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Docket Number 50-346

License Number NPF-3

Serial Number 2820

October 6, 2003

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Subject: Licensing Basis for Not Assuming a Passive Failure of a Manual Valve Following a
Postulated Loss-of-Coolant Accident

Ladies and Gentlemen:

The purpose of this letter is to present the licensing basis for not assuming the passive failure of Service Water System manual valve SW82 following a postulated loss-of-coolant accident (LOCA) at the Davis-Besse Nuclear Power Station, Unit Number 1 (DBNPS). This licensing basis issue was raised during a NRC inspection as documented in NRC Inspection Report 50-346/02-14, dated February 26, 2003. The inspection report discussed the inspector's belief that separation of the valve disc from the valve stem with the valve disc subsequently blocking flow from the Emergency Core Cooling System pump room coolers was credible and required to be assumed as part of the DBNPS passive failure analysis. This item was characterized as an unresolved issue (URI 50-346/2002-014-05) within the NRC inspection report, pending review by the NRC Office of Nuclear Reactor Regulation.

The enclosed document addresses this issue in detail for the DBNPS. It is submitted for NRC review and concurrence that a passive failure of manual valve SW82 following a LOCA is not required to be assumed under the DBNPS licensing basis.

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

Very truly yours,

CWS

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Enclosures

cc: Regional Administrator, NRC Region III
J. B. Hopkins, DB-1 NRC/NRR Senior Project Manager
C. S. Thomas, DB-1 Senior Resident Inspector
Utility Radiological Safety Board

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**FirstEnergy Nuclear Operating Company
Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS)**

**Licensing Basis for Not Assuming a Passive Failure of a Manual Valve
Following a Postulated Loss-of-Coolant Accident (LOCA)**

Issue:

The purpose of this document is to present the current licensing basis for not assuming the passive failure of Service Water System manual valve SW82 following a postulated loss-of-coolant accident (LOCA) at the DBNPS. This licensing basis issue was raised at the DBNPS during a NRC inspection and documented in NRC Inspection Report 50-346/02-14, dated February 26, 2003. The inspection report discussed the inspector's belief that separation of the valve disc from the valve stem with the valve disc subsequently blocking flow from the Emergency Core Cooling System pump room coolers was credible and required to be assumed as part of the DBNPS passive failure analysis. This item was characterized as an unresolved issue (URI 50-346/2002-014-05) within the NRC inspection report, pending review by the NRC Office of Nuclear Reactor Regulation (NRC/NRR). This document addresses this issue in detail for the DBNPS.

DBNPS Licensing Basis Summary:

The DBNPS safety-related Service Water System was licensed to meet the intent of the single failure criterion, including certain passive failures. Manual valve SW82 is located in the safety-related portion of the Service Water System and thus is subject to the single failure criterion. However, a review of the DBNPS licensing basis, as discussed in Table 9-4 of the Final Safety Analysis Report (FSAR) and Table 9.2-3 of the Updated Safety Analysis Report (USAR), has shown that the implementation of the single failure criterion did not assume a postulated passive failure involving a manual valve stem-to-disc separation for Service Water System manual valve SW82.

The DBNPS licensing basis is consistent with the NRC's generic position at the time of licensing. This type of passive failure was not required to be postulated based on information contained in NRC NUREG-0153, "Staff Discussion of Twelve Additional Technical Issues Raised by Responses to November 3, 1976 Memorandum from Director, NRR to NRR Staff," December 1976, and NRC SECY 77-439, "Single Failure Criterion," dated August 17, 1977. As discussed in these documents, the only passive failures in conjunction with a LOCA that were required to be assumed for fluid systems involve fluid leakage from the gross failure of a pump or valve seal during the long-term cooling mode following the LOCA (24 hours or greater after the event) but not pipe breaks. No other passive failures were required to be assumed in fluid systems because it was judged that compounding of probabilities associated with other types of passive failures, following the pipe break associated with a LOCA, results in probabilities

sufficiently small that they can be reasonably discounted without substantially affecting overall systems reliability.

NUREG-0153 specifically addresses the consequences of the passive mechanical valve failure of a dropped disc that could not be detected followed by a plant transient as expected to be less than 10 CFR Part 100 guidelines and within the acceptance criteria for low probability events. Further, NUREG-0153 concluded that *"the probability of a passive mechanical valve failure during the time period in which consequences could be significantly affected appears to be negligibly small."* The following provides a detailed discussion of the DBNPS licensing basis for not assuming a passive failure of Service Water System manual valve SW82 due to a stem-to-disc separation.

