February 20, 2002

Mr. Howard Bergendahl
Vice President - Nuclear, Davis-Besse
FirstEnergy Nuclear Operating Company
Davis-Besse Nuclear Power Station
5501 North State Route 2
Oak Harbor, OH 43449-9760

SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1, INSERVICE INSPECTION RELIEF REQUEST NO. RR-A22 FOR THE SECOND 10-YEAR INSPECTION INTERVAL (TAC NO. MB1609)

Dear Mr. Bergendahl:

By letter dated March 24, 2001, FirstEnergy Nuclear Operating Company requested Relief Request No. RR-A-22 for the second 10-year inservice inspection (ISI) interval for the Davis-Besse Nuclear Power Station (DBNPS), Unit 1. The request pertains to relief from the volumetric examination of essentially 100 percent (greater than 90 percent in accordance with Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds") of the weld volume as required by the American Society of Mechanical Engineers Code, Section XI, for the Core Flood Nozzle to Safe-End welds of the reactor vessel.

DBNPS demonstrated that compliance to the Code-required examination coverage would result in hardship or unusual difficulty without a compensating increase in the level of safety and quality due to the configuration of the Code Flood Nozzle Flow Restrictors, which prevents a complete ultrasonic examination of the welds. The Nuclear Regulatory Commission (NRC) staff authorizes the licensee's alternative examination coverage obtained for the welds, pursuant to the provisions of 10 CFR 50.55a(a)(3)(ii), for the second 10-year ISI interval which ended on September 20, 2000. The staff believes that the examination coverage of the weld volume provides reasonable assurance of the structural integrity of the subject welds. Details of the NRC staff's safety evaluation are contained in the enclosure.

This completes all of the staff's work on the above-listed submittal. Please contact the project manager, Mr. Stephen Sands, by telephone at (301) 415-3154 if you have any questions.

Sincerely,

/RA/

Anthony J. Mendiola, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-346

Enclosure: Safety Evaluation

cc w/encl: See next page

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NAME	SSands	THarris	*TChan	*MO'Neill	AMendiola
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cc:

Mary E. O'Reilly
FirstEnergy
76 South Main Street
Akron, OH 44308

Manager - Regulatory Affairs
FirstEnergy Nuclear Operating Company
Davis-Besse Nuclear Power Station
5501 North State - Route 2
Oak Harbor, OH 43449-9760

Director
Ohio Department of Commerce
Division of Industrial Compliance
Bureau of Operations & Maintenance
6606 Tussing Road
P.O. Box 4009
Reynoldsburg, OH 43068-9009

Regional Administrator
U.S. Nuclear Regulatory Commission
801 Warrenville Road
Lisle, IL 60523-4351

Michael A. Schoppman
Framatome ANP
1911 N. Ft. Myer Drive
Rosslyn, VA 22209

Resident Inspector
U.S. Nuclear Regulatory Commission
5503 North State Route 2
Oak Harbor, OH 43449-9760

Plant Manager, Randel J. Fast
FirstEnergy Nuclear Operating Company
Davis-Besse Nuclear Power Station
5501 North State - Route 2
Oak Harbor, OH 43449-9760

Dennis Clum
Radiological Assistance Section Supervisor
Bureau of Radiation Protection
Ohio Department of Health
P.O. Box 118
Columbus, OH 43266-0118

Carol O'Claire, Chief, Radiological Branch
Ohio Emergency Management Agency
2855 West Dublin Granville Road
Columbus, OH 43235-2206

Ohio Environmental Protection Agency
DERR--Compliance Unit
ATTN: Zack A. Clayton
P.O. Box 1049
Columbus, OH 43266-0149

Public Utilities Commission of Ohio
Transportation Department
180 East Broad Street
Columbus, OH 43215-3793

Attorney General
Department of Attorney
30 East Broad Street
Columbus, OH 43216

President, Board of County
Commissioners of Ottawa County
Port Clinton, OH 43252

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SECOND 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM

RELIEF REQUEST NO. RR-A22

FIRSTENERGY NUCLEAR OPERATING COMPANY

DAVIS-BESSE NUCLEAR POWER STATION

DOCKET NO. 50-346

1.0 INTRODUCTION

The inservice inspection of the American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). In 10 CFR 50.55a(a)(3), it states that alternatives to the requirements of paragraph (g) may be used, when authorized by the Nuclear Regulatory Commission (NRC), if the licensee demonstrates that: (i) the proposed alternatives would provide an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

2.0 BACKGROUND

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code, incorporated by reference in 10 CFR 50.55a(b), 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The applicable ASME Section XI Code of Record for the Davis-Besse Nuclear Power Station (DBNPS) second 10-year inservice inspection (ISI) interval, is the 1986 Edition. The components (including supports) may meet the requirements set forth in subsequent editions and addenda of the ASME Code incorporated by reference in 10 CFR 50.55a(b) subject to the limitations and modifications listed therein and subject to Commission approval.

