

February 13, 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-A23 FOR THE SECOND 10-YEAR  
INSPECTION INTERVAL (TAC NO. MB1608)

Dear Mr. Campbell:

By letter dated March 27, 2001, FirstEnergy Nuclear Operating Company requested relief from certain American Society of Mechanical Engineers (ASME) Code Section XI requirements. Specifically, Relief Request No. RR-A23 for the second 10-year inservice inspection (ISI) interval for the Davis-Besse Nuclear Power Station (DBNPS), Unit 1, was requested. Subsequent to the Nuclear Regulatory Commission staff's discussion with DBNPS, a revision to Relief Request No. RR-A23 was submitted by letter dated September 6, 2001. The ASME Code, Section XI, 1995 Edition, 1996 Addenda, Appendix VIII, Supplement 4, requires that performance demonstration results satisfy the statistical parameters specified in Subparagraph 3.2(c). In lieu of this, DBNPS proposes that in the sizing of flaw depth, the following acceptance criterion be used: the Root Mean Square Error of the flaw depths estimated by ultrasonic examination, when compared with the true depths, shall not exceed 0.15 inch.

The staff, based on the enclosed safety evaluation, finds the DBNPS alternative provides an acceptable level of safety and quality. Therefore, pursuant to the provisions of 10 CFR 50.55a(a)(3)(i), the staff authorizes the proposed alternative to the Code requirements in Relief Request No. RR-A23 for the second 10-year ISI interval which ended on September 20, 2000.

This completes all 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/encls: See next page

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Mr. Howard Bergendahl  
FirstEnergy Nuclear Operating Company

Davis-Besse Nuclear Power Station, Unit 1

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

RELATED TO THE SECOND INSERVICE INSPECTION INTERVAL

REVISION TO RELIEF REQUEST NO. RR-A23

DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1

FIRSTENERGY NUCLEAR OPERATING COMPANY

DOCKET NO. 50-346

1.0 INTRODUCTION

By letter dated March 27, 2001, FirstEnergy Nuclear Operating Company (FENOC), the licensee, submitted a request for relief from certain American Society of Mechanical Engineers (ASME) Code Section XI requirements for inservice inspection at the Davis-Besse Nuclear Power Station (DBNPS). Subsequent to the staff's discussions with the licensee, a revision to Relief Request No. RR-A23 was submitted by letter dated September 6, 2001. The ASME Code, Section XI, 1995 Edition, 1996 Addenda, Appendix VIII, Supplement 4, requires that performance demonstration results satisfy the statistical parameters specified in Subparagraph 3.2(c). In lieu of this, the licensee proposes that with respect to the sizing of flaw depth, the following acceptance criterion be used: the Root Mean Square Error (RMSE) of the flaw depths estimated by ultrasonic examination when compared with the true depths, shall not exceed 0.15 inch.

The staff has reviewed and evaluated the information provided in Relief Request No. RR-A23. The basis for disposition is documented below.

2.0 BACKGROUND

Inservice inspection of the ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel (B&PV) Code and applicable addenda as required by 10 CFR 50.55a(g), except where specific 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. 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. For DBNPS, the applicable edition of Section XI of the ASME Code for the second 10-year inservice inspection interval is the 1986 Edition.

### 3.0 DISCUSSION (RELIEF REQUEST NO. RR-A23)

#### 3.1 Component Description

ASME Code, Section XI, Examination Category B-A, Item No. B1.11, Reactor Vessel Circumferential Shell Welds; B1.21, Reactor Vessel Circumferential Head Welds; and B1.30, Reactor Vessel Shell-to-Flange Weld, subject to Appendix VIII, Supplement 4, examination. [Relief Request RR-A20 (submitted by FENOC letter, Serial Number 2622, dated November 13, 1999, and supplemented by FENOC letter, Serial Number 2694, dated March 24, 2001), requested relief to apply the requirements of Appendix VIII, Supplement 4 to the Reactor Vessel Shell-to-Flange Weld because ASME Section XI does not specify that Appendix VIII requirements are applicable to this weld.]

#### 3.2 ASME Code Class

ASME Section XI, Class 1

#### 3.3 Examination Requirement

10 CFR 50.55a(b)(2) was amended to reference Section XI of the ASME B&PV Code through the 1995 Edition with the 1996 Addenda (64FR 51370). The ASME Code, Section XI, 1995 Edition, 1996 Addenda, Appendix VIII, Supplement 4, requires that performance demonstration results satisfy the statistical parameters specified in Subparagraph 3.2(c).