Background:

A Potential Condition Adverse to Quality Report (PCAQR), dated December 10, 1991, described a condition identified during the DBNPS Individual Plant Examination (IPE) involving a single passive failure that would fail all Emergency Core Cooling System (ECCS) room cooling. The PCAQR stated that if Service Water System manual valve SW82 on the ECCS room cooler combined service water outlet header failed closed, there would not be a service water flowpath through the ECCS room coolers. This would potentially affect the ECCS equipment (high pressure injection (HPI) pumps, low pressure injection (LPI) pumps, and containment spray pumps). It was also noted that this failure would also affect one train of the containment air coolers. Manual valve SW82 is an ASME Section III, Class 3, 1971 Edition 10-inch butterfly valve. The final resolution of this issue, found acceptable by the NRC as detailed in NRC Inspection Report 50-346/91022, dated January 17, 1992 (DBNPS letter Log Number 1-2594), was to lock valve SW82 open to prevent mispositioning of the valve.

However, recently, NRC Inspection Report 50-346/02-14, dated February 26, 2003 (DBNPS letter Log Number 1-4359), documented an issue identified during the review of the single-failure effects in the Service Water System. The inspector postulated a passive failure in manual valve SW82. The inspector requested the DBNPS analysis for assuming that valve SW82 failed closed and could not be reopened; for example, if the valve had a stem-to-disc failure. The DBNPS staff had previously assessed other failures of SW82, but did not consider a stem-to-disc separation as either credible or required to be assumed as part of the passive failure analysis for the DBNPS. The inspector questioned the DBNPS licensing basis position that stem-to-disc separation was not credible and also questioned the licensing basis position that stem-to-disc separation was not required to be assumed as part of a passive failure analysis. This inspection issue was categorized by the inspector as an unresolved issue (URI 50-346/ 2002-014-05), pending further review by NRC/NRR.

Licensing/Regulatory Basis:

10 CFR 54.3(a) defines the current licensing basis (CLB) as that set of NRC requirements applicable to a specific plant and the licensee's written commitments for assuring compliance with and operation within applicable NRC requirements and the plant-specific design basis (including all modifications and additions to such commitments over the life of the license) that are docketed and in effect. The CLB includes the NRC regulations contained in 10 CFR Parts 2, 19, 20, 21, 26, 30, 40, 50, 51, 54, 55, 70, 72, 73, 100, and Appendices thereto; orders; license conditions; exemptions; and Technical Specifications. It also includes the plant-specific design-basis information defined in 10 CFR 50.2 as documented in the most recent final safety analysis report (FSAR) as required by 10 CFR 50.71 and the licensee's commitments remaining in effect that were made in docketed correspondence such as licensee responses to NRC bulletins, generic letters, and enforcement actions, as well as licensee commitments documented in NRC safety evaluations, or described in licensee event reports.

The DBNPS was licensed by the NRC in the 1970's. It received its Construction Permit on March 24, 1971, and its Operating License on April 22, 1977. During this timeframe, various regulatory requirements were being developed and were evolving. As the DBNPS went through the Construction Permit and the Operating License review stages, the reviews were based on the regulatory requirements in effect at the time. This constituted the historical licensing basis for the DBNPS at the time of initial operation.

At the time the DBNPS was being designed, constructed and licensed in the late 1960's and early 1970's, the existing 10 CFR 50, Appendix A, General Design Criteria (GDC) were not requirements in the Code of Federal Regulations. At that time, it was the practice of the Atomic Energy Commission (AEC) to require applicants for Construction Permits (CPs) to specify the plant design, performance and siting criteria in Preliminary Safety Analysis Reports submitted by applicants in accordance with 10 CFR 50.34(a). This practice led to inconsistencies in the imposition of requirements for each plant being licensed during this time and, recognizing this, the AEC codified the GDC in Appendix A to 10 CFR 50, which became effective on May 21, 1971 (36 FR 3255, February 20, 1971).

At the time 10 CFR 50, Appendix A was published, it was not the intent of the Commission to make it retroactive to plants that had received their CPs from the AEC. The regulations themselves, as well as the Statements of Consideration for these regulations, clearly state that they apply to proposed sites and those applying for a CP in accordance with 10 CFR 50.34(a) (36 FR 3255). This position was supported in a Memorandum from S. J. Chilk (Secretary) to J. M. Taylor (EDO), September 18, 1992, "SECY-92-223 – Resolution of Deviations Identified During the Systematic Evaluation Program" that stated: *"The Commission (with all Commissioners agreeing) has approved the staff proposal in Option 1 of this paper in which the staff will not apply the General Design Criteria (GDC) to plants with construction permits issued prior to May 21, 1971."*

At the time of the promulgation of Appendix A to 10 CFR Part 50, the Commission stressed that the GDC were not new requirements and were promulgated to more clearly articulate the licensing requirements and practice in effect at that time. While compliance with the intent of the GDC is important, each plant licensed before the GDC were formally adopted was evaluated on a plant specific basis, determined to be safe, and licensed by the Commission. Furthermore, current regulatory processes are sufficient to ensure that plants continue to be safe and comply with the intent of the GDC."

