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Subject: Davis-Besse Nuclear Power Station Response to NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors"

References:
1. NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," September 13, 2004.
2. 10 Code of Federal Regulations 50.46 (b)(5), "Long-term Cooling."
3. Regulatory Guide 1.82, Revision 3, "Water Sources for Long-term Recirculation Cooling Following a Loss of Coolant Accident," November 2003.
4. Nuclear Energy Institute Document NEI 04-07, "Pressurized Water Reactor Sump Performance Evaluation Methodology and associated Nuclear Regulatory Commission Safety Evaluation Report."

Ladies and Gentlemen:

On September 13, 2004, the Nuclear Regulatory Commission (NRC) issued NRC Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," (Reference 1). This GL requested that all holders of Operating Licenses for Pressurized-Water Reactors submit specific information on, and schedules for, completing detailed analyses of the potential for design basis events to generate sufficient debris to preclude successful long-term core cooling, as required by 10 CFR 50.46 (b)(5) (Reference 2).

During the extended shutdown caused by the boric acid corrosion of the Davis-Besse Nuclear Power Station (DBNPS) reactor vessel head, the DBNPS identified issues with the Containment Emergency Sump. Licensee Event Report (LER) 2002-005-00, dated

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November 4, 2002, and revisions dated December 11, 2002, and May 21, 2003 reported this information to the NRC. As a part of resolving this issue, an action plan was developed and implemented. Actions necessary to resolve this issue were completed prior to restart of the plant from the thirteenth refueling outage (13RFO).

Subsequent to the DBNPS resolution of these issues, References 3 and 4 were issued. Reference 3 identified methods of designing an emergency sump strainer acceptable to the NRC staff. Reference 4 was created by the Nuclear Energy Institute (NEI) to provide guidance on how to perform the required analyses. The NRC issued a Safety Evaluation Report (SER) for Reference 4 on December 6, 2004. The SER endorses the NEI methodology and explains the NRC Staff position on areas of difference with the NEI methodology.

In order to ensure that the DBNPS activities are fully compliant with regulatory requirements, FENOC will undertake a full review of the existing design. No physical modifications are anticipated as a result of this review, but should some be identified, a schedule for completion will be included in the required September 1, 2005 submittal. The September 1, 2005 submittal will fully describe the activities taken to resolve Generic Safety Issue 191 at DBNPS, as required by GL 2004-02 Requested Information Item 2. Attachment 1 of this letter provides the information requested by Generic Letter (GL) 2004-02 Requested Information Item 1. Attachment 2 identifies regulatory commitments made in this letter.

If you have any questions or require further information, please contact Mr. Henry L. Hegrat at (330) 315-6944.

The statements contained in this submittal, including its associated attachments, are true and correct to the best of my knowledge and belief. I declare under penalty of perjury that the foregoing is true and correct.

Executed on: March 4, 2005

By: Barry S. Allen for M. B. Bezilla
Mark B. Bezilla, Vice President - Nuclear

DRB/s

Attachments

cc: NRC/RIII Administrator
DB-1 NRC/NRR Project Manager
DB-1 Senior Resident Inspector
Utility Radiological Safety Board

Response to Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors"

Item 1: Within 90 days of the date of the safety evaluation report providing the guidance for performing the requested evaluation, addressees are requested to provide information regarding their planned actions and schedule to complete the requested evaluation. The information should include:

(a) A description of the methodology that is used or will be used to analyze the susceptibility of the ECCS [Emergency Core Cooling System] and CSS [Containment Spray System] recirculation functions for your reactor to the adverse effects identified in this Generic Letter of post-accident debris blockage and operation with debris–laden fluids identified in the generic letter. Provide the completion date of the analysis that will be performed.

Response 1(a):

The Davis-Besse Nuclear Power Station (DBNPS) has completed an analysis of the susceptibility of the ECCS and CSS recirculation functions to the adverse effects of post-accident debris blockage and operation with debris–laden fluids. This analysis was completed prior to issuance of Nuclear Energy Institute Document NEI 04-07, "Pressurized Water Reactor Sump Performance Evaluation Methodology," and the NRC's related Safety Evaluation Report. In light of the issuance of these documents, FENOC plans to perform a review of the existing DBNPS analysis. The description of the analysis methodology and a discussion of the planned actions follow.

Description of Methodology

The methodology already implemented at the DBNPS to analyze the susceptibility of the ECCS and CSS to post-accident debris blockage and operation with debris-laden fluid included the following:

1) Identification of containment debris source term
2) Debris transport analyses
3) Analysis of Net Positive Suction Head (NPSH) available and required during applicable post-accident conditions
4) Design and installation of a new Containment Emergency Sump Strainer
5) Evaluation of downstream effects of debris–laden water

Containment walkdowns were utilized to identify the debris source term to be used in the evaluations. A description of these walkdowns is provided in response to Item 1(b) below.

Debris transport analysis was performed in two steps. First, the debris transport fractions for the two bounding accident scenarios were determined. The bounding scenarios for the transport analyses were determined to be a double-ended break of the Reactor Coolant System (RCS) hot leg in the east D-ring of containment and a rupture of one of the RCS nozzles entering the Reactor Vessel in the vessel annulus space. The east D-ring was selected due to the large amount of fibrous insulation in that D-ring at the time of analysis. The break within the vessel annulus was included because it assumed the loss of integrity of the lower sump strainer. The debris transported to the post-LOCA containment pool was determined using NUREG/CR-6772, *GSI-191: Separate-Effects Characterization of Debris Transport in Water,* Los Alamos National Laboratory, August 2002. Once the fraction entering the pool was determined, a Computational Fluid Dynamics analysis was performed to assess the potential for the debris to slide across the floor or to stay in suspension and be carried to the Emergency Sump strainer. All debris capable of transport was assumed to reach the strainer. Consideration of removal by trash racks installed around the periphery of the containment, normal to the recirculation flow direction was included. Debris was conservatively assumed to be uniformly distributed across the strainer.

