

September 26, 2005

MEMORANDUM TO: Darrell J. Roberts, Chief, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

FROM: David L. Solorio, Chief **/RA/**
Balance of Plant Section
Plant Systems Branch
Division of Systems Safety and Analysis
Office of Nuclear Reactor Regulation

SUBJECT: CLOSEOUT LETTER FOR BULLETIN 2003-01, "POTENTIAL IMPACT
OF DEBRIS BLOCKAGE ON EMERGENCY SUMP RECIRCULATION
AT PRESSURIZED-WATER REACTORS"

The Plant Systems Branch (SPLB) has reviewed and evaluated the information provided in responses to Bulletin 2003-01 by the licensee for the Salem, Unit 1 and Unit 2. SPLB has determined that the licensee's actions have been responsive to and meet the intent of Bulletin 2003-01. Attached to this letter is the proposed close-out letter for the above plants. If you have any questions, please contact Mark Kowal or Alan Wang. Please include Alan Wang and Mark Kowal on the distribution list.

Docket Nos: 50-272, 50-311

Attachment: As stated

CONTACTS: Mark Kowal, SPLB/DSSA
415-1663
Alan B. Wang, DLPM, PD IV
415-1445

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PSEG Nuclear, LLC
P.O. Box 236,
Hancocks Bridge, NJ 08038-0236

SUBJECT: SALEM UNIT 1 AND UNIT 2 - RESPONSE TO NRC BULLETIN 2003-01,
"POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY SUMP
RECIRCULATION AT PRESSURIZED WATER REACTORS (TAC NOS. MB9607
AND MB9608)

Dear Mr. Joyce:

This letter acknowledges receipt of your response dated August 6, 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. The NRC issued Bulletin 2003-01 to all pressurized-water reactor (PWR) licensees requesting that they provide a response, within 60 days of the date of Bulletin 2003-01, that contains either the information requested in following Option 1 or Option 2 stated in 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 the Discussion section, and are in compliance with all existing applicable regulatory requirements.
- Option 2: Describe any interim compensatory measures (ICMs) 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 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 RWST or to otherwise provide inventory to

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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 6, 2003, that you had implemented the following ICMs:

- (1) EOPs which address transfer to cold-leg recirculation and the loss of recirculation capability, and which are exercised by operators during simulator training scenarios - ICM category #1;
- (2) EOPs which direct operators to monitor 12 plant specific instruments for indication of proper ECCS operation - ICM category #1;
- (3) LOCA procedures which direct the stoppage of one containment spray pump early in recirculation alignment to prolong the time available for the operators to establish cold leg recirculation prior to refueling water storage tank (RWST) depletion - ICM category #2;
- (4) EOP guidance for other than large break LOCAs to delay depletion of the RWST before switchover to sump recirculation, including steps to cooldown and depressurize the reactor coolant system (RCS) to reduce break flow, thereby reducing the injection flow necessary to maintain RCS subcooling and inventory, with SI pumps sequentially stopped to reduce injection flow and therefore RWST outflow - ICM category #2;
- (5) for smaller LOCAs, RCS pressure remains greater than residual heat removal (RHR) pump discharge pressure and containment spray actuation does not occur, resulting in a significant reduction of RWST draindown and making it possible to depressurize the RCS to cold shutdown conditions before the RWST is drained to the sump recirculation switchover level, making sump blockage a non-issue - ICM category #2;
- (6) capability to quickly inject borated water to the affected unit RWST from the opposite unit RWST - ICM category #3;
- (7) procedures for positive control of materials taken into the containment, with controls on plastic placement, paper tags and tool loss, and with containment inspection criteria to verify that no loose debris is present at containment closeout which could cause restriction at the containment sump suction during a LOCA event - ICM category #4;
- (8) containment sump visual inspections every outage, and procedures to review the storage of "transient loads" (temporary equipment) in containment during power operation - ICM category #4;
- (9) outage cleanup planned activities assuring that containment housekeeping standards are met - ICM category #4;
- (10) an end-of-outage walkdown inspection to verify that no loose debris is present in accessible places, with independent senior manager inspection tours of the containment assessing cleanliness and loose debris status - ICM category #4;
- (11) routine vacuum cleaning and visual inspection of both the inner and outer annulus drain trenches - ICM category #4; and

(12) visual operability verification of the containment sump and its subsystem suction piping for loose debris and evidence of structural distress or corrosion, and that the sump components (trash racks and screens) show no evidence of structural distress or corrosion, with acceptance criteria for the interior mesh screens that they be intact and free of defects - ICM category #6.

You also stated in your response that you would be implementing the following ICMs:

(1) additional training on the containment sump blockage issues of Bulletin 2003-01 (by April 30, 2003) - ICM category #1;

(2) enhancements to the Technical Support Center (TSC) Integrated Engineering Response procedure to provide additional guidance on mitigating the effects of degraded ECCS pump performance due to sump blockage, with tabletop training sessions (by October, 2004) - ICM category #1;

(3) updates to the Salem containment walkdown procedures to add emphasis based on the issues raised in Bulletin 2003-01 (by spring 2004) - ICM category #4; and

(4) operability verifications ensuring that the containment drain annulus within and outside the bio-shield are free of debris with plates (baskets) in place (by spring 2004) - ICM category #5;

You further stated in your response, including justifications, that you would not be implementing the following ICM: procedural modifications, if appropriate, that would delay the switchover to containment pump recirculation.