Since the CP for the DBNPS was issued on March 24, 1971 (prior to the codification of the GDC), the design, performance, and siting criteria for the DBNPS were initially specified in the Preliminary Safety Analysis Report (PSAR), followed by the FSAR and then by the USAR. Although the DBNPS criteria are similar to the GDC, they are not identical and, in some instances, were applied in a manner differently than they would be today.

It is important to note that the DBNPS FSAR and USAR Appendix 3D, contain information regarding the extent of the committed compliance of the DBNPS design with the GDC. However, while this appendix states the DBNPS design "meets the intent" of this guidance, the DBNPS design may not be entirely consistent with the regulations later issued (i.e., the GDC), or later revisions of the safety and information guides referencing the GDC.

FSAR, Revision 27, April 1977

The following discussions provide information related to the single failure criterion as applied to manual valves in fluid systems in the design of the DBNPS during the FSAR/Operating License review stage. The Operating License was issued based on the NRC's review of the FSAR.

FSAR Appendix 3D provides discussions of conformance with the NRC General Design Criteria. It states that the design of the DBNPS meets the intent of Appendix A, 10 CFR 50, the General Design Criteria for Nuclear Power Plants as published in the Federal Register on February 20, 1971, and as amended in the Federal Register on July 7, 1971.

The FSAR Appendix 3D discussion of GDC-44, "Cooling Water," states the following:

"A system to transfer heat from structures, systems, and components important to safety, to an ultimate heat sink shall be provided. The system safety function shall be to transfer the combined heat load of these structures, systems, and components under normal operating and accident conditions.

Suitable redundancy in components and features, and suitable interconnections, leak detection, and isolation capabilities shall be provided to assure that for on-site

electric power system operation (assuming off-site power is not available) and for off-site electric power system operation (assuming on-site power is not available) the system safety function can be accomplished, assuming a single failure."

The FSAR then briefly discusses the Service Water System and refers to FSAR Section 9.2.1.

With respect to service water, FSAR Section 9.2.1.3, "Safety Evaluation," states: "*A single-failure analysis has been made on the active and passive components of the system to show that a single failure of any component will not prevent fulfilling the design functions. This analysis is illustrated in Table 9-4.*" FSAR Table 9-4, "Single Failure Analysis Service Water System," provides a listing of those components evaluated for single failure effects in the safety evaluation. The passive failures included in the table are ruptures of piping and components, none of which is evaluated as affecting the redundant subsystem. Valve SW82 is shown on FSAR Figure 9-2 as a check valve, but is not listed in Table 9-4 as being subject to a single failure analysis.

Accordingly, the FSAR, which was later reviewed by the NRC staff in order to issue an Operating License to the DBNPS, did not assume a passive failure of valve SW82.

Operating License Safety Evaluation Report

The DBNPS Operating License Safety Evaluation Report (OL SER) was issued by the NRC as NUREG-0136, dated December 1976, and followed by Supplement No. 1. The NRC stated in Section 9.3.1, "Service Water System," that based on its review of the Service Water System design it concluded that GDC-44 was met and the design was acceptable. As discussed in Section 1.1 of the OL SER, the NRC staff performed a safety review of the FSAR in preparing the OL SER. As discussed above, the FSAR did not assume a passive failure of valve SW82.

Accordingly, the DBNPS Operating License was issued without requiring the assumption of a passive failure of manual valve SW82.

Updated Safety Analysis Report (USAR)

A review of the USAR did not identify any information contrary to that discussed above for the FSAR. As shown on USAR Figure 9.2-1, valve SW82 is now a manual butterfly valve, which allows the valve to be placed in a locked open position in accordance with the DBNPS Locked Valve Program.

USAR Section 3.6.2.1, "Dynamic and Environmental Effects of Protection Criteria – General," states that a single failure in an active component of a required safety related system is assumed in order to meet the basic design criteria for pipe ruptures and that other passive failures in addition to the postulated pipe break are not assumed to occur.

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With respect to service water, USAR Section 9.2.1.3, "Safety Evaluation," states: *"A single-failure analysis has been made on components of the system to show that a single failure of any component as shown on Table 9.2-3 will not prevent fulfilling the design functions."* USAR Table 9.2-3, "Single Failure Analysis Service Water System," provides a listing of those components evaluated for single failure effects in the safety evaluation. Manual valve SW82 (ECCS room cooler combined service water outlet header valve) is listed in the table as a failure that is not credible due to the fact that it is a manual valve.

Docketed Correspondence

The following docketed correspondence provides information related to the single failure criterion as applied to Service Water System manual valve SW82 in the design of the DBNPS.