Determination of the NPSH required and the NPSH available for operation involved several calculations. The NPSH required was based on the flow through the system plus recirculation flow through the pumps. The conservative minimum water level in containment post-LOCA was calculated. This considered both the level at the time of transition to recirculation and the long-term level, to account for volume changes due to cooldown. The head loss through the strainer structure and the ECCS and CSS piping due to maximum flow conditions was determined. The calculations determined the maximum allowable head loss for the debris bed. In comparing this value to the head loss expected from the debris, it was found that adequate positive margin to protect the pumps from cavitation always exists.

The strainer included in the above analyses was the new strainer installed during the refueling outage. The strainer was designed to the standards of the Davis-Besse Design Criteria Manual. It included consideration of static and dynamic loading, such as seismic loads and flow-induced loads due to the presence of the debris on the strainer surface. The material of construction was all stainless steel so that post-LOCA chemical environment would have no impact on strainer integrity. The strainer consists of two portions. The upper section is comprised of 27 vertical cylinders that have strainer media installed on the outer surface and a concentric inner surface of strainer media. The media is stainless steel plate perforated with 3/16" (0.1875") diameter holes on 5/16" centers. This results in a 32% free area in the media. The hole size was based on preventing

material that could block a containment spray nozzle. Nozzle clogging is discussed in the Updated Safety Analysis Report (USAR) Table 6.2-21. In addition, the potential for debris smaller than 0.1875" to affect downstream components was assessed.

The lower strainer is made of 10 large tubes of strainer media installed at the bottom of the in-core instrument tunnel. These are connected to a collection plenum. Three parallel tubes then pass any incoming flow to a plenum located at the top of the in-core tunnel stairs. The parallel tubes are also strainer media that can allow flow into the sump. From the upper plenum, a hole through the wall passes flow into the emergency sump. The opening is protected with additional strainer media so that if the lower strainer integrity is lost due a vessel cavity LOCA, the water entering the sump will still be filtered. The refueling canal drain to the reactor cavity and sump floor drain feature protection to maintain unobstructed flow paths supporting overall sump operation.

Even with the strainer present, small particles will enter the ECCS and CSS fluid streams. A detailed analysis of the downstream components was conducted to identify points where flow paths might be affected by the debris-laden water. When needed, testing was performed and modifications were made to support long term operation in the post-LOCA debris environment. The plant modifications required to implement these results were implemented as part of the refueling outage activities.

Planned Actions

A review of existing analyses to confirm the methodology yields conservative results will be performed. This work will be performed to support submittal of a final report by September 1, 2005, as required by GL 2004-02 Requested Information Item 2. Detailed description of each activity will be included in that report. Should any additional modifications be required, a schedule for implementation will be provided with the September 1, 2005 response.

Item 1(b) A statement of whether you plan to perform a containment walkdown surveillance in support of the analysis of the susceptibility of the ECCS and CSS recirculation functions to the adverse effects of debris blockage identified in this generic letter. Provide a justification if no containment walkdown surveillance will be performed. If a containment walkdown surveillance will be performed, state the planned methodology to be used and the planned completion date.

Response 1(b):

The DBNPS has performed a walkdown surveillance of containment in support of the analysis of the susceptibility of the ECCS and CSS recirculation functions to the adverse effects of debris blockage. The walkdowns were completed during 13RFO.

The walkdowns were conducted in accordance with procedure EN-DP-01507, Containment Walkdown for Potential Sump Screen Debris Sources. This procedure was based on Nuclear Energy Institute Document NEI 02-01, Rev. 0, "Condition Assessment Guidelines: Debris Sources Inside PWR Containments," April, 2002. All personnel that performed the walkdowns were trained prior to conducting the walkdowns in class ESC-CH-01, "Containment Health Lesson Plan: Emergency Sump Inspection." The walkdowns utilized design drawings to identify potential debris sources. These sources were verified during the walkdowns, and any undocumented sources identified. The results of the walkdowns were documented in report DBE004-RPT-001 (ACT 03-0159), "Determination of Post-LOCA Debris Generation for Design of Emergency Sump Strainer." The inventory of containment coatings was addressed as a separate issue throughout the debris source term identification phase, with its own governing procedures and processes. However, the results were included in the debris transport analysis and the sump strainer design.

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Attachment 2

COMMITMENT LIST

The following list identifies those actions committed to by the Davis-Besse Nuclear Power Station (DBNPS) in this document. Any other actions discussed in the submittal represent intended or planned actions by the DBNPS. They are described only for information and are not regulatory commitments. Please notify the Supervisor - Licensing (330-315-6944) of any questions regarding this document or any associated regulatory commitments.

COMMITMENTS	DUE DATE
A review of existing analyses to confirm the methodology yields conservative results will be performed. This work will be performed to support submittal of a final report by September 1, 2005, as required by GL 2004-02 Requested Information Item 2. Detailed description of each activity will be included in that report. Should any additional modifications be required, a schedule for implementation will be provided with the September 1, 2005 response.	September 1, 2005