

December 15, 2005

Mr. Richard M. Rosenblum
Chief Nuclear Officer
Southern California Edison Company
San Onofre Nuclear Generating Station
P.O. Box 128
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SUBJECT: SAN ONOFRE NUCLEAR GENERATING STATION, UNITS 2 AND 3 -
RESPONSE TO NRC BULLETIN 2003-01, "POTENTIAL IMPACT OF DEBRIS
BLOCKAGE ON EMERGENCY SUMP RECIRCULATION AT PRESSURIZED-
WATER REACTORS" (TAC NOS. MB9610 AND MB9611)

Dear Mr. Rosenblum:

This letter acknowledges receipt of your response dated August 1, 2003, to Nuclear Regulatory Commission (NRC) Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors," dated June 9, 2003, and supplemented by letters dated October 13, 2004, and September 8, 2005. The NRC issued Bulletin 2003-01 to all pressurized-water reactor licensees requesting that they provide a response, within 60 days of the date of Bulletin 2003-01, that contains either the information requested in Option 1 or Option 2 of Bulletin 2003-01:

- Option 1: State that the emergency core cooling system (ECCS) and containment spray system (CSS) recirculation functions have been analyzed with respect to the potentially adverse post-accident debris blockage effects identified in this bulletin, taking into account the recent research findings described in the Discussion section, and are in compliance with all existing applicable regulatory requirements.
- Option 2: Describe any interim compensatory measures that have been implemented or that will be implemented to reduce the risk which may be associated with potentially degraded or nonconforming ECCS and CSS recirculation functions until an evaluation to determine compliance is complete. If any of the interim compensatory measures listed in the Discussion section will not be implemented, provide a justification. Additionally, for any planned interim measures that will not be in place prior to your response to this bulletin, submit an implementation schedule and provide the basis for concluding that their implementation is not practical until a later date.

You provided an Option 2 response.

Bulletin 2003-01 discussed six categories of interim compensatory measures (ICMs):

(1) operator training on indications of and responses to sump clogging; (2) procedural modifications, if appropriate, that would delay the switchover to containment sump recirculation (e.g., shutting down redundant pumps that are not necessary to provide required flows to cool the containment and reactor core, and operating the CSS intermittently); (3) ensuring that alternative water sources are available to refill the refueling water storage tank (RWST) or to otherwise provide inventory to inject into the reactor core and spray into the containment atmosphere; (4) more aggressive containment cleaning and increased foreign material controls; (5) ensuring containment drainage paths are unblocked; (6) ensuring sump screens are free of adverse gaps and breaches.

You stated in your bulletin response of August 1, 2003, that you have implemented the following measures:

- (1) Under CEN-152, Combustion Engineering (CE) Emergency Procedure Guidelines (EPGs), operators are provided with safety injection (SI) throttle stop criteria predicated on satisfying certain plant conditions (e.g., reactor coolant system (RCS) sub-cooling, pressurizer level), and operator training re-enforces the need for timely throttle/stop actions - ICM category #1;
- (2) Under four San Onofre Nuclear Generating Station (SONGS) Operating Instructions, operators are provided with four methods for filling the refueling water storage tank (RWST): blended makeup, spent fuel pool crosstie, primary tanks, and the opposite unit RWST - ICM category #3;
- (3) Step 15 of the Functional Recovery procedure directs operators to initiate makeup as required to the RWST, while Floating Step 20 of the Emergency Operating Instructions (EOIs) directs operators to maintain RWST level greater than 19 percent and evaluate the need for makeup to the RWST (with additional direction provided in the Technical Support Center Guideline "MAINTAIN RWST LEVEL") - ICM category #3;
- (4) A Containment Cleanliness and Loose Debris Program which provides for "clean as you go" work activities, cleaning of accessible areas before containment closeout, Health Physics Manager containment cleanliness inspections, and containment cleanliness inspections by 70 qualified representatives from a broad divisional cross-section of station personnel - ICM category #4;
- (5) A coatings assessment program for SONGS Units 2 & 3 Service Level 1 coatings used in containment, which are procured, applied, and maintained by Southern California Edison (SCE) or their contractor to comply with American National Standards Institute (ANSI) N101.2 and Regulatory Guide 1.54 (with certain exceptions discussed in your submittal) - ICM category #4;
- (6) Condition assessment walkdowns of Service Level 1 coatings inside containment each refueling outage, with repair or repair scheduling as degraded or nonconforming coatings are identified - ICM category #4;
- (7) A multi-discipline working group, the San Onofre Coatings Inspection Team, provides continuous assessment of the SONGS coatings program to ensure continued compliance with regulatory and industry standards - ICM category #4;

- (8) Various material controls to restrict the use of and control materials in containment which could potentially block the containment emergency sump (CES) - ICM category #4;
- (9) A containment closeout critical valve verification which includes checking the refueling pool fill/drain line valve from the refueling cavity to the CES area is locked open and the flange is removed - ICM category #5; and
- (10) A containment emergency sump surveillance conducted during refueling outages to verify all gaps in the sump screen greater than 0.090 inch are sealed or reduced to no greater than 0.090 inch - ICM category #6.

