sump. Although this corrective action does not specifically address the second condition contributing to high offsite doses discussed above, the condition of low spray pH on one side of containment during the injection phase is not sufficient to result in high offsite doses once the recirculation phase pH problem has been corrected. Isolation of the spray additive tanks at the end of the injection phase ensures that high spray pH will not occur during the recirculation phase. This remains true in the event of a single failure of a spray additive tank isolation valve to close.

Implementation of these design changes will ensure that spray pH will be maintained less than 10.5 during the entire injection and recirculation phases, satisfying the existing equipment qualification limits for equipment located inside containment. In addition, the preliminary LOCA dose analysis for the control room, technical support center, and offsite indicates that these design modifications result in acceptable dose levels.

IV. Recurrence Control

An isolated error in the analysis of containment spray pH by Westinghouse has been identified as the cause of the deficiency. Therefore, no recurrence control is required.

V. Safety Analysis

The environmental qualification of equipment would be suspect if this situation were left uncorrected since, with the current design, the environmental qualification parameters specified for chemicals would be exceeded. Safety-related equipment (non-Westinghouse) has been qualified for a pH range of 8.5 to 10.5. Westinghouse supplied safety-related electrical equipment has been qualified to a pH of 10.5.

Since the pH range falls outside the environmental qualification range for safety-related equipment, it is assumed that until corrected a safety hazard exists and that the condition is reportable under 10CFR50.55(e). In addition 10CFR100 limits may have been exceeded for the low pH range.