



South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

November 11, 2004  
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U. S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
One White Flint North  
11555 Rockville Pike  
Rockville, MD 20852

South Texas Project  
Units 1 and 2  
Docket Nos. STN 50-498, STN 50-499  
Request for Additional Information Bulletin 2003-01,  
"Potential Impact of Debris Blockage on  
Emergency Sump Recirculation at Pressurized Water Reactors"

Reference: Letter, Thomas J. Jordan to NRC Document Control Desk, "60-day response to NRC Bulletin 2003-01," dated August 7, 2003 (NOC-AE-03001569)

This letter responds to a request for additional information from the NRC staff regarding the referenced STPNOC 60-day response to Bulletin 2003-01.

There are no commitments contained in this response. Resulting actions will be handled in accordance with the STP Corrective Action Program.

If there are any questions regarding this response, please contact Scott Head at (361) 972-7136 or me at (361) 972-7902.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on November 11, 2004

T. J. Jordan  
Vice President  
Engineering & Technical Services

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Attachment: Request for Additional Information Regarding Bulletin 2003-01,  
"Potential Impact of Debris Blockage on Emergency Sump  
Recirculation at Pressurized Water Reactors"

cc:

(paper copy)

Bruce S. Mallett  
Regional Administrator, Region IV  
U. S. Nuclear Regulatory Commission  
611 Ryan Plaza Drive, Suite 400  
Arlington, Texas 76011-8064

Richard A. Ratliff  
Bureau of Radiation Control  
Texas Department of State Health Services  
1100 West 49th Street  
Austin, TX 78756-3189

Jeffrey Cruz  
U. S. Nuclear Regulatory Commission  
P. O. Box 289, Mail Code: MN116  
Wadsworth, TX 77483

C. M. Canady  
City of Austin  
Electric Utility Department  
721 Barton Springs Road  
Austin, TX 78704

(electronic copy)

A. H. Gutterman, Esquire  
Morgan, Lewis & Bockius LLP

J. J. Nesrsta  
City Public Service

David H. Jaffe  
U. S. Nuclear Regulatory Commission

R. L. Balcom  
Texas Genco, LP

C. A. Johnson  
AEP Texas Central Company

Jon C. Wood  
Cox Smith Matthews

C. Kirksey  
City of Austin

R. K. Temple  
City Public Service

## **Request for Additional Information Regarding Bulletin 2003-01 "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized Water Reactors"**

- 1. On page 4 of Attachment 1 of your Bulletin 2003-01 response you discuss interim compensatory measure operator training on indications of and responses to sump clogging. However, your response does not completely discuss the operator training to be implemented. Please provide a detailed discussion of the operating procedures to be implemented, the indications of sump clogging that the operators are instructed to monitor, and the response actions the operators are instructed to take in the event of sump clogging and loss of ECCS recirculation capability.**

### **STP Response:**

- 1.1. Operators involved in the Licensed Operator Requalification (LOR) Program at the South Texas Project participated in Classroom and Simulator training dealing with sump blockage issues.**

During these training sessions, the following discussions regarding sump blockage indication were discussed:

- 1.1.1. Indications of cavitation for Safety Injection and Containment Spray pumps.**

The indications discussed include fluctuating discharge pressure and flow. In the event that operators were to observe such fluctuations, the discussion identified additional support actions, such as directing plant operators in the field (with appropriate Health Physics support) to check for abnormal noise at the pump(s) and erratic amperage readings at the pump breakers at the electrical switchgear.

- 1.1.2. Potential for various alarm indications were discussed with an emphasis on the effectiveness of the annunciator response in light of a known condition (sump blockage).**

- 1.2. The subsequent simulator sessions described below, provided valuable reinforcement of the principles and concepts presented in the classroom phase of the training.**

During the simulator session, a design basis loss of cooling accident was simulated and the crews implemented existing procedures as follows:

