



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

April 4, 2012

Mr. Mark J. Ajluni  
Nuclear Licensing Director  
Southern Nuclear Operating Company, Inc  
P.O. Box 1295  
Bin - 038  
40 Inverness Center Parkway  
Birmingham, Alabama 35201

SUBJECT: JOSEPH M. FARLEY NUCLEAR PLANT, UNIT 1 - SAFETY EVALUATION OF  
RELIEF REQUEST FNP-ISI-RR-01 (TAC NO. ME5966)

Dear Mr. Ajluni:

By letter dated March 28, 2011, as supplemented by letters dated August 11, 2011, and March 9, 2012, Southern Nuclear Operating Company, (the licensee) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) for relief from certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI requirements at the Joseph M. Farley Nuclear Plant, (FNP), Unit 1.

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g)(5)(iii), the licensee notified the NRC that it has determined that compliance with the ASME Code, Code Case N-695, "Qualification Requirements for Dissimilar Metal Piping Welds" root mean square error (RMSE) criterion for sizing flaws of 0.125 inches for the subject welds at FNP, Unit 1 is impractical and proposes to use an RMSE value of 0.189 inches. Pursuant to 10 CFR 50.55a(g)(6)(i), the staff has evaluated the licensee's determination that the Code Case requirements are impractical.

The NRC staff determines that granting a relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a. Therefore, the NRC staff grants relief as specified in the enclosure, i.e., the use of the alternate depth-sizing qualification (0.189 inch), subject to the licensee providing, for NRC staff review and approval prior to the expiration of the relief, the information identified in the enclosure as items 1, 3, 4, and 5 should a crack requiring depth sizing be identified. This relief is granted for FNP, Unit 1, until prior to startup following refueling Cycle 25.

M. Ajluni

- 2 -

All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in the subject request for relief remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Sincerely,

A handwritten signature in black ink that reads "Nancy L. Salgado". The signature is written in a cursive style with a large initial 'N' and 'S'.

Nancy L. Salgado, Branch Chief  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-348

Enclosure: Safety Evaluation

cc w/encl: Distribution via Listserv



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELIEF REQUEST FNP-ISI-RR-01 ALTERNATIVE DEPTH SIZING CRITERIA FOR THE  
FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL  
JOSEPH M. FARLEY NUCLEAR PLANT, UNIT 1

DOCKET NO. 50-348

TAC NO. ME5966

1.0 INTRODUCTION

By letter dated March 28, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML110871951) as supplemented by letters dated August 11, 2011, (ADAMS Accession No. ML112232241) and March 9, 2012, (ADAMS Accession No. ML12072A233) Southern Nuclear Operating Company, (SNC, the licensee) submitted relief request RR FNP-ISI-RR-01. Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g)(5)(iii), the licensee notified the Nuclear Regulatory Commission (NRC or the Commission) that it has determined that compliance with the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Code Case N-695, "Qualification Requirements for Dissimilar Metal Piping Welds" root mean square error (RMSE) criterion for sizing flaws of 0.125 inches for the subject welds at Joseph M. Farley Nuclear Plant (FNP), Unit 1 is impractical and proposes to use an RMSE value of 0.189 inches. Pursuant to 10 CFR 50.55a(g)(6)(i), the staff is evaluating the licensee's determination that the Code Case requirements are impractical.

The licensee initially requested that relief be granted for the fourth 10-year ISI interval of FNP, Unit 1, however in its March 9, 2012 submittal, the licensee revised its request to apply to inspection activities completed prior to the restart of Unit 1 from refueling Cycle 25.

2.0 REGULATORY EVALUATION

In its relief request, the licensee requests relief from the depth sizing acceptance criteria contained in ASME Code Case N-695. ASME Code Case N-695 is a code case which is accepted by the NRC for use in NRC Regulatory Guide (RG) 1.147, Revision 16, "Inservice Inspection Code Case Acceptability ASME Code Section XI, Division 1," as incorporated by reference in 10 CFR 50.55a(b).

Title 10 CFR, Section 50.55a(g)(4)(ii) states, in part, that inservice examination of components must comply with the latest edition of the ASME Code incorporated by reference in 10 CFR 50.55a(b) or the optional ASME Code cases listed in RG 1.147.

Enclosure

Title 10 CFR, Section 50.55a(g)(5)(iii) states, in part, that licensees may determine that conformance with certain code requirements is impractical and that the licensee shall notify the Commission and submit information in support of the determination.

