



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

July 12, 2010

Mr. Mark J. Ajluni
Manager, Nuclear Licensing
Farley Nuclear Plant
Southern Nuclear Operating Company, Inc.
40 Inverness Center Parkway
Birmingham, Alabama 35201

SUBJECT: JOSEPH M. FARLEY NUCLEAR PLANT, UNIT 2 (FARLEY UNIT 2) – RELIEF
REQUEST FOR EXTENSION OF THE REACTOR VESSEL INSERVICE
INSPECTION DATE TO THE YEAR 2020 (PLUS OR MINUS ONE OUTAGE)
(TAC NO. ME3010)

Dear Mr. Ajluni:

By letter dated January 4, 2010, Southern Nuclear Operating Company, Inc. (SNC), proposed an alternative to the American Society of Mechanical Engineers (ASME), *Boiler and Pressure Vessel Code* (Asme Code), inservice inspection (ISI) interval requirements for the reactor vessel ISI. The alternative, FNP-ISI-ALT-09 for Farley Unit 2, proposes to extend the ISI interval for reactor vessel examination category B-A and B-D welds from 10 to 20 years. This would extend the next reactor vessel ISI date for these components in Farley Unit 2 to the year 2020 (plus or minus one outage).

The Nuclear Regulatory Commission (NRC) staff has reviewed SNC's submittal and, based on the information provided, the NRC staff has determined that the proposed alternative provides an acceptable level of quality and safety. Therefore, pursuant to Title 10 of the *Code of Federal Regulations*, Part 50, Section 50.55a(a)(3)(i), the NRC staff authorizes the use of the proposed alternative to extend the reactor vessel ISI date to the year 2020 (plus or minus one outage), thus extending the fourth ISI interval for Farley Unit 2, Category B-A and B-D components from 10 to 20 years.

M. Ajluni

- 2 -

All other requirements of ASME Code, Section XI, for which relief has not been specifically requested remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Sincerely,



Gloria Kulesa, Chief
Plant Licensing Branch II
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-364

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

REGARDING RELIEF REQUEST FNP-ISI-ALT-09

TO EXTEND REACTOR VESSEL WELD EXAMINATIONS

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

JOSEPH M. FARLEY NUCLEAR PLANT, UNIT 2

DOCKET NO. 50-364

1.0 INTRODUCTION

By letter dated January 4, 2010¹, Southern Nuclear Operating Company, Inc. (SNC), requested Nuclear Regulatory Commission (NRC) approval for Joseph M. Farley Nuclear Plant, Unit 2 (Farley Unit 2), to use an alternative, FNP-ISI-ALT-09, to the requirements of the American Society of Mechanical Engineers, *Boiler and Pressure Vessel Code* (ASME Code), Section XI, Paragraph IWB-2412, Inspection Program B. Specifically, the alternative was requested pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.55a(a)(3)(i) to extend the inservice inspection (ISI) interval for examinations of the reactor pressure vessel (RPV) welds (Category B-A) as well as the nozzle-to-vessel welds and inner radius sections (Category B-D) from 10 years to 20 years.

The NRC staff verbally authorized the licensee's requested alternative in a teleconference on March 25, 2010. This safety evaluation (SE) documents the basis for the staff's verbal authorization and is written consistently with the information available at the time the verbal authorization was given.

2.0 REGULATORY REQUIREMENTS

In accordance with 10 CFR 50.55a(g)(4), SNC is required to perform ISI of ASME Code Class 1, 2, and 3 components and system pressure tests during the first 10-year interval and subsequent 10-year intervals that 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), subject to the limitations and modifications listed therein.

For the fourth ISI interval at Farley Unit 2, which began on December 1, 2007, the Code of record for the inspection of ASME Code Class 1, 2, and 3 components is the 2001 Edition through the 2003 addenda of the ASME Code, Section XI. The regulation in 10 CFR 50.55a(a)(3) states, in part, that the Director of the Office of Nuclear Reactor Regulation (NRR) may authorize an alternative to the requirements of 10 CFR 50.55a(g). For an alternative to be authorized, as per 10 CFR 50.55a(a)(3)(i), the licensee must demonstrate that the proposed alternative would provide an acceptable level of quality and safety.

¹ Agencywide Documents Access and Management System (ADAMS), Accession No. ML100050080

2.1 Background

The ISI of Category B-A and B-D components consists of visual and ultrasonic examinations intended to discover whether flaws have initiated, whether pre-existing flaws have extended, and whether pre-existing flaws may have been missed in prior examinations. These examinations are required to be performed at regular intervals, as defined in Section XI of the ASME Code.