- 1.2.1. Upon reduction of Refueling Water Storage Tank (RWST) level to the recirculation switchover setpoint, operators aligned the Emergency Core Cooling (ECCS) trains to cold leg recirculation per the emergency procedure(s). In the final configuration the RWST ECCS suction valves were closed, ECCS sump valves were open and no pumps were taking suction from the RWST.
- 1.2.2. After aligning the ECCS trains for cold-leg recirculation, the operators transitioned to the procedure in effect. The crews continued in the emergency procedures for the loss of reactor or secondary coolant and post LOCA cooldown and depressurization and identified specific plant procedures.<sup>1</sup>
- 1.2.3. After the suction source for the ECCS was aligned to the emergency sumps, the scenario simulated gradual sump blocking of the ECCS trains. The following indications were received by the operators during the simulation:
  - 1.2.3.1. Fluctuations in discharge flow for the running High Head Safety Injection (HHSI), Low Head Safety Injection (LHSI) or Containment Spray (CS) pumps as indicated on the Main Control Board (MCB) and the Integrated Computer System (ICS).
  - 1.2.3.2. Fluctuations in discharge flow for the pumps identified above corresponding to similar transients in discharge pressure in the order of full meter range for the pumps.<sup>2</sup>
- 1.2.4. During the simulator scenario, when crew(s) identified that at least one train of emergency coolant recirculation (ECCS equipment) was no longer available due to the sump blockage, the crew(s) transitioned to the emergency operating procedure for the loss of emergency coolant recirculation, per the Conditional Information Page (CIP).<sup>3</sup>

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<sup>1</sup> Conditions other than DBA LOCA were discussed following the scenarios in light of expected indication differences, effects on recovery actions and operator response. The general conclusion of these discussions recognized that the smaller break (SBLOCA) conditions presented not only a lesser probability of sump blockage but also significantly less likelihood of core damage.

<sup>2</sup> The follow-up discussions described earlier identified that in cases where a SBLOCA was the initiating event, the indications of loss of sump availability (blockage) could also translate to Reactor Coolant System (RCS) pressure and changes in pressurizer level behavior (rate of fill/drain).

<sup>3</sup> The term conditional information page (CIP) is the STP equivalent to the Westinghouse "Emergency Response Guideline "Foldout Page". The conditional information pages (CIP) for relevant emergency operating procedures include the "Loss of Emergency Coolant Recirculation Transition" item included. These procedures are identified as having the potential for long term ECCS sump recirculation and therefore loss of recirculation concerns.

1.2.5. The emergency operating procedure for the loss of emergency coolant recirculation provides the Emergency Response Guideline (ERG) based guidance for restoration of recirculation as well as the contingencies for cooling down and depressurizing the Reactor Coolant System (RCS) in the event that recirculation can not be restored. The major actions of this procedure are identified and briefly described below:

1.2.5.1. Continue attempts to restore Emergency Coolant Recirculation (ECR):

The first priority is to access the equipment needed for ECR and restore that equipment prior to performing any extreme recovery actions. This action is in effect continuously throughout the procedure and in the event that ECR is restored the operator would return to the procedure and step in effect.

1.2.5.2. Increase/Conserve RWST level:

Makeup is added to extend the time available for pumps to take suction from the RWST. Also, limiting outflow by securing unneeded Containment Spray (CS) Pumps and limiting Safety Injection (SI) pump flowrate(s).

1.2.5.3. Commencing a cooldown to Cold Shutdown:

This is identified as a 100°F/hr cooldown to limit coolant leakage while minimizing thermal stresses thus remaining within the limits of the Integrity Safety Function Status Tree.

1.2.5.4. Depressurize RCS to minimize RCS subcooling:

This action reduces break flow from the LOCA.

1.2.5.5. Try to add makeup to RCS from alternate source:

At this point in the procedure, the operator is directed to provide makeup from any alternate source to cool the core. STP utilizes the normal Chemical and Volume Control System (CVCS) equipment as the plant specific method.

**1.2.5.6. Depressurize SGs to cool down and depressurize the RCS:**

A controlled depressurization of the Steam Generators (SG) will allow the SI accumulators to inject, minimize the break flow and allow the RCS to reach Residual Heat Removal (RHR) System cut-in conditions.

**1.2.5.7. Maintain RCS heat removal:**

This action is complete by the establishing and maintaining RHR conditions or utilizing steam dumps. The plant engineering staff is consulted for further actions at this point for additional recovery actions.

**1.2.6. The operating crews continued in the scenario at this point until the actions to restore a suction from the RWST were in progress, core cooling and heat sink critical safety functions were satisfied, and RHR entry conditions were established (or at least approached).<sup>4</sup>**

Following the completion of the scenario, the operators discussed the indications received vs. those anticipated during the classroom discussion. The discussion included a review of how other indications, such as indications of RCS subcooling, core exit thermocouple temperature and natural circulation conditions may be affected, depending on the initiating event.