You stated in your bulletin response of August 1, 2003, that you would implement the following measure: licensed operator requalification training to address loss of flow/loss of pump suction while in the recirculation mode of emergency core cooling, including indications of sump clogging and related severe accident management guidelines (SAMGs) to be entered (by November 30, 2003) - ICM category #1.

You also stated in your response that you would evaluate any Westinghouse changes to CEN-152, and make procedural changes as appropriate.

In your October 13, 2004, response to a September 7, 2004, NRC request for additional information, you described in detail operator requalification training conducted from October 7 to November 4, 2003, which included:

- (1) discussion of 10 possible near-term EOI changes by Westinghouse;
- (2) indications of sump degradation - ICM category #1; and
- (3) existing sump clogging related operator actions under EOIs or SAMGs (e.g., termination of SI to extend time to Recirculation Actuation Signal (RAS), RWST inventory monitoring, RAS condition verifications, minimizing SI, high-pressure safety injection (HPSI), and core spray flows), RWST refill and RCS injection bypassing the RWST, refilling the reactor cavity with unborated fire main water, and throttling of SI pumps - ICM category #1;

In your October 13, 2004, response you discussed the new CEN-152, Revision 5.3, change put forward by the Westinghouse Owners Group (WOG) in WCAP-16204, Revision 1, "Evaluation of Potential ERG [emergency response guideline] and EPG Changes to Address NRC Bulletin 2003-01 Recommendations (PA-SEE-0085)." This WOG document provided 11 Candidate Operator Actions (COAs - interim compensatory measures) as well as specific changes to CEN-152 to be evaluated by each CE licensee. You stated that SONGS had determined that some of the WOG procedural modifications may be risk adverse at SONGS (based on qualitative risk assessments comparing both risk positive and risk negative aspects). You stated that some of the CEN-152, Revision 5.3 steps would be implemented by July 1, 2005:

In the supplement dated September 8, 2005, you discussed the 11 WOG COAs from WCAP-16204 as follows:

- (1) COA A1a, "Operator Action to Secure One Containment Spray Pump Before Recirculation Alignment," concluding that for single failure/restart demand failure, potential operator distraction, offsite dose, and containment pressure and temperature considerations there would be a net increase in risk from this COA and it would not be implemented;
- (2) COA A1b, "Operator Action to Secure Both Spray Pumps," concluding that this COA would not be implemented for the same reasons as for COA A1a above;
- (3) COA A2, "Manually Establish One Train of Sump Recirculation Prior to Automatic Actuation," concluding that this COA would require operators to manually override the automatic safety function wherein Low Pressure Safety Injection Pumps automatically start to supply borated water to the RCS from the RWSTs, resulting in a net increase in risk. Further, this action would result in a reduced water level in containment due to the inventory remaining in the RWST, and would also result in all debris being drawn into the single operating sump increasing head-loss for the operating recirculation pump. Finally, containment spray drawn from the sump has a reduced cooling effect than spray drawn from an RWST. Therefore, it was decided that this COA would not be implemented;
- (4) COA 3-CE, "Terminate One Train of Safety Injection After Recirculation Alignment," concluding that this COA would require operators to manually override the automatic safety function wherein High Pressure Safety Injection Pumps automatically start to supply borated water to the RCS from the RWSTs, and for single failure/restart demand failure and potential operator distraction reasons this COA would not be implemented;
- (5) COA 4, "Early Termination of One Low Pressure Safety Injection (LPSI)/Residual Heat Removal (RHR) Pump Prior to Recirculation Alignment," concluding that in securing an LPSI pump the operators would be required to override an automatic safety function. Further, for single failure/restart demand failure and potential operator distraction reasons there would be a net increase in risk and this COA would not be implemented;
- (6) COA 5, "Refill of Refueling Water Storage Tank," concluding that this step was incorporated in "Floating Step 10, Monitor RWST Level" in SONGS procedure SO23-12-11, "EOI Supporting Attachments," Attachment 2 - ICM category #3;
- (7) COA 6, "Inject More Than One RWST Volume From a Refilled RWST or by Bypassing the RWST," concluding that the portion of this COA relating to injecting more than one RWST volume from a refilled RWST was incorporated into SONGS procedure SO23-12-11, "EOI Supporting Attachments," Attachment 14, "Recirculation Actuation Signal (RAS) Operation," Step 4a. However, SCE declined to implement the portion of COA 6 dealing with bypassing the RWST based on it being considered a net risk increase - ICM category #1;
- (8) COA 7, "Provide More Aggressive Cooldown and Depressurization Following a Small Break LOCA [loss-of-coolant accident]," concluding that this COA was incorporated into SONGS procedure SO23-12-11, "EOI Supporting Attachments," Attachment 14, "Recirculation Actuation Signal (RAS) Operation," Step 8 - ICM category #2;