#### 3.4 Alternative Examination

In lieu of ASME Section XI, Appendix VIII, Supplement 4, Subparagraph 3.2 (c) pertaining to "Sizing Acceptance Criteria," the following alternative will be used: (a) The RMSE error of the flaw depths estimated by ultrasonic examination, as compared with the true depths, shall not exceed 0.15 in.

#### 3.5 Basis for Relief

During the 12<sup>th</sup> refueling outage in April 2000, the DBNPS reactor vessel shell circumferential welds, head welds, and shell-to-flange weld were examined. The examination process was qualified to the requirements of Appendix VIII, Supplement 4 using the Performance Demonstration Initiative (PDI) protocol. The PDI protocol does not use the statistical

parameters of Appendix VIII, Supplement 4, Subparagraph 3.2(c) for the qualification of this examination equipment.

Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested to use the RMSE of the flaw depths estimated by ultrasonic examination, when compared with the true depths, as not to exceed 0.15 inch, in lieu of the statistical parameters of Appendix VIII, Supplement 4, Subparagraph 3.2(c), as an acceptance criterion in depth sizing of flaws. The length sizing acceptance criterion of 0.75 inch RMS was previously requested (FENOC letter, Serial Number 2644, dated February 27, 2000), and approved by the NRC in Relief Request RR-A21 (TAC No. MA8294, FENOC Log Number 5645).

#### 4.0 EVALUATION

Supplement 4, Subparagraph 3.2(c) of Appendix VIII, requires that the ultrasonic performance demonstration results be plotted on a two-dimensional plot, with the measured depth plotted along the ordinate axis and the true depth plotted along the abscissa axis. For qualification, the plot must satisfy the following statistical parameters: (1) slope of the linear regression line is not less than 0.7; (2) the mean deviation of flaw depth is less than 0.25 inch; and (3) correlation coefficient is not less than 0.70.

The licensee proposes to eliminate the use of Supplement 4, Subparagraph 3.2(c), which imposes three statistical parameters for depth sizing. The first parameter, 3.2(c)(1), pertains to the slope of a linear regression line. The linear regression line is the difference between actual versus true value plotted along a through-wall thickness. For Supplement 4 performance demonstrations, a linear regression line of the data is not applicable because the performance demonstrations are performed on test specimens with flaws located in the inner 15 percent through-wall. The differences between actual versus true value produce a tight grouping of results which resemble a shotgun pattern. The slope of a regression line from such data is extremely sensitive to small variations, thus making the parameter of Subparagraph 3.2(c)(1) a poor and inappropriate acceptance criterion. The second parameter, 3.2(c)(2), pertains to the mean deviation of flaw depth. The value used in the Code is too lax with respect to evaluating flaw depths within the inner 15 percent of wall thickness. Therefore, the licensee proposes to use the more appropriate criterion of 0.15 inch RMS of 10 CFR 50.55a(b)(2)(xv)(C)(1), which modifies Subparagraph 3.2(a), as the acceptance criterion. The third parameter, 3.2(c)(3), pertains to a correlation coefficient. The value of the correlation coefficient in Subparagraph 3.2(c)(3) is inappropriate for this application since it is based on the linear regression from Subparagraph 3.2(c)(1).

The U.S. nuclear utilities created the PDI to implement performance demonstration requirements contained in Appendix VIII of Section XI of the Code. The PDI was aware of the inappropriateness of Subparagraph 3.2(c) early in the development of its program. The PDI personnel brought the issue before the appropriate ASME committee, which formalized eliminating the use of Supplement 4, Subparagraph 3.2(c) in Code Case-622. The NRC staff representatives participated in the discussions and consensus process of the code case. Based on the above, the NRC staff believes that the use of Subparagraph 3.2(c) requirements, in this context, is inappropriate for this case, and that the proposed alternative to use the RMS value of 10 CFR 50.55a(b)(2)(xv)(C)(1), specifically 0.15 inch RMS, which modifies the criterion

of Appendix VIII, Supplement 4, Subparagraph 3.2(a), in lieu of Subparagraph 3.2(c), will provide an acceptable level of quality and safety.

## 5.0 CONCLUSION

Based on the discussion above, the staff concludes that the proposed alternative to use the depth sizing criterion of Appendix VIII, Supplement 4, Subparagraph 3.2(a) as modified by 10 CFR 50.55a(b)(2)(xv)(C)(1), in lieu of Subparagraph 3.2(c), will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative is authorized for the second 10-year ISI interval for DBNPS.

Principal Contributor: P. Patnaik

Date: February 13, 2002