

December 15, 2005

Mr. David A. Christian
Senior Vice President and
Chief Nuclear Officer
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: KEWAUNEE POWER STATION - RESPONSE TO THE U.S. NUCLEAR
REGULATORY COMMISSION BULLETIN 2003-01, "POTENTIAL IMPACT OF
DEBRIS BLOCKAGE ON EMERGENCY SUMP RECIRCULATION AT
PRESSURIZED-WATER REACTORS (TAC NO. MB9584)

Dear Mr. Christian:

This letter acknowledges receipt of your response dated August 7, 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, for the Kewaunee Nuclear Power Plant (KNPP). 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 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 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; and (6) ensuring sump screens are free of adverse gaps and breaches.

You stated in your Bulletin response of August 7, 2003, that you had implemented the following interim compensatory measures:

- (1) operator training providing an overview of Bulletin 2003-01 concerns, an overview of compensatory measures in place, an overview of emergency operating procedures (EOPs) which address containment sump issues, an overview of the indications available to operators in the control room which would be indicative of sump clogging, and reinforcement of management expectations regarding equipment degradation monitoring - ICM category #1;
- (2) a sump clogging training module for licensed operators, auxiliary operators and Emergency Directors addressing response to loss-of-coolant accident (LOCA) using EOPs, importance of aggressive cooldown of the reactor coolant system to avoid initiating recirculation cooling, indications of ECCS and Internal Containment Spray (ICS) pump distress, the impact of sump clogging on EOP critical safety functions, the content and implementation of the Severe Accident Management Guidelines, proposed changes or enhancements to operating procedures, and simulator exercises demonstrating a loss of recirculation flow due to clogged sump screens - ICM category #1;
- (3) EOP steps intended to delay RWST inventory depletion such as minimizing outflow from the RWST by reducing safety injection (SI) flow rate and stopping containment spray pumps if conditions allow - ICM category #2;
- (4) procedural guidance to refill the RWST from a variety of sources and under a variety of plant conditions upon loss of emergency coolant recirculation - ICM category #3;
- (5) requirements for the application of service level I coatings (appropriate for expected containment environments), a label removal/replacement program, and containment cleaning and foreign material control implemented through work area cleanliness procedures and end of outage containment walkdowns, with special attention to common debris such as filter bags and the restraint of stored equipment - ICM category #4;
- (6) a 1997 transport study of containment flowpaths resulting in the installation of additional floor penetration sleeves, a refueling cavity standpipe, and a gate with a 4-inch toe rail to minimize debris transport (a set of permanent rather than interim measures) - ICM category #5; and
- (7) visual inspections of sump screens each refueling outage comparing the screens with the design drawings and noting any defects, gaps, breaches, adverse alignment, corrosion or damage - ICM category #6.

In a May 17, 2004, supplemental Bulletin response, you discussed your consideration of the interim compensatory measures discussed in Westinghouse Owners Group (WOG) report WCAP-16204, Revision 1, "Evaluation of Potential ERG and EPG Changes to Address NRC Bulletin 2003-01 Recommendations." In your response, you addressed each of the 11 Candidate Operator Actions (COAs) evaluated in WCAP-16204 as follows:

