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10 CFR 50.54(f)

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United States Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20551-0001

Subject: Davis-Besse Nuclear Power Station 60-Day Response to NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors"

References:
1. NRC Bulletin 2003-01, "Potential Impact on Emergency Sump Recirculation at Pressurized-Water Reactors," dated June 9, 2003 (Log 6094)
2. Draft Regulatory Guide 1107 (DG-1107) "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident," dated February 2003.
3. LER 2002-005, "Potential Clogging of the Emergency Sump Due to Debris in Containment"
4. LER 2003-002, "Potential Degradation of High Pressure Injection Pumps Due to Debris in Emergency Sump Fluid Post Accident"

Ladies and Gentlemen:

On June 9, 2003, the Nuclear Regulatory Commission (NRC) issued Bulletin 2003-01, "Potential Impact on Emergency Sump Recirculation at Pressurized-Water Reactors." This Bulletin identifies issues associated with the potential post-accident debris blockage impeding or preventing the operation of the Emergency Core Cooling Systems (ECCS) and Containment Spray Systems (CSS) in the recirculation mode at pressurized water reactors (PWRs) in the event of a loss of coolant accident (LOCA) or other high energy line break accidents for which sump recirculation is required by 10 CFR 50.46(b)(5).

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The Bulletin requires requested information be provided within 60 days of the date of the Bulletin issuance. The NRC intends to use this information to verify compliance with regulations and to ensure that any interim risks associated with post-accident debris blockage are minimized while evaluations to determine compliance proceed. Specifically, the Bulletin requested licensees to either: 1) State that the ECCS and CSS recirculation functions have been analyzed with respect to the potentially adverse post-accident debris blockage effects identified in the NRC Bulletin and are in compliance with 10 CFR 50.46(b)(5) and all existing applicable regulatory requirements (Option 1); or 2) Describe any interim compensatory measures that have been or will be implemented to reduce the risk which may be associated with the potentially degraded or nonconforming ECCS and CSS recirculation functions until an evaluation to determine compliance has been completed (Option 2).

Attachment 2 of this letter contains FirstEnergy Nuclear Operating Company's response to Bulletin 2003-01 for the Davis-Besse Nuclear Power Station (DBNPS) in accordance with Option 1. This response was developed utilizing the recent research findings described in the Discussion section of the Bulletin. The DBNPS is currently in an extended outage due to the discovery of boric acid corrosion on the reactor vessel head. During this outage, concerns with ECCS and CSS recirculation functions with respect to the potentially adverse post-accident debris blockage effects identified in the NRC Bulletin have been analyzed. These issue will be resolved prior to restart of the DBNPS in compliance with 10 CFR 50.46(b)(5) and all existing applicable regulatory requirements, including the DBNPS Technical Specifications addressing the operability of the ECCS and CSS.

If you have any questions or require further information, please contact Mr. Kevin L. Ostrowski, Manager-Regulatory Affairs, at (419) 321-8450.

Very truly yours,

AWB/s

Enclosures
Attachments

cc: NRC/RIII Administrator
Chairman, NRC DB Oversight Panel
DB-1 NRC/NRR Project Manager
DB-1 NRC/NRR Backup Project Manager
DB-1 Senior Resident Inspector
Utility Radiological Safety Board

DAVIS-BESSE NUCLEAR POWER STATION, UNIT NUMBER 1,

60-DAY RESPONSE TO BULLETIN 2003-01, "POTENTIAL IMPACT ON

EMERGENCY SUMP RECIRCULATION AT PRESSURIZED-WATER REACTORS"

This letter and associated attachments are submitted pursuant to 10 CFR 50.54(f) and contain information pursuant to NRC Bulletin 2003-01, dated June 9, 2003. The statements contained in this submittal are true and correct to the best of my knowledge, linformation, and belief.

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

Executed on: 8-8-03

By: _____
Lew W. Myers, Chief Operating Officer

Response to NRC Bulletin 2003-01, "Potential Impact on Emergency Sump Recirculation at Pressurized-Water Reactors," for the Davis-Besse Nuclear Power Station, Unit 1 (DBNPS)

Bulletin 2003-001 requires that Pressurized Water Reactor (PWR) licensees provide information within 60 days of the date of the Bulletin on the potential impact of debris blockage on emergency sump recirculation. The purpose of this attachment is to provide the information as required by the Bulletin based on current conditions at the DBNPS.

The Bulletin provides the following two options for licensees in responding to the NRC:

> 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 NRC Bulletin, taking into account the research findings described in the Discussion Section, and are in compliance with 10 CFR 50.46(b)(5) and all existing applicable regulatory requirements.
>
> Option 2
> Describe any interim compensatory measures that have been or will be implemented to reduce the risk which may be associated with the potentially degraded or nonconforming ECCS and CSS recirculation functions until an evaluation to determine compliance has been completed.