2.2 Summary of WCAP-16168-NP, Revision 2

In 2006, the Pressurized Water Reactor (PWR) Owners Group submitted a topical report, WCAP-16168-NP, Revision 1² (henceforth referred to as WCAP-16168), to the NRC in support of making a risk-informed assessment of extensions to the ISI intervals for Category B-A and B-D components. In the report, the PWR Owners Group took data associated with three different PWR plants (referred to as the pilot plants), one designed by each of the main contractors for PWR nuclear power plants in the USA, and performed the necessary studies on each of the pilot plants required to justify the proposed extension for the ISI interval for Category B-A and B-D components from 10 to 20 years.

The analyses in WCAP-16168 used probabilistic fracture mechanics tools and inputs from the work described in the NRC's pressurized thermal shock (PTS) risk re-evaluation^{3,4}. The PWR Owners Group analyses incorporated the effects of fatigue-crack growth and inservice inspection. Design-basis transient data was used as input to the fatigue-crack growth evaluation. The effects of ISI were modeled consistently with the previously approved probabilistic fracture mechanics codes⁵. These effects were put into evaluations performed with the Fracture Analysis of Vessels-Oak Ridge (FAVOR) code⁶. All other inputs were identical to those used in the PTS risk re-evaluation.

From the results of the studies, the PWR Owners Group concluded that the ASME Code, Section XI 10-year inspection interval for Category B-A and B-D components in PWR RPVs can be extended to 20 years. Their conclusion from the results for the pilot plants was considered to apply to any plant designed by the three vendors (Westinghouse, Combustion Engineering, and Babcock and Wilcox) as long as the critical, plant-specific parameters (defined in Appendix A of the WCAP) are bounded by the pilot plants.

2.3 Summary of NRC SE on WCAP-16168

The staff's conclusion in its SE⁷ on WCAP-16168 indicates that the methodology presented in WCAP-16168, in concert with the guidance provide by Regulatory Guide (RG) 1.174, Rev. 1⁸, is acceptable for referencing in requests to implement alternatives to ASME Code inspection requirements for PWR plants in accordance with the limitations and conditions in the SE. In

² WCAP-16168-NP, Rev. 1, ADAMS Accession No. ML060330504

³ NUREG-1806, ADAMS Accession No. ML061580318

⁴ NUREG-1874, ADAMS Accession No. ML070860156

⁵ WCAP-14572-NP-A, ADAMS Accession No. ML012630327

⁶ ONRL/NRC/LTR0418, ADAMS Accession No. ML042960391

⁷ US NRC SE for Footnote 2, May 8, 2008, ADAMS Accession Nos. ML081060051 and ML081060045

⁸ RG 1.174, Rev. 1, ADAMS Accession No. ML023240437

addition to showing that the subject plant is bounded by the pilot plants' information from Appendix A in the WCAP, the key points of the May 8, 2008, SE are summarized below:

1. The dates identified in the request for alternative should be within plus or minus one refueling cycle of the dates identified in the implementation plan provided to the NRC. Any deviations from the implementation plan⁹ should be discussed in detail in the request for alternative. The maximum proposed ISI interval is 20 years.
2. The requirements for reporting the results of ISIs found in the voluntary PTS rule apply in all cases. Licensees that do not implement the voluntary PTS rule must amend their licenses to require that the information and analyses requested in the voluntary PTS rule be submitted for NRC staff review and approval. The amendment to the license shall be submitted at the same time as the request for alternative ISI interval.
3. The request for alternative ISI interval can use any NRC-approved method to calculate ΔT_{30} and RT_{MAX-X} ¹⁰. However, if the request uses the NUREG-1874 methodology to calculate ΔT_{30} , then the request should include the analysis described in paragraph (6) of subsection (f) to the voluntary PTS rule. The analysis should be done for all of the materials in the beltline area with at least three surveillance data points
4. If the subject plant is a Babcock & Wilcox designed plant:
 - Licensees must verify that the fatigue-crack growth of 12 heat-up/cool-down transients per year bound the fatigue-crack growth for all of its design-basis transients
 - Licensees must identify the design-basis transients that contribute to significant fatigue-crack growth
5. If the subject plant has RPV forgings that are susceptible to underclad cracking or if the RPV includes forgings with RT_{MAX-FO} ¹⁰ values exceeding 240°F, then the WCAP analyses are not applicable. The licensee must submit a plant-specific evaluation for any extension to the 10-year inspection interval for ASME Code, Section XI, Category B-A and B-D RPV welds.