By letter dated January 17, 1992, (DBNPS letter Log Number 1-2594) the NRC provided the results of a routine safety inspection (50-346/91022) which provided the following discussions:

"On December 10, 1991, as a result of the Davis-Besse Individual Plant Examination, the licensee documented on PCAQ 91-0611 that a single passive failure of manual valve, SW82, would cause a loss of all ECCS room cooling. With this valve shut there would not be a service water flowpath through the ECCS room coolers and one train of containment air coolers.

The licensee's staff evaluated this condition and determined that it was within the plant's original design basis and therefore was not reportable to the NRC. In addition, due to its relative inaccessible location, the licensee further determined that no additional actions such as locking the valve were required.

The inspectors reviewed the licensee's actions and concluded that the prudent thing to do was to lock the valve in the open position."

The report goes on to state that: *"Because of the inspector's concerns, the licensee has locked the valve open and is evaluating further the need for additional controls on this valve."* No violations or deviations were identified with respect to this issue. Although the DBNPS took action to lock open valve SW82 to address the inspector's passive failure concern, it did not change the licensing basis of this valve as defined in 10 CFR 54.3(a), i.e., a passive failure of valve SW82 is not assumed.

Regulatory Information:

The following information discusses NRC positions related to the passive single failure criterion with respect to the design and licensing of nuclear power station fluid systems during the time the DBNPS was being licensed.

NUREG-0153, "Staff Discussion of Twelve Additional Technical Issues Raised by Responses to November 3, 1976 Memorandum from Director, NRR to NRR Staff," December 1976, provides an NRR position on passive failures in fluid systems. Issue 17, "Passive Mechanical Failures," was initiated in response to a concern that certain issues were not being treated adequately by the staff. One of these was whether a passive failure caused by separation of the valve disc from its operator needed to be considered in the design of safety related equipment as the assumed single failure.

The NUREG states that: *"Staff practice has not required that a passive mechanical valve failure be considered as a single failure following a postulated design basis accident, such as a loss-of-coolant accident, although the single failure criterion is applied to active failure modes of such valves."* The NUREG goes on to state that: *"Our position on passive mechanical valve failures is based on our judgment that such failures have an acceptably low likelihood of occurrence during both the injection (short term) and recirculation (long term) phases of a loss-of-coolant accident. Further, analyses of ECCS performance in WASH-1400 indicate that passive mechanical failures of valves were unimportant contributors to ECCS unavailability during both the injection and recirculation modes of operation."* In addition, the NUREG states: *"In our judgment, the probability of a LOCA followed by a passive mechanical failure is low enough that, in consideration of this design objective, equipment relied upon to mitigate this accident need not be designed such that a concurrent single passive failure of a valve would not result in exceeding established acceptance criteria."* The NUREG also states: *"The probability of occurrence of such a plant transient, convoluted with the probability of an undetected prior passive mechanical valve failure, is believed to be about the same as the probability of occurrence of accidents such as a steam line break accident. Accordingly, the staff believes that equipment relied upon to mitigate the consequences of transients is currently designed such that a concurrent single passive mechanical valve failure would not result in consequences exceeding established acceptance criteria for low probability events."* The staff concluded that consideration of this issue did not warrant revisions to any existing licenses. It should be noted that this NUREG was dated the same month and year as the DBNPS Operating License Safety Evaluation Report.

SECY 77-439, "Single Failure Criterion," dated August 17, 1977, provided an information paper from the NRC staff to the Commissioners on the Single Failure Criterion and its application. The following relevant information is from SECY 77-439 Section 2, "Important Elements of the Single Failure Criterion," Part D, "Passive Failure in a Fluid System." *"In the study of passive failures it is current practice to assume fluid leakage owing to gross failure of a pump or valve seal during the long-term cooling*

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mode following a LOCA (24 hours or greater after the event) but not pipe breaks. No other passive failures are required to be assumed because it is judged that compounding of probabilities associated with other types of passive failures, following the pipe break associated with a LOCA, results in probabilities sufficiently small that they can be reasonably discounted without substantially affecting overall systems reliability."

Conclusion:

Based on the DBNPS licensing basis and regulatory information presented above, it can be concluded that the Service Water System manual valve SW82 is not required to be analyzed with respect to a passive failure, e.g., a stem-to-disc separation. Additionally, the DBNPS believes the inclusion of valve SW82 within the DBNPS Locked Valve Program as locked in the open position provides a further basis for not assuming a passive failure of this valve in conjunction with a postulated LOCA.

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COMMITMENT LIST

The following list identifies those actions committed to by the Davis-Besse Nuclear Power Station, Unit Number 1, (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 Manager - Regulatory Affairs (419-321-8450) at the DBNPS of any questions regarding this document or associated regulatory commitments.

COMMITMENTS

None

DUE DATE

None