Omaha Public Power District
444 South 16th Street Mall
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U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, D.C. 20555

References:
1. Docket No. 50-285
2. Letter from NRC (L. R. Wharton) to OPPD (T. L. Patterson) dated December 9, 1996 (TAC No. M74412)
3. Letter from OPPD (W. G. Gates) to NRC (Document Control Desk) dated June 26, 1995 (LIC-95-0112)(TAC No. M92801)
4. Letter from OPPD (W. G. Gates) to NRC (Document Control Desk) dated July 11, 1995 (LIC-95-0109)(TAC No. M92926)
5. Letter from OPPD (S. K. Gambhir) to NRC (Document Control Desk) dated May 8, 1997 (LIC-97-041)

SUBJECT: Human Reliability Analysis for Fort Calhoun Station (FCS) Low Pressure Safety Injection Pump and Safety Injection Tank Allowed Outage Time Extensions

Omaha Public Power District (OPPD) submitted, via References 3 and 4, Applications for Amendments to revise the FCS Technical Specifications for Low Pressure Safety Injection (LPSI) pumps and Safety Injection Tanks (SITs). These submittals are part of the Combustion Engineering Owners Group risk-based Allowed Outage Time (AOT) extension pilot project.

As part of the review of the AOT extension requests, Ms. Nanette Gilles and Mr. Millard Wohl of the NRC staff visited FCS on December 11, 1996. Based on discussions during this visit, OPPD agreed to perform an additional sensitivity analysis to evaluate the impact of the HRA on the specific risk-based applications submitted in References 3 and 4. The attachment to this letter describes this analysis.

Also, in Reference 2 the NRC documented review of the FCS Individual Plant Examination (IPE) completed in response to Generic Letter 88-20. This document stated that if the FCS IPE were applied in support of risk-based regulatory applications, additional treatment of Human Reliability Analysis (HRA) should be conducted. As additional background, the Reference 5 letter submitted by OPPD addresses perceived weaknesses in the FCS HRA methodology on a generic basis.

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Please contact me if you have any questions.

Sincerely,

S. K. Gambhir
Division Manager -
Engineering & Operations Support

TCM/tcm

Attachment

c: Winston & Strawn
E. W. Merschoff, NRC Regional Administrator, Region IV
L. R. Wharton, NRC Project Manager
W. C. Walker, NRC Senior Resident Inspector
N. V. Gilles, NRC/NRR
M. L. Wohl, NRC/NRR
P. J. Hijeck, CEOG Assistant Project Manager

HUMAN RELIABILITY ANALYSIS RELATED TO LPSI AND SIT APPLICATIONS

Definitions

SIRWT - Safety Injection and Refueling Water Tank, the reservoir used for the injection phase of post-accident mitigation.

RAS - Recirculation Actuation Signal, which is generated automatically when the SIRWT level reaches approximately 16 inches; RAS causes the suction for the Safety Injection Pumps and Containment Spray Pumps to swap from the SIRWT to the containment sump

Human Failure Events

Three human failure events were identified relevant to the LPSI and SIT Allowed Outage Time (AOT) extension requests, and all of these actions represent pre-initiator maintenance errors. These errors involve the miscalibration of the pressure transmitters for the SI Tanks (BHFLSITPRS), miscalibration of the SIRWT level switches causing failure of RAS to initiate (GHFC00STLS), and miscalibration of the SIRWT level switches causing RAS to initiate prematurely (GHFLPRESS). These basic events have a failure probability of 3.00E-4 in the IPE. When the failure probabilities for all three of these human actions were increased by one order of magnitude, the resulting conditional CDF, assuming one SIT is out for maintenance, increased from 2.18E-5/year to 2.35E-5/year, an increase of 7.7%.

Safety Injection Tanks

The only HRA parameter directly associated with the SITs involves the gross miscalibration of the pressure transmitters which provide indication of the nitrogen overpressure in the SITs. The SITs are passively actuated based on tank overpressure relative to Reactor Coolant System pressure, and thus do not require the pressure transmitters to inject. Miscalibration errors are highly unlikely events and assume a miscalibration sufficient to defeat the overall function of the system by indicating SIT pressures well above actual pressures. In the evaluation of the SIT pressure transmitter miscalibration, it is assumed that a common cause miscalibration of all the transmitters occurs and that the error is sufficiently large so as to defeat the function of the SIT.

Best estimate analyses indicate that for a typical large cold leg LOCA, the excess inventory injected from the SITs spills onto the containment floor after the downcomer is filled to the elevation of the RV nozzles. This inventory loss is equivalent to the liquid inventory of one SIT. Therefore, for the pressure transmitter miscalibration to have any impact on the LOCA transient, it would have to be large enough to prevent the discharge of one-third of the SIT inventory for each SIT connected to an intact cold leg. This would require a miscalibration of the sensor such that an indicated SIT tank pressure of 240 psig would reflect an actual SIT pressure of less than 100 psig. This condition is extremely unlikely; therefore, the present HRA failure probability used for this miscalibration is considered conservative. The impact of HRA modeling on the SIT evaluations used to support the AOT extension request is negligible.

Low Pressure Safety Injection

The remaining two miscalibration errors account for potential miscalibration of the SIRWT level switches and are primarily related to the LOCA initiating event and particularly impact the availability of HPSI. These HRA errors have a negligible impact on the LPSI AOT. For event GHFC00STLS, it is assumed that the miscalibration results in a delayed actuation of RAS. This can result in loss of suction for the HPSI, LPSI, or CS pumps by drawing on an empty SIRWT. Although operator action to manually initiate RAS is possible, such action has not been credited in the above CDF estimate for large LOCA. Analogously, the last miscalibration error considers the possibility of the level switch to be miscalibrated high. This results in premature initiation of RAS. For a limited band of level switch miscalibration, this could result in an automatic realignment of the HPSI pumps to a sump with an inadequate NPSH. It is assumed that the HPSI pumps would lose suction and therefore fail. Again, operator intervention has not been credited in the above CDF estimate.

Independent of the HRA as modeled, parameters involving yearly increases in CDF would not be affected because these numbers are presented in terms of deltas from current risk, and any change in the human error probabilities would be true for the base case as well as the case for the proposed AOT extension.

Conclusion

OPPD noted in References 3 and 4 that extending the AOTs for the LPSI pumps and the SITs is risk beneficial. Based on the additional analysis summarized above, this risk beneficial conclusion for the AOT extensions is still valid.