Pursuant to 10 CFR 50.55a(g)(5), if the licensee determines that conformance with an examination requirement of Section XI of the ASME Code is not practical for its facility, information shall be submitted to the Commission in support of that determination and a request made for relief from the ASME Code requirement. After evaluation of the determination,

pursuant to 10 CFR 50.55a(g)(6)(i), the Commission may grant relief and may impose alternative requirements that are determined to be authorized by law, will not endanger life, property, or the common defense and security, and are otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed.

By letter dated March 24, 2001, FirstEnergy Nuclear Operating Company, the licensee for DBNPS, submitted Relief Request No. RR-A22 for the second 10-year ISI interval of Davis-Besse. The request pertains to relief from the volumetric examination of essentially 100 percent (greater than 90 percent in accordance with Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds)," of the weld volume as required by the ASME Code, Section XI, for the Core Flood Nozzle to Safe-End welds of the reactor vessel. The licensee has stated that compliance to the Code-required examination coverage would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety due to the configuration of the Core Flood Nozzle Flow Restrictors, which prevents a complete ultrasonic examination of the welds. The staff has evaluated the licensee's alternative examination coverage obtained for the welds, pursuant to the provisions of 10 CFR 50.55a(a)(3)(ii).

3.0 DISCUSSION (RELIEF REQUEST NO. RR-A22)

3.1 System/Component for which Relief is Requested

Core Flood Nozzle to Safe-End Welds (Weld Numbers RC-RPV-WR-54/55-W and RC-RPV-WR-54/55-Y)

3.2 ASME Code Class

ASME Section XI, Class 1

3.3 Code Requirement

The ASME Code, Section XI, 1986 Edition, Subsection IWB, Table IWB-2500-1, Examination Category B-F, Item B5.10 requires 100 percent volumetric examination of the Reactor Vessel Nozzle to Safe-End butt welds. Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds," approved for use by the NRC in Regulatory Guide 1.147, allows credit for full volume coverage of welds if it can be shown that greater than 90 percent of the required volume has been examined.

3.4 Code Requirement from which Relief is Requested

Relief is requested from the requirement to examine 100 percent of the required weld volume specified in the ASME Code, Section XI, 1986 Edition. Due to the existing configuration of the Core Flood Nozzle Flow Restrictors, obtaining greater than 90 percent coverage of the required weld volume as allowed under Code Case N-460 would cause unusual difficulty without a compensating increase in the level of quality and safety.

3.5 Licensee's Basis for Relief

During the examination of the two DBNPS Reactor Vessel Core Flood Nozzle to Safe-End butt welds during the 12th Refueling Outage in the spring of 2000, it was not possible to examine greater than 90 percent of the examination volume.

The Reactor Vessel Core Flood Nozzle (i.e., Core Flood Nozzle) to Safe-End butt welds were examined from the inside surface using the Framatome URSULA inspection system. URSULA is a computer controlled system which uses a contact ultrasonic test head to obtain ultrasonic data for the detection and sizing of indications. The contact head is fitted with an array of transducers in direct contact with the examination surface.