The DBNPS is currently in an extended outage due to the discovery of boric acid corrosion on the reactor vessel head. During this outage, the DBNPS has previously identified issues related to the Emergency Sump Strainer and the High Pressure Injection (HPI) pumps as described in LER 2002-005, "Potential Clogging of the Emergency Sump Due to Debris in Containment" and LER 2003-002, "Potential Degradation of High Pressure Injection Pumps Due to Debris in Emergency Sump Fluid Post Accident." Prior to restart the DBNPS will have resolved all corrective actions needed to demonstrate operability of the ECCS and CSS recirculation functions with respect to the potentially adverse post-accident debris blockage effects as required by Option 1 of the Bulletin, 10 CFR 50.46(b)(5), and other existing applicable regulatory requirements.

Net Positive Suction Head (NPSH) Evaluation

The containment emergency sump is required to provide suction for recirculation of reactor coolant for long-term emergency core cooling following a Loss of Cooling Accident (LOCA). During 13RFO the emergency sump had been declared inoperable due to potential sources of post-accident debris potentially clogging the emergency sump strainer and the potential for downstream debris blockage to occur due to a gap discovered in the screen. As part of corrective actions for the emergency sump issues, a modification was initiated to replace the previous ECCS emergency sump strainer with a conservatively larger strainer design. This modification

expanded the screen surface area from the previous 50 square feet to approximately 1200 square feet of available area while decreasing the individual opening size and shape from approximately 1/4 inch square openings (5/16 inches diagonal) to 3/16 inch circular openings.

A debris generation analysis was performed to identify and quantify potential sources for emergency sump strainer blockage through the use of field walkdown data, design documents, industry related documents and standard industry practices. The debris generation analysis was then used as a direct input to a debris transport analysis, which evaluates how much of the potential debris may migrate to the emergency sump strainer. The emergency sump screen was designed to ensure that even with the effects of debris clogging on the sump strainer in conjunction with the post-LOCA water level in containment there is sufficient NPSH available for proper operation of Emergency Core Cooling System (ECCS) and Containment Spray System (CSS) equipment. The modification of the emergency sump strainer is nearing completion. All fieldwork and calculations are complete in that the new strainer with larger surface area is installed and the debris generation, transport, strainer head loss, and strainer integrity analyses are complete.

Strainer Structural Integrity

The new emergency sump strainer has been designed to accommodate all anticipated structural loads including seismic loading, LOCA blow down loads, and retained debris loads, where appropriate. The design ensures that the structural integrity of the strainer will be maintained. Due to its size and location within containment, a portion of the strainer could be damaged by debris generated following a LOCA in the reactor annular space. Therefore, a permanently installed second strainer boundary has been included in the design to maintain the strainer boundary integrity.

Inventory Holdup

To ensure a conservative design, the post-LOCA containment flood height was calculated after identifying potential water hold up volumes within the associated systems (the hold up volumes were included in addition to an assumed hold up volume for margin). The upper elevations of containment have drains to the normal sump that are open to the flood up region of the containment. A ring of grating between each floor and the containment vessel wall precludes significant hold up of water above the pool. The single largest volume hold up zone is the deep end of the refueling canal. This volume has a drain path to the normal containment sump that is closed by a blank flange during refueling outages. Containment close-out procedures require removal of the blank flange and opening of the associated isolation valve prior to power operation and independent verification of these actions is required.

Additionally, a rack enclosure around the refueling canal drainpipe was installed during the current outage. This ensures that large debris can not block the path to the normal containment sump. Other racks were installed in the pool's flow path to the emergency sump. These gratings

were sized to help reduce the amount of large debris that would reach the sump strainer, but have sufficient opening size to support the flow requirements of the ECCS and CSS.

Downstream Blockage

An assessment was performed on ECCS and CSS components to evaluate the impact of debris (less than or equal to 3/16-inch diameter) that could pass through the new screen and affect equipment that is required post-LOCA for Emergency Sump recirculation. Systems that were assessed to determine if they would be affected by this debris included the Low Pressure Injection (LPI) System, the High Pressure Injection (HPI) System, the Containment Spray System (CSS), Boron Precipitation Control Systems, and as referenced in the Bulletin, the Nuclear Fuel. Components evaluated for these systems included piping, valves, coolers, flow elements and orifices, pumps, instrumentation, and spray nozzles. This evaluation assumed that debris was able to reach the equipment in question, and then determined if the debris would clog the associated clearances. During the evaluation, potential debris concerns were identified with the LPI, CSS, and HPI pumps. No debris concerns were identified for the Boron Precipitation Control Systems or the Nuclear Fuel.

The LPI system is designed to provide long term core cooling by circulating cooled reactor coolant to the core from the Emergency Containment Sump following a LOCA. The LPI pumps are designed with mechanical seals, and have cyclone separators to ensure the mechanical seals are supplied with clean water. The cyclone separators originally installed in the LPI/DH pumps' seal water supply lines contain orifices smaller than the size of debris that could potentially be entrained in the seal water. The mechanical seal manufacturer has stated that the seal installed in the LPI pumps is tolerant of debris in the seal water, and minimal seal water is required. Evaluations have been performed to show that the LPI pump seals would not be adversely affected by potential debris. The LPI pump seal cyclone separators have been replaced with cyclone separators whose internal orifices are larger than the maximum possible debris size, and evaluation of the effects of fibrous debris on the separators is ongoing. The remainder of the LPI system, including piping, valves, coolers, flow elements and orifices, have been reviewed for potential debris that could make its way through the emergency sump strainer following a LOCA and determined to not be adversely affected.