- (9) COA 8-CE, "Provide Guidance on Symptoms and Identification of Containment Sump Blockage," concluding that this COA was incorporated into SONGS procedure SO23-12-11, "EOI Supporting Attachments," Attachment 2, "Floating Steps FS-22, "MONITOR ECCS Pump(s) Suction after RAS" - ICM category #1;
- (10) COA 9-CE, "Contingency Actions in Response to: Containment Sump Blockage, Loss of Suction, and Cavitation," concluding that this COA was incorporated into SONGS procedure SO23-12-11, "EOI Supporting Attachments," Attachment 2, "Floating Steps," FS-22, "MONITOR ECCS Pump(s) Suction after RAS." (Actions to be taken should the pumps show unstable flow, discharge pressure or motor amperage, with the containment sump recirculation attachment also enhanced to address this issue) - ICM category #1;
- (11) COA 10, "Early Termination of One Train of HPSI Injection Prior to Recirculation Alignment," concluding that this COA would require operators to manually override the automatic safety function wherein HPSI pumps automatically start to supply borated water to the RCS from the RWSTs, and for single failure/restart demand failure and potential operator distraction reasons this COA would not be implemented;
- (12) COA 11, "Prevent or Delay Containment Spray for Small Break LOCAs (<1.0 Inch Diameter) in Ice Condenser Plants," concluding that this COA was not applicable to the SONGS non-ice condenser containment design.

In an October 19, 2005, e-mail to NRC (Agencywide Documents Access Management System (ADAMS) Accession No. ML0534300987), SCE stated that, although it still considered RWST bypass to represent a net risk increase and would not proceduralize this action in its emergency operating procedures (COA 6), if such a bypass were needed in a beyond design-basis LOCA situation to inject water into the RCS to protect the core, such an action would be considered in responding to the LOCA. SCE stated that sources would be from the spent fuel pool, the unaffected unit RWST, the condensate system, fire service water, or other available water volumes - ICM category #3.

The NRC staff has considered your Option 2 response for compensatory measures that were to have been implemented to reduce the interim risk associated with potentially degraded or nonconforming ECCS and CSS recirculation functions. Based on your response, the NRC staff considers your actions to be responsive to and meet the intent of Bulletin 2003-01. Please retain any records of your actions in response to Bulletin 2003-01, as the NRC staff may conduct subsequent inspection activities regarding this issue.

Should you have any questions, please contact me at 301-415-1480 or the lead PM for this issue, Alan Wang at 301-415-1445.

Sincerely,

/RA/

N. Kalyanam, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-361 and 50-362

cc: See next page

- (9) COA 8-CE, "Provide Guidance on Symptoms and Identification of Containment Sump Blockage," concluding that this COA was incorporated into SONGS procedure SO23-12-11, "EOI Supporting Attachments," Attachment 2, "Floating Steps FS-22, "MONITOR ECCS Pump(s) Suction after RAS" - ICM category #1;
- (10) COA 9-CE, "Contingency Actions in Response to: Containment Sump Blockage, Loss of Suction, and Cavitation," concluding that this COA was incorporated into SONGS procedure SO23-12-11, "EOI Supporting Attachments," Attachment 2, "Floating Steps," FS-22, "MONITOR ECCS Pump(s) Suction after RAS." (Actions to be taken should the pumps show unstable flow, discharge pressure or motor amperage, with the containment sump recirculation attachment also enhanced to address this issue) - ICM category #1;
- (11) COA 10, "Early Termination of One Train of HPSI Injection Prior to Recirculation Alignment," concluding that this COA would require operators to manually override the automatic safety function wherein HPSI pumps automatically start to supply borated water to the RCS from the RWSTs, and for single failure/restart demand failure and potential operator distraction reasons this COA would not be implemented;
- (12) COA 11, "Prevent or Delay Containment Spray for Small Break LOCAs (<1.0 Inch Diameter) in Ice Condenser Plants," concluding that this COA was not applicable to the SONGS non-ice condenser containment design.

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The NRC staff has considered your Option 2 response for compensatory measures that were to have been implemented to reduce the interim risk associated with potentially degraded or nonconforming ECCS and CSS recirculation functions. Based on your response, the NRC staff considers your actions to be responsive to and meet the intent of Bulletin 2003-01. Please retain any records of your actions in response to Bulletin 2003-01, as the NRC staff may conduct subsequent inspection activities regarding this issue.

Should you have any questions, please contact me at 301-415-1480 or the lead PM for this issue, Alan Wang at 301-415-1445.

Sincerely,

/RA/

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 Office of Nuclear Reactor Regulation
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Docket Nos. 50-361 and 50-362

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November 2005

San Onofre Nuclear Generating Station
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