The Core Flood Nozzles are each fitted with a flow restrictor located in the bore of the nozzle and is welded in place; the flow restrictor is not removable. During the examination of the Core Flood Nozzle to Safe-End butt welds, it was not possible to examine greater than 90 percent of the examination volume because of a loss of data at the top of the Core Flood Nozzles. There are only two possible conditions that could result in the loss of data at the top of the nozzles; one being lack of contact between the transducer and the surface of the component, and the other being a lack of coupling media. In order to be certain that the coverage limitation at the top of the nozzles was not attributed to inadequate transducer contact due to tool misalignment, several attempts were made to reposition the inspection tool to obtain better contact at the top of the nozzle. All attempts made to improve transducer contact produced the same inspection results. It was therefore concluded that the only other possibility for the limitation at the top of the nozzles was due to inadequate coupling that resulted from air trapped at the top of the nozzles. These air pockets were caused by the Core Flood Nozzle Flow Restrictors trapping air during the filling of the Reactor Coolant System for 10-year inservice examination of the Reactor Vessel. The design and configuration of the flow restrictors in the two Core Flood Nozzles, and resultant air pockets, caused a loss of data at the top of the nozzles which reduced the examination volume coverage to 86 percent on the Y-Axis Core Flood Nozzle to Safe-End butt weld and to 76 percent on the W-Axis Core Flood Nozzle to Safe-End butt weld. Eighty-six percent of the Y-Axis Core Flood Nozzle-to-Safe End butt weld and 76 percent of the W-Axis Core Flood Nozzle-to-Safe End butt weld examination volumes were examined. No indications exceeding the acceptance standards of IWB-3514 were noted. Relief from the ASME Boiler and Pressure Vessel Code, Section XI, Table IWB-2500-1, Item B5.10 and Code Case N-460 is requested pursuant to 10 CFR 50.55a(a)(3)(ii) for the Second 10-year ISI interval. The design and configuration of the Core Flood Nozzle Flow Restrictors prohibits a complete examination of the Core Flood Nozzle to Safe-End butt welds. This results in a hardship in that complying with the Code requirements would require redesign or removal of the flow restrictors. Any additional examinations to achieve the Code-specified greater than 90 percent examination coverage would require [sic] offloading the reactor core and removal of the core barrel. As cited above, the examination coverage achieved was marginally below the Code-specified coverage and did not reveal any indications wherein acceptance standards were not met. Therefore, redesign or additional examination efforts would provide no compensating increase in the level of quality or safety.

3.6 Alternative Examination

The Core Flood Nozzle to Safe-End butt welds were examined to the extent possible. Approximately 86 percent of the Y-Axis Core Flood Nozzle to Safe-End butt weld and 76 percent of the W-Axis Core Flood Nozzle to Safe-End butt weld were examined.

4.0 EVALUATION

The staff has evaluated the information provided by the licensee in support of the volumetric examinations of the subject welds performed during the second 10-year ISI interval. The staff concurs with the licensee's finding that the core flood nozzle flow restrictors could tend to trap air during circulation of reactor coolant when the system is open to the atmosphere. As reactor coolant exits the flow restrictor, air bubbles form and migrate preferentially to the top of the nozzle due to proximity and, thus, impede acoustic coupling between the transducer and the weld. These nozzles are permanently attached to the reactor vessel. Therefore, the Code-specified volumetric examination coverage of the subject weld would invariably require offloading the reactor core for performance of the examination to prevent formation of air bubbles at the exit end of the flow restrictor.

The licensee's best-effort examination of the welds with the reactor core in place resulted in volumetric coverages of 86 percent in the circumferential direction and 76 percent in the transverse direction, giving a composite coverage of 81 percent. The examination coverage achieved did not reveal any indications for which acceptance standards were not met. Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds," approved for use by NRC in Regulatory Guide 1.147, allows credit for full volume coverage of welds if it can be shown that greater than 90 percent of the required volume has been examined. The extent of volumetric examination coverage falls below the required coverage by 9 percent. The staff believes that if there were any service-induced flaws existing in the welds and/or in the base metal adjacent to the welds, the examination of 81 percent of weld volume would have at least detected a portion of it with a high degree of confidence. In order to obtain an additional 9 percent in volumetric examination coverage, the licensee would have to offload the reactor core, which involves moving the core in and out of the spent fuel pool. The staff, therefore, has determined that the alternative examination coverage provides reasonable assurance of the structural integrity of the welds, and compliance to the Code-required examination coverage would result in hardship to the licensee without a compensating increase in the level of quality and safety.

5.0 CONCLUSION

The staff has reviewed the licensee submittal and has concluded that the configuration of the core flood nozzle flow restrictor affects volumetric examination coverage of reactor vessel core flood nozzle to safe-end butt welds. The Code-required examination coverage cannot be achieved without offloading the reactor core during examination, and it will be a hardship without a compensating increase in the level of quality and safety to offload the reactor core for a small increase in the volumetric examination coverage. The staff believes that the examination coverage of the weld volume provides reasonable assurance of the structural integrity of the subject welds. Therefore, the licensee's alternative examination coverage in

Relief Request No. RR-A22 is authorized pursuant to 10 CFR 50.55a(a)(3)(ii), for the second 10-year inservice inspection interval of Davis-Besse Nuclear Power Station, which ended on September 20, 2000.

Principal contributor: P. Patnaik

Date: February 20, 2002