- 2. On page 5 of Attachment 1 of your Bulletin 2003-01 response you state that "STPNOC will consider [ERG] changes once the WOG has provided more information defining exactly what procedural changes reduce risk while improving sump performance." The Westinghouse Owners Group (WOG) has developed operational guidance in response to Bulletin 2003-01 for Westinghouse and CE type pressurized water reactors (PWRs).**

**2.1. Please provide a discussion of your plans to consider implementing this new WOG guidance.**

**STP Response:**

- 2.1.1. A review and comparison of the Westinghouse Owners Group (WOG) Sump Blockage Control Room Guideline (SBCRG) and STP's Emergency Operating Procedures (EOPs) for a loss of**

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<sup>4</sup> In some cases the time to reach RHR entry conditions exceeded the time limits of the scenario and therefore once control and substantial progress toward the entry conditions were established the simulator scenario was terminated.

coolant recirculation was performed.<sup>5</sup> Based on this evaluation, changes to STP's current EOPs would not provide any reduction in the risk of sump blockage or improve sump performance. Additionally, it was determined that STP's current EOPs accomplish all the major action categories of the SBCRG and the ERG. Therefore, changes to STP's current EOPs are not necessary at this time.

**2.2. Include a discussion of the WOG recommended compensatory measures that have been or will be implemented at your plant, and the evaluations or analyses performed to determine which of the WOG recommended changes are acceptable at your plant.**

**STP Response:**

2.2.1. Based on the evaluation described above, the following table lists the WOG recommended compensatory actions that currently exist in the STP EOPs.

**Table 1 - Candidate Operator Actions (COAs) Currently Incorporated in STP EOPs**

COA #	Title	Evaluation
A5	Refill of Refueling Water Storage Tank	This step is initiated at step 3 of the existing STP Loss of Emergency Coolant Recirculation EOP. This action is taken to extend the time that Safety Injection and Containment Spray pumps can take suction from the RWST and provide cooling to the RCS. <sup>6</sup>
A7	Provide More Aggressive Cooldown and Depressurization Following A Small Break LOCA	This step is initiated at step 5 of the existing STP Loss of Emergency Coolant Recirculation EOP. This action is taken to reduce the overall temperature of the RCS coolant and metal temperature to reduce the need for supporting plant systems and equipment required for heat removal. <sup>7</sup>

2.2.2. Additionally, Table 2 lists the WOG recommended changes that are under consideration. These potential compensatory actions are currently under review and STP will provide the status of our review in the 90-day response to Generic Letter 2004-02 and the results will be provided in the final response to the Generic Letter.

2.2.3. STP considers the COAs listed in Table 2 as enhancements and changes to STP's current EOPs would not provide any reduction in the risk of sump blockage or improve sump performance.

<sup>5</sup> CR # 04-14219 includes the step by step analysis comparing the SBCRG and STP's Loss of Emergency Coolant Recirculation Procedure. This procedure is based on the WOG Emergency Response Guideline (ERG) ECA1.1.

<sup>6</sup> This is the second major action category of the ERG. Basis of step 2 of Westinghouse ERG provides for RWST makeup to provide extended time for RCS cooling. STP EOP step 3 corresponds with this ERG step.

<sup>7</sup> This is the third major action category of the ERG. Basis of step 4 of Westinghouse ERG establishes the cooldown to reduce the heat energy remaining in the primary thus reducing the cooling requirements of the SI system. STP EOP Step 5 corresponds with this ERG step.

