Entergy

Entergy Operations, Inc.
River Bend Station
5485 U.S. Highway 61
P. O. Box 220
St. Francisville, LA 70775
Tel 225 336 6225
Fax 225 635 5068

Rick J. King
Director
Nuclear Safety Assurance

November 29, 2000
U.S. Nuclear Regulatory Commission
Document Control Desk, OP3-17
Washington, D.C. 20555-0001

Subject: Supplemental Information Related to SLC Foreign Material Unresolved Item
River Bend Station - Unit I
License No. NPF-47
Docket No. 50-458

References: 1) Licensee Event Report 50-458 / 00-013-00 dated October 13, 2000 (RBG-45513)
2) OE9813 - Inoperability of the Standby Liquid Control System During Air Sparging Operation

File Nos.: G9.5, G15.4.1
RBG-45567
RBF1-00-0255

Ladies and Gentlemen:

The NRC's Senior Resident Inspection Exit of November 17, 2000, provided RBS with an unresolved item related to foreign material discovered in the Standby Liquid Control (SLC) Storage Tank on September 14, 2000 (reference 1). After identification of the subject concern, a Significant Event Response Team (SERT) was formed to investigate. As a part of the investigation, the safety significance of the condition was evaluated. This letter provides additional risk significance and past operability information related to this incident.

The SLC System is a redundant, independent reactivity control system for use in the unlikely event that the control rod drive system fails to insert control rods when required. The system will inject borated water in sufficient concentration and quantity to shut down and maintain the reactor subcritical when the reactor is cold and xenon free. Emergency Operating Procedures specify the plant conditions requiring SLC injection.

IE22

An evaluation of the operability of the SLC tank considering the as found configuration of the trash bag pieces within the SLC tank has been performed. Based on the this evaluation, the SERT concluded that the SLC system would have been able to perform its safety function provided that the SLC storage tank was in a steady-state condition (i.e., plastic bag pieces that are not attached to underwater components are floating on the surface of the SLC solution). At the time of discovery, the majority of the plastic bag pieces were floating on the surface and would not have reached the pump suction until well after the minimum required solution had been pumped into the reactor. The closest piece of the plastic trash bag was attached to the air sparger piping approximately 4.5 feet from the suction nozzle. Two other trash bag pieces were attached to the air sparger piping and under the mixing heater approximately 6.0 feet and 6.3 feet from the suction nozzle respectively.

To determine whether a piece of plastic attached to the air sparger piping would have entered the suction of the pump in the event that it detached during SLC operation, an evaluation was performed using the following assumptions:

1. Plastic pieces in the solution have a rise velocity between the minimum (0.0281 ft/s) and maximum (0.0540 ft/s) velocities observed during rise velocity testing in water.
2. The centerline of the outlet pipe is 3.63" above the bottom of the tank. The air support structure is 3.25" above the bottom.
3. When SLC pump is in operation, the flow inside the tank is driven by the gravity force only. The flow is laminar and no turbulence is expected.
4. The fluid inside the tank before SLC injection is stagnant.
5. No vortex effects will be considered since the outlet is on the side of the tank.
6. The analysis assumes a spherical flow field. Along a spherical surface with a radius of r and the outlet at the center, the flow velocity has the same magnitude. Since the volume of the SLC tank is limited and the outlet is on the side close to the bottom, non-uniform flow field is expected. For conservatism, the spherical surface area calculated is only 1/12 of the total spherical surface area, which corresponds to half of a 60° stripe (1/6 of total 360°).
7. The SLC injection flow rate is 43 gpm.

This evaluation demonstrated that even when the lowest rise velocity (i.e., most conservative) is considered, the closest observed piece of plastic (a distance of 4.5 feet from the tank outlet) would not have been drawn into the SLC pump suction if it had detached during SLC injection. To address the possibility that a piece of plastic had been located closer to the SLC tank outlet and subsequently detached prior to discovery, an evaluation was performed for a piece of plastic 3.0 feet from the SLC outlet. This distance was chosen based on the configuration of the underwater components and the observed plastic migration. This evaluation determined that a piece of plastic at the closest postulated point also would not have entered the SLC pump suction piping.

Although this analysis demonstrates SLC operability while the storage tank was in a steady-state condition, the foreign material response to air sparging cannot be accurately predicted. Storage tank air sparging is normally performed for approximately 10 minutes prior to the monthly chemistry sample. Testing of the foreign material and videotape observations taken during the tank cleanout, confirmed that the plastic floated in the SLC solution. In addition, agitation of a container of water and trash bag pieces caused the plastic to submerge, with a brief time delay observed prior to the material floating back to the surface. Administrative controls are implemented to ensure SLC is not initiated while air is flowing into the tank (reference 2). Therefore, the only time period that SLC operability cannot be demonstrated is during the brief time period required for the plastic to float to the surface following air sparging.

The EPRI PSA Applications Guide (EPRI TR-105396) shows that the upper limit for non-risk significant changes in Conditional Core Damage Probability is 1.0×10^{-6}. This guide states the temporary risk increase criteria is the proper criteria to apply for event significance assessments. Incremental risk is calculated as follows:

Incremental Risk = (Instant. CDF (/yr) – base CDF) * Actual time (days) /365 d/year

The River Bend Station (RBS) PRA Revision 2D has a Zero Maintenance Baseline Core Damage Frequency of 2.48×10^{-6}/year. The instantaneous risk with the SLC system out of service is 2.51×10^{-6}/year. Conservatively assuming an entire day for the SLC tank to reach equilibrium conditions following the monthly air sparging results in a yearly SLC out of service time of 12 days and the following incremental risk:

Risk = $(2.51 \times 10^{-6}/\text{year} - 2.48 \times 10^{-6}/\text{year}) * (12 \text{ days} \div 365 \text{ days/year}) = 9.9 \times 10^{-10}$

Therefore, using the methodology for temporary changes in the EPRI Probabilistic Safety Assessment Applications Guide (EPRI TR-105396), the calculated incremental risk value and associated risk insights show that a 12 day/year SLC system out of service time is non-risk-significant.

Should you have any questions regarding the attached information, please contact Mr. Kirk Jenks of my staff at (225) 381- 3771.

Sincerely,

RJK/khj

CC:

U. S Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011

NRC Sr. Resident Inspector
P.O. Box 1050
St. Francisville, LA 70775

NRR Project Manager, Jefferey F. Harold
U.S. Nuclear Regulatory Commission
M/S 0 7D1
Washington, D.C. 20555

Director Office of Enforcement
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001