Title 10 CFR, Section 50.55a(g)(6)(i) states, in part that the Commission will evaluate determination under paragraph (g)(5) of this section that code requirements are impractical and that the Commission may grant such relief and may impose such alternative requirements as it determines is authorized by law and will not endanger life or property.

### 3.0 TECHNICAL EVALUATION

#### 3.1 Component Descriptions

The licensee stated that the components under consideration are the ASME Code Class 1 dissimilar metal (DM) butt welds (Table IWB-2500-1, Examination Category B-F, and Item No. B5.10) joining the reactor inlet and outlet loops to the reactor pressure vessel (RPV) nozzle. The materials covered are clad carbon steel RPV nozzles joined to the stainless steel safe-ends using Alloy 600 weld metal.

<b>Weld Designation</b>	<b>Weld Description</b>
ALA1-4100-1DM	Loop 1 Outlet Nozzle To Safe-End
ALA1-4200-1DM	Loop 2 Outlet Nozzle To Safe-End
ALA1-4300-1DM	Loop 3 Outlet Nozzle To Safe-End
ALA1-4100-14DM	Loop 1 Safe-End To Inlet Nozzle
ALA1-4200-14DM	Loop 2 Safe-End To Inlet Nozzle
ALA1-4300-14DM	Loop 3 Safe-End To Inlet Nozzle

These components have an inside diameter (ID) ranging from 69.8 centimeters (cm) to 72.4 cm (27.47 inches to 28.49 inches) and the thicknesses of the nozzle and safe-end materials range from 8.3 cm to 9.1 cm (3.27 inches to 3.57 inches).

#### 3.2 Applicable Code Edition and Addenda

ASME Code, Section XI, 2001 Edition through 2003 Addenda is the code of record for the fourth 10-year inservice inspection (ISI) interval of FNP, Unit 1, which began on December 1, 2007, and will end on November 30, 2017.

#### 3.3 Applicable Code Requirement

The licensee stated that the volumetric examination specified in Table IWB-2500-1, Examination Category B-F, Item No. B5.10 will be performed using the ultrasonic testing (UT) method as described in IWA-2232 and Appendix I of the ASME Code, Section XI. Appendix I, Paragraph I-2220, requires that the UT examination procedures, equipment, and personnel are qualified by the performance demonstration in accordance with the ASME Code, Section XI, Appendix VIII, requirements. As an alternative to Appendix VIII, Supplement 10, the licensee adopted ASME Code Case N-695, "Qualification Requirements for Dissimilar Metal Piping

Welds.” The NRC has approved for use, ASME Code Case N-695 in RG 1.147, Revision 16. Paragraph 3.3(c) indicates examination procedures, equipment, and personnel are qualified for depth-sizing when the RMSE of the flaw depth measurements, as compared with the true depths, does not exceed 0.125 inch.

#### 3.4 Impracticality of Compliance

The licensee stated that the inability of examination procedures to achieve the required 0.125 inch RMSE value is primarily due to a combination of factors such as surface condition (e.g., roughness), scan access, base materials, and the dendritic structure in the welds themselves. The licensee also stated that the nuclear power industry has attempted to qualify personnel and procedures for depth-sizing examinations performed from the inside surface of dissimilar metal welds since November 2002, but that, to date, no inspection vendor has met RMSE requirements of Code Case N-695.

#### 3.5 Licensee’s Proposed Alternative

The licensee proposed using an alternative depth sizing RMSE qualification criterion of 0.189 inch, which is greater than the 0.125 inch RMSE value in ASME Code Case N-695. The licensee stated that the proposed RMSE of 0.189 inch is based on the results achieved by the licensee’s examination vendor. The licensee stated that if the examination vendor demonstrates an improved depth-sizing RMSE prior to the examination, the excess of that improved RMSE over the 0.125 inch RMSE requirement, if any, will be added to the measured value.

The licensee stated that in the event an indication is detected during volumetric examination of welds listed in RR FNP-ISI-RR-01 that requires depth-sizing, the difference between the required RMSE and the demonstrated RMSE (0.189 inch) would be added to the measured through-wall extent for comparison with applicable ASME Code, Section XI, acceptance criteria.