In an October 29, 2004, response to a September 10, 2004, NRC request for additional information (RAI) you discussed the Westinghouse Owners Group ICM of WCAP-16204 "Evaluation of Potential ERG and EPG Changes to address NRC Bulletin 2003-01 Recommendations (PA-SEE-0085)" as they pertain to the design and operation of Salem Unit 1 and Unit 2 as follows:

(1) COA A1a "Operator Action to Secure One Spray Pump" (prior to initiating containment sump recirculation), concluding that PSEG will complete by February 11, 2005, an evaluation of actions to stop one of two operating containment spray pumps earlier in a LOCA recovery, considering a complete interruption of spray flow due to a failure of the remaining active pump, and (if acceptable) will implement the appropriate EOP changes by July 31, 2005;

(2) COA A1b "Operator Action to Secure Both Spray Pumps," concluding that Salem EOPs currently provide direction to stop two containment spray pumps if containment pressure has been reduced below the spray signal reset pressure - ICM category #1;

(3) COA A2 "Manually Establish One Train of Containment Sump Recirculation Prior to Automatic Actuation," concluding that it is not feasible to establish a train of sump recirculation based on the small margin between the water volume available in the containment sump when the RWST low level is reached, and the water volume required in the containment sump to support operation of a RHR pump on recirculation;

(4) COA A3-W "Terminate One Train of Safety Injection After Recirculation Alignment," concluding that both the necessary analyses and single failure-related license amendment effort, and the potential for clad surface temperatures to reach unacceptable values, outweigh the sump-blockage-related benefit of this COA;

(5) COA A4 "Early Termination of One LPSI/RHR Pump Prior to Recirculation Alignment," concluding that risk to core cooling and potential fuel damage would result from this ICM;

(6) COA A5 "Refill of Refueling Water Storage Tank," concluding that Salem will modify its transfer to cold leg recirculation procedure to establish makeup to the RWST after the last operating containment spray pump is stopped (with actual injection of this water into the RCS or into containment not being directed until after sump recirculation is lost), and will modify its containment sump blockage contingency actions procedure to provide additional makeup flow to the RCS from borated water sources (by February 11, 2005) - ICM category #3;

(7) COA A6 "Inject More Than One RWST Volume From a Refilled RWST or by Bypassing the RWST," concluding that Salem will include actions to provide additional makeup flow to the RCS from a borated water source, after loss of recirculation capability due to sump blockage, in a new procedure based on the generic Westinghouse guideline "Sump Blockage Control Room Guideline" or "SBCRG" - ICM category #1;

(8) COA A7 "Provide More Aggressive Cooldown and Depressurization Following a Small Break LOCA," concluding that with the Salem EOPs based on Westinghouse Emergency Response Guidelines" or "ERGs" cooldown rate maximization up to the Technical Specification limit is already in place - ICM category #2;

(9) COA A8-W "Provide Guidance on Symptoms and Identification of Containment Sump Blockage," concluding that PSEG will make monitoring of indications of sump blockage integral (rather than referenced) parts of Salem's transfer to cold leg recirculation and loss of emergency recirculation procedures - ICM category #1;

(10) COA A9 "Develop Contingency Actions in Response to: Containment Sump Blockage, Loss of Suction, and Cavitation," concluding that, as well as developing a new procedure based on the Westinghouse SBCRG discussed above, TSC procedures were enhanced to provide additional guidance to the TSC staff to mitigate the effects of degraded ECCS pump performance if containment sump blockage is indicated or occurs (including whether one train of ECCS pumps should be shut down, whether one train of Containment Spray should be shut down, whether RHR flow should be throttled/reduced, whether the Salem loss of emergency recirculation procedure should be entered, and whether the Chemical Volume Control System positive displacement pump cross connection should be used to support the affected unit) - ICM category #1;

(11) COA A10 "Early Termination of One Train of HPSI/High-Head Injection Prior to Recirculation Alignment (RAS)," concluding that this ICM is not considered risk-beneficial due to the risk of core damage upon single failure loss of the one operating HPSI pump during a small break LOCA; and

(12) concluded that COA A11 was applicable only to ice condenser plants, unlike Salem.

In a September 14, 2005, response to an August 18, 2005, conference call and NRC request

Mr. Joyce

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for additional information you further discussed Westinghouse Owners Group ICM COA A1a of WCAP-16204 "Evaluation of Potential ERG and EPG Changes to address NRC Bulletin 2003-01 Recommendations (PA-SEE-0085)" as this action pertains to the design and operation of Salem Unit 1 and Unit 2 as follows:

(1) COA A1a, "Operator Action to Secure One Spray Pump," (prior to initiating containment sump recirculation), would not be implemented at Salem Unit 1 and Unit 2 because the continuous operation of the containment spray system is credited in the current licensing basis analysis for the design basis LOCA, which assumes that at least one CS pump is running. A single failure of the remaining running CS pump would result in a loss of iodine removal capability.

The NRC staff has considered your Option 2 response for compensatory measures that were or 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-[xxxx] or the lead PM for this issue, Alan Wang at 301-415-1445.

Sincerely,

[Name], Project Manager, Section [1 or 2]
Project Directorate [I, II, III, or IV]
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

cc: See next page [Plant Mailing List]

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