**Table 2 - COAs Under Consideration**

<b>COA #</b>	<b>TITLE</b>	<b>Evaluation</b>
A1a	Candidate Operator Action to Secure One Spray Pump	After verifying containment conditions, actions to secure Containment Spray (CS) Pumps are already under consideration per the existing STP Loss of Emergency Coolant Recirculation procedure. COA # A1a, would stop the containment spray pump prior to transfer to recirculation from the sump. The steps referenced in the EOP above would not be in effect until on recirculation. STP is currently evaluating actions to remove CS pumps from service earlier in an event.
A1b	Operator Action to Secure Both Spray Pumps	See response above. Additionally, COA # A1b would secure all CS pumps prior to recirculation conditions. With verification of containment cooling, the action to remove all CS pumps from service is taken during recirculation by the existing STP EOP.
A6	Inject More Than One RWST Volume From a Refilled RWST or by Bypassing the RWST	This action is already incorporated by the existing EOP procedure. However, STP is evaluating additional methods of RWST makeup and evaluating containment flooding concerns associated with this action.
A8	Provide Guidance on Symptoms and Identification of Containment Sump Blockage	STP is currently training operators on symptoms of containment sump blockage and evaluating additional instrumentation needed to provide positive indication of sump blockage.
A9	Develop Contingency Actions in Response to: Containment Sump Blockage, Loss of Suction, and Cavitation	Contingency actions would be based on the completion of the evaluations for COA A8. If additional instrumentation were installed, then the STP EOP would be modified to include this indication for evaluation of sump conditions. Until the extent of plant modifications is established, operators will continue to be trained for response to the existing plant configuration indication for sump conditions.

**2.3. Provide technical justification for those WOG recommended compensatory measures not being implemented by your plant.**

**STP Response:**

- 2.3.1. Based on the evaluation described above, the following list summarizes the WOG recommended operator actions not under consideration by STP.

**COAs Not Under Consideration:**

- 2.3.1.1. Candidate Operator Action A2: Manually Establish One Train of Containment Sump Recirculation Prior to Automatic Actuation.

**Technical Justification:**

Currently, the ERG network does not support this action. The actions are not accounted for by time considerations and the event is not validated with respect to component conditions that would prompt this action. A setpoint for required sump level for operation of an ECCS train or an individual pump is NOT presently available.

- 2.3.1.2. Candidate Operator Action A3-W: Terminate One Train of Safety Injection after Recirculation Alignment.

**Technical Justification:**

This step potentially removes all SI flow from the core. With the exception of pump current, the listed indicators of cavitation could be unreliable. However, pump current may not ensure that the pump or the core is protected<sup>8</sup>. Without the transition to the Function Restoration Procedures (FRP) for core cooling per the listed guidance of the SBCRG, the interruption of all SI flow to the core may result in the loss of core cooling.

The symptom based development of the ERG network does not provide for actions to be taken based on assumptions of an event. The removal of a train of SI flow could result in the total loss of flow to the core.

- 2.3.1.3. Candidate Operator Action A4: Early Termination of One LPSI/RHR Pump Prior to Recirculation Alignment

**Technical Justification:**

See Technical Justification 2.3.1.2 above. STP design does not support this configuration.

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<sup>8</sup> LHSI and HHSI pump ampere indication is in the individual switchgear rooms not in the main control room. Indications of cavitation such as flow oscillations and pressure fluctuations may have erroneous readings due to blockage from material in the sump. The amp readings may not indicate actual cavitation until significant damage has already occurred in the pump.

- 2.3.1.4. Candidate Operator Action A10: Early Termination of One Train of HPSI/High Head Injection Prior to Recirculation Alignment (RAS).

**Technical Justification:**

See Technical Justification number 2.3.1.2 above.

**2.4. Also include a detailed discussion of:**

**2.4.1. The procedures being modified:**

**STP Response:**

- 2.4.1.1. The EOPs may be modified in the future, contingent on the potential compensatory actions review described in section 2.2.2.

**2.4.2. The operator training being implemented**

**STP Response:**

- 2.4.2.1. See STP Response to Question 1 for operator training.

**2.4.3. Schedule for implementing these compensatory measures.**

**STP Response:**

- 2.4.3.1. As indicated in STP Response 2.2.2, These potential compensatory actions are currently under review and STP will provide the status of our review in the 90-day response to Generic Letter 2004-02 and the results will be provided in the final response to the Generic Letter.

- 3. NRC Bulletin 2003-01 provides possible interim compensatory measures licensees could consider to reduce risks associated with sump clogging. In addition to those compensatory measures listed in Bulletin 2003-01, licensees may also consider implementing unique or plant-specific compensatory measures, as applicable. Please discuss any possible unique or plant-specific compensatory measures you considered for implementation at your plant. Include a basis for rejecting any of these additional considered measures.**

**STP Response:**

- 3.1. None, other than the emergency procedure changes described in the response to Question 2.