#### 3.6 Licensee’s Bases for Relief

The licensee stated that RR FNP-ISI-RR-01 was submitted due to the impracticality of meeting the required 0.125 inch RMSE value. The licensee stated that the nuclear power industry has attempted to qualify personnel and procedures for depth-sizing examinations performed from the ID surface of DM welds since November 2002. To date, no inspection vendor has met the 0.125 inch RMSE requirement of ASME Code Case N-695. The most recent attempt at achieving 0.125 inch RMSE was in early 2008. This attempt, as well as previous attempts, did not achieve the required RMSE value. The qualification attempts have been substantial. The attempts have involved multiple vendors, ultrasonic instruments, personnel, and flaw depth-sizing methodologies, all of which have been incapable of achieving the required RMSE.

The licensee stated that the proposed alternative assures that the nozzle-to-safe end DM welds will be fully examined by procedures, personnel, and equipment qualified by demonstration in all aspects except depth-sizing. Therefore, it will assure that there is reasonable assurance of structural integrity, thus, will provide an acceptable level of quality and safety.

### 3.7 Duration of Relief

The licensee initially requested that relief be granted for the fourth 10-year ISI interval of FNP, Unit 1, however in its March 9, 2012 submittal, the licensee revised its request to apply to inspection activities completed prior to the restart of Unit 1 from refueling Cycle 25.

### 3.8 Staff Evaluation

As described above, the licensee has requested relief from the requirements of ASME Code Case N-695, "Qualification Requirements for Dissimilar Metal Piping Welds." This code case requires that procedures used to inspect dissimilar metal welds from the ID be qualified by performance demonstration. The acceptance criterion established by the code case is a RMSE of not greater than 0.125 inches.

The licensee has reported and the staff has confirmed that attempts have been made to qualify ID UT inspection procedures since 2002 and that, to date, no inspection vendor has been able to meet the acceptance criteria established by the code case despite the fact that numerous individuals from several companies have attempted to do so. The staff finds that this repeated inability to qualify ID UT inspection techniques in accordance with ASME Code Case N-695 constitutes an impracticality as described in 10 CFR 50.55a(g)(5)(iii). Use of an alternate approach, such as an outer diameter (OD) examination, represents a burden to the licensee as the welds under consideration may be inaccessible from the OD or inspectors may be subject to significant radiation dose in performing the inspections.

Title 10 CFR, Section 50.55a(g)(6)(i) permits the Commission to grant relief in cases of impracticality when it determines (in part) that such relief will not endanger life or property. Given that there is always some uncertainty in measuring cracks, and given that relaxation of the ASME Code Case N-695 acceptance criterion may increase the uncertainty of crack measurements, there is a possibility that, for a given crack, the depth measured using a technique which fails to meet the code case acceptance criteria will underestimate the depth of the crack to a greater extent than a similar measurement using a procedure which meets the acceptance criteria. This situation could be viewed as a decreasing assurance that structural integrity or leak tightness of the subject welds will be maintained and, therefore, a failure to meet the criteria in 10 CFR 50.55a(g)(6)(i).

To address the issue of increased potential for undersizing of flaws by inspection procedures which do not meet the ASME Code Case N-695 acceptance criterion, the licensee has proposed to increase the measured depth of the crack by the difference between the actual RMSE obtained for the procedure employed and the code case acceptance criterion. In this case, the RMSE for the procedure employed is 0.189 inches. For example, a crack which measured 0.2 inches deep would be treated as though it was 0.264 inches deep:

$$0.2" + (0.189" - 0.125") = 0.264"$$

While this approach provides some additional margin of safety when compared to not adjusting the crack depth, the staff did not have sufficient evidence to confirm that the adjustment to the crack depth was sufficient to provide reasonable assurance that cracks measured using procedures with larger RMSE values would not be undersized when compared to those meeting the RMSE criteria. This lack of assurance was primarily based on the difficulty of sizing cracks

when the ID surfaces of the weld are rough and the circumstances of the testing program are not designed to address this issue.

In November 2011, the staff reviewed the Performance Demonstration Initiative (PDI) program (administered by the Electric Power Research Institute (EPRI)) data used to qualify welds for ASME Code Cases. Based on this review, the staff was able to determine:

1. When using inspection procedures which do not meet the ASME Code Case N-695 acceptance criterion, a significant number of data points are undersized by greater than 0.064 inches (0.189" – 0.125") indicating that reasonable assurance that cracks will not be significantly undersized does not exist when using this approach;
2. When using inspection procedures which do not meet the ASME Code Case N-695 acceptance criterion, only a very few data points are undersized by greater than twice the RMSE of the procedure employed (in this case  $2 \times 0.189 = 0.378$ ). The addition of twice the RMSE to the measured depths of any flaws found during the ID inspections provides reasonable assurance that cracks will not be significantly undersized.