- (1) COA #1 "Secure One or Both Containment Spray Pumps Before Recirculation Alignment," concluding that KNPP's current EOPs already meet the intent of this COA by stopping one ICS pump prior to manual switchover to sump recirculation (WOG COA A1a to secure one ICS pump adopted, WOG COA A1b to secure both spray pumps not adopted) - ICM category #2;
- (2) COA #2 "Manually Initiate One Train of Containment Sump Recirculation," concluding that, although preserving RWST inventory is desirable, considerations such as iodine fission product scrub and reaching required containment sump pH values prevent implementation of this COA at Kewaunee;
- (3) COA #3 "Terminate One Train of HPSI [high pressure safety injection]/High-Head Injection After Recirculation Alignment," concluding that current Kewaunee EOPs meet the intent of this COA - ICM category #1;
- (4) COA #4 "Terminate LPSI [low pressure safety injection]/Residual Heat Removal (RHR) Pump Prior to Recirculation Alignment," concluding that this combustion engineering (CE) targeted COA is not applicable to Westinghouse designed plants;
- (5) COA #5 "Refill Refueling Water Storage Tank," concluding that strong consideration will be given to adding EOP steps to initiate refilling the RWST after its contents are depleted (implementation by November 30, 2005) - ICM category #3;
- (6) COA #6 "Inject More Than One RWST Volume from Refilled RWST or by Bypassing the RWST," concluding that strong consideration will be given to mitigating the flooding concerns arising from injecting more than one RWST volume, and to determining during containment sump recirculation the feasibility of aligning a standby injection train or another means of injection to a refilled RWST or to an alternate source bypassing the RWST (by November 30, 2005) - ICM category #3;
- (7) COA #7 "Provide More Aggressive Cooldown and Depressurization Following a Small Break LOCA," concluding that a review will be conducted of the Kewaunee EOPs to determine if wording changes are required in the EOPs or their background documents to stress the importance of performing an aggressive cooldown, within Technical Specification limits, in response to a small-break LOCA - ICM category #2;
- (8) COA #8 "Provide Guidance on Symptoms and Identification of Containment Sump Blockage," concluding that an evaluation will be conducted to determine if additional parameters should be included in the EOPs or supporting procedures for monitoring and identifying signs of sump blockage (implementation by November 30, 2005) - ICM category #1;
- (9) COA #9 "Develop Contingency Actions in Response to Containment Sump Blockage,

Loss of Suction, and Cavitation,” concluding that evaluations will be performed to determine if the minimum reactor coolant system injection flow rates can be lowered, and to determine the degree to which the Westinghouse Sump Blockage Control Room Guideline (SBCRG) should be converted into a Kewaunee-specific procedure (implementation by November 30, 2005) - ICM category #1;

- (10) COA #10 “Terminate HPSI/High-Head Injection Prior to Recirculation Alignment,” concluding that this CE targeted COA is not applicable to Westinghouse design plants; and,
- (11) COA #11 “Delay Containment Spray Actuation for Small Break LOCA in Ice Condenser Plants,” concluding that this COA is not applicable to a non-ice condenser plant such as KNPP with its dry containment.

In a November 8, 2004, response to a September 7, 2004, NRC request for additional information (RAI), you provided two new sump clogging training commitments to be completed prior to exiting refueling outage #27, and updated the status of the implementation of the WOG COAs as follows:

- (1) COA #5 - stating that it had been determined that it would be appropriate to begin to refill the RWST when its contents are depleted - ICM category #3;
- (2) COA #6 -stating that the actions of COA #6 will be completed as part of the development of a plant-specific version of the Westinghouse SBCRG under COA #9 (discussed below) - ICM category #3;
- (3) COA #7 - stating that COA #7 on aggressive cooldown had been completed through update of three KNPP EOPs to stress to the operators the need for a rapid cooldown within Technical Specifications limits - ICM category #2;
- (4) COA #8 - stating that COA #8 had been completed through the revision of three procedures directing operator monitoring of residual heat removal (RHR) pump parameters - ICM category #1; and
- (5) COA #9 - stating that COA #9 to develop contingency actions in response to containment sump blockage, loss of suction and cavitation had been partially completed through the allowance of a variable minimum flow requirement for RHR cavitation conditions in three procedures, and will be fully completed through development of a plant-specific version of the SBCRG (by May 31, 2005) - ICM category #1.

In your November 8, 2004, response to a September 7, 2004, NRC RAI, you elaborated on the specific aspects of the Kewaunee design which would indicate that the schedule planned for implementation of the WOG COAs is appropriate. We find these rationales (such as extensive use of reflective metal insulation in LOCA destruction zones, the Kewaunee Protective Coatings Program, significant calculated net-positive suction head margin, and a containment design conducive to directing flow to the containment sump) support your WOG COA completion schedules, as amended in your November 8, 2004, RAI response.

The NRC staff had considered your Option 2 response for compensatory measures that were

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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 301-415-1439 or the lead Project Manager for this issue, Alan Wang at 301-415-1445.

Sincerely,

/RA/

David H. Jaffe, Senior Project Manager
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-305

cc: See next page

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The NRC staff had 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 301-415-1439 or the lead Project Manager for this issue, Alan Wang at 301-415-1445.

Sincerely,

/RA/

David H. Jaffe, Senior Project Manager
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Office of Nuclear Reactor Regulation

Docket No. 50-305

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