The CSS is an engineered safety feature that has the dual function of removing heat and fission product iodine from the post-accident containment atmosphere. The CSS pumps, which also take suction from the emergency sump in the post-LOCA recirculation mode, did not have cyclone separators installed in the seal water supply lines in the past. The new containment emergency sump screens will prevent any debris large enough to plug the CSS pump mechanical seal water supply lines because they have no clearances smaller than the 3/16-inch diameter opening of the sump screens. Although evaluations have shown the mechanical seals can withstand the debris that may pass through the sump strainers for an extended period of time, an enhancement was made to the CSS to install cyclone separators with sufficient internal clearances in the seal water lines for the CSS Pumps. As described above, evaluation of the effects of fibrous debris on the separators is ongoing. The remainder of the CSS, including

piping, valves, coolers, flow elements, orifices and spray nozzles, have been reviewed for potential debris that could make its way through the emergency sump strainer following a LOCA and determined to not be adversely affected.

The HPI system is required to mitigate the consequences of all breaks of the Reactor Coolant System pressure boundary which result in loss of reactor coolant at a rate in excess of the capability of the Reactor Coolant Makeup System. The HPI System is initially aligned to take suction from the BWST, however, in the event the BWST inventory becomes depleted, and HPI pump flow continues to be required, pump suction is re-aligned to the containment emergency sump via the discharge of the LPI pumps. Additionally, the HPI pumps are utilized to control boron concentration post-LOCA that may result from boiling heat transfer within the reactor core. As stated previously, issues discovered during the reviews of the HPI System have been documented in LER 2003-002, "Potential Degradation of High Pressure Injection Pumps Due to Debris in Emergency Sump Fluid Post Accident." The HPI pumps use process-fluid supplied hydrostatic bearings on the outboard end of the pump shafts. The introduction of debris into the pumps may block water flow to the hydrostatic bearings due to blockage of ports leading to the bearing housings. A range of debris or particles was recognized to possibly result in degradation of the HPI Pump wear rings and other pump internals. The DBNPS is currently pursuing modifications to the HPI system design to mitigate the effects of debris, which may result in incorporation of strainers to eliminate debris or particles of concern, replacement of the bearing with a new design, or replacement of the entire pump. The modifications are also being supplemented by testing to validate they will adequately resolve the issues of concern with respect to debris. The remainder of the HPI system, including piping, valves, coolers, flow elements and orifices, have been reviewed for potential debris that could make its way through the emergency sump strainer following a LOCA and determined to not be adversely affected.

The DBNPS submitted a License Amendment Application on May 14, 2003, to modify Technical Specification 3/4.5.2, Emergency Core Cooling Systems - ECCS Subsystems – $T_{avg} \geq$ 280°F (Serial Letter Number 2950, License Amendment Request No. 03-0008) to allow operation with the existing HPI Pumps during the Restart Test Plan inspection activities being conducted during the ongoing outage.

Conclusion

A comparison of the new emergency sump strainer design as well as the ECCS, CSS and containment designs to Draft Regulatory Guide (DRG) 1107, "Water Sources for Long Term Recirculation Cooling Following a Loss-of-Coolant Accident," was performed and substantive compliance was demonstrated. Deviations from the DRG such as the lack of a redundant emergency sump and the sloping of the containment floor do not substantially deviate from the DRG, and are within the licensing basis of the facility, as documented in the Davis-Besse Updated Safety Analysis Report and NUREG 136, Davis-Besse Safety Evaluation Report.

The Emergency Sump Strainer modification, which included removal of the old sump screen, installation of an emergency sump strainer with an expanded screen surface area, and analyses

relative to debris generation and transport inside containment for future operability conditions, is nearing completion. Although both the LPI and CSS were evaluated and determined to be capable of performing their intended safety function, enhancements to both systems have been performed to improve their ability to continue to operate in the recirculation mode with potential post-accident debris.

Testing of modifications to the HPI pumps to determine pump operability during postulated accidents is currently being performed. Prior to restart, required modifications and testing of the HPI pumps will be complete to ensure compliance with all applicable regulatory requirements.

Based on the above, it is concluded that prior to restart, the DBNPS will meet the requirements of 10 CFR 50.46(b)(5) and other applicable regulatory requirements as they pertain to operation of the Emergency Core Cooling Systems and Containment Spray Systems.

COMMITMENT LIST

The following list identifies those actions committed to by the Davis-Besse Nuclear Power Station in this document. Any other actions discussed in the submittal represent intended or planned actions by Davis-Besse. They are described only as information and are not regulatory commitments. Please notify the Manager – Regulatory Affairs (419-321-8450) at Davis-Besse of any questions regarding this document or associated regulatory commitments.

COMMITMENTS	DUE DATE
Davis-Besse will have analyzed the ECCS and CSS recirculation functions with respect to the potentially adverse post-accident debris blockage effects identified in the NRC Bulletin to confirm compliance with 10 CFR 50.46(b)(5) and all existing applicable regulatory requirements.	Prior to Restart