Based on these findings the staff issued a request for additional information (RAI) on February 23, 2012 (ADAMS Accession No. ML12048B330). In this RAI the staff identified two approaches to the issue of crack sizing that could potentially be found to be acceptable. These were:

1. Adjust the measured depth of the crack upward by 0.378 inches ( $2 \times 0.189$ ); or
2. Provide a commitment such that if cracks are identified for which sizing is required during the scheduled examinations, a flaw evaluation will be submitted to the NRC for review and approval.

Specific information to be included in the flaw evaluation, as requested in the RAI, includes:

1. Provide the measured flaw size.
2. Provide the personal qualification RMSE for the analyst who measured the flaw size and justification for adjusting the depth of the measured crack by less than twice the RMSE.
3. Conduct eddy current testing to determine if the flaw is surface breaking.
4. Provide the ID surface profile of the weld, pipe, nozzle, and safe end (as applicable) in the region at and surrounding the transducer locations used to depth size the detected flaw.
5. Describe the suspected flaw degradation mechanism and the process used to determine the degradation mechanism.

In its response to the RAI dated March 9, 2012, the licensee stated that it would provide the information requested in items 1, 3, 4, and 5 in a submitted flaw evaluation. The licensee provided an acceptable response to item 2 by pointing out that the adequacy of an individual's

performance in this regard is established by their having met the applicable training/qualification requirements and that further disclosure of individual personnel qualification results could compromise the integrity of the qualification program. Moreover, the staff finds that the risks to the integrity of the qualification program outweigh the benefit of obtaining this information. The staff withdraws the request for information with respect to item 2.

Based on the concerted efforts by the industry to meet the acceptance criteria contained in ASME Code Case N-695 and the difficulties associated with other inspection methods, the staff finds that meeting the 0.125 inch acceptance criterion in ASME Code Case N-695 is impractical and represents a burden to the licensee. This relief is subject to the licensee providing the information listed above in items 1, 3, 4, and 5, for the subject indicated flaws. On that basis, and subsequent to NRC staff review and approval of information submitted, the staff finds that this alternative provides reasonable assurance of structural integrity or leak tightness of the subject component and therefore "will not endanger life or property" as required by 10 CFR 50.55a(g)(6)(i).

#### Conclusion

As set forth above, the NRC staff determines that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a. Therefore, the NRC staff grants relief as specified above, i.e., the use of the alternate depth-sizing qualification (0.189 inch), subject to the licensee providing, for NRC staff review and approval prior to the expiration of the relief, the information identified above as items 1, 3, 4, and 5 should a crack requiring depth sizing be identified. This relief is granted for FNP, Unit 1, until prior to startup following refueling Cycle 25.

All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in the subject request for relief remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: S. Cumblidge

Date: April 4, 2012



M. Ajluni

- 2 -

All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in the subject request for relief remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Sincerely,

*/RA/*

Nancy L. Salgado, Branch Chief  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-348

Enclosure: Safety Evaluation

cc w/encl: Distribution via Listserv

DISTRIBUTION:

Public  
RidsOgcRp Resource  
RidsRgn2MailCenter Resource  
S. Cumblidge, NRR

LPL2-1 R/F  
RidsNrrDeEpnb (DAley)  
RidsNrrPMFarleyResource  
RidsNrrDorIDpr Resource

RidsNrrDorLpl2-1 Resource  
RidsNrrLASFiguroa Resource  
RidsAcrsAcnw\_MailCTR Resource  
M. Kotzalas, EDO R-II

ADAMS Accession No. ML12094A281

\*memo transmitted SE dated

OFFICE	NRR/LPL2-1/PM	NRR/LPL2-1/LA	NRR/DE/EPNB/BC	OGC	NLO	NRR/LPL2-1/BC
NAME	RMartin	SFiguroa (BTully for)	DAley	MSmith w/ comment		NSalgado
DATE	04/02/12	04/04/12	04/02/12	04/03/12		04/04/12

OFFICIAL RECORD COPY