3.0 PROPOSED FNP-ISI-ALT-09 FOR FARLEY UNIT 2

3.1 Description of Proposed Alternative

In FNP-ISI-ALT-09, SNC proposes to defer the ASME Code-required Category B-A and B-D weld ISI of Farley Unit 2 until 2020 (approximately 20 years from the last inspection). This schedule is consistent with the revised PWR Owners Group Letter, OG-09-454¹¹.

⁹ PWR Owners Group Letter OG-06-356, ADAMS Accession No. ML082210245

¹⁰ Defined in NUREG-1874, ADAMS Accession No. ML070860156

¹¹ PWR Owners Group Letter OG-09-454, ADAMS Accession No. ML093370133

3.2 Components for Which Relief is Requested

The affected components are the subject plant RPV and its interior attachments and core support structure. The following examination categories and item numbers from IWB-2500 and Table IWB-2500-1 of the ASME Code, Section XI, are addressed in this request:

For Relief Request ISI-022:

Examination Category	Item Number	Description
B-A	B1.11	Circumferential Shell Weld
B-A	B1.12	Longitudinal Shell Welds
B-A	B1.21	Circumferential Head Weld
B-A	B1.30	Shell-to-Flange Weld
B-D	B3.90	Nozzle-to-Vessel Welds

3.3 Basis for Proposed Alternative

The basis for the alternative is found in the NRC-approved version of WCAP-16168¹² (referred to as WCAP-16168-A). Plant-specific parameters for the subject plant are summarized in Enclosure 1 to the licensee's letter of January 4, 2010. The format of the information is patterned after that found in Appendix A of the WCAP.

All of the critical parameters listed in Tables 1, 2, and 3 of Enclosure 1 to the licensee's letter of January 4, 2010, are bounded by the WCAP-16168-A pilot plant.

3.4 Duration of Proposed Alternative

The licensee requests that the proposed alternative (FNP-ISI-ALT-09) should be applicable for the remainder of the 4th ISI interval at Farley Unit 2 that currently ends in 2017, but which would be extended to 2027 for the inspection of the subject RPV components.

4.0 STAFF TECHNICAL EVALUATION

The NRC staff has reviewed Enclosure 1 to the licensee's letter dated January 4, 2010, to make this evaluation. In Table 1, the "Frequency and Severity of Design-Basis Transients" of Farley Unit 2 were found to be bounded by WCAP-16168-A. Also, the Farley Unit 2 RPV was single-layer clad and so was bounded by WCAP-16168-A.

Table 2 of the submittal includes additional information pertaining to previous RPV inspections and the schedule for future ones. The next inspection for Farley Unit 2 would be in 2020, consistent with SNC's application of January 4, 2010. This is also consistent with the revised PWR Owners Group Letter OG-09-454. There were a total of 14 indications detected in the most recent inservice inspection, including 8 found in the inner 3/8 inch of the RPV thickness. All of the indications were acceptable per IWB-3500 of ASME Code, Section XI and the requirements of the proposed alternate PTS Rule (10 CFR 50.61a), so therefore, there is no requirement for remedial action or further analysis.

¹² WCAP-16168-NP-A, Rev. 2, ADAMS Accession No. ML082820046

The calculation of $TWCF_{95-TOTAL}^{10}$ was performed using Table 3 of the submittal as a basis. The request uses RG 1.99, Rev. 2 methodology to calculate ΔT_{30} . The calculations were independently verified via the NRC staff's calculation and the difference between the licensee's and staff's calculations were found to be insignificant. The $TWCF_{95-TOTAL}$ was found to be acceptably low as calculated through the methodology prescribed in RG 1.99, Rev. 2 and detailed in Table 3 of the submittal.

At the time of issuance of the SE for WCAP-16168-A, it was the NRC staff's intent to establish a process by which licensees could receive approval to implement 20-year ISI intervals for the subject component examinations through the end of their facility's current operating license. This objective led to the provision, as discussed in Section 4 of the SE for WCAP-16168-A, that the licensee would submit a license condition which required the licensee to evaluate future volumetric ISI data in accordance with the criteria in the draft and/or final alternative PTS Rule, 10 CFR 50.61a. The NRC staff has since determined that the appropriate process for requesting further extensions of the ISI interval, beyond this granting of relief in response to SNC's application of January 4, 2010, is through 10 CFR 50.55a for each subsequent ISI Interval. Accordingly, the NRC staff considers that such a license condition as discussed above is not necessary and that requirements for future evaluation of ISI data will be addressed as a part of the review of further requests for extension of the ISI Interval for the subject components.

The NRC staff will grant ISI interval extensions for the subject components on an interval-by-interval basis, i.e., only a facility's current ISI interval will be extended for up to 20 years. Licensees will have to submit updated alternatives to the NRC for review and approval to extend each following ISI interval from 10 years to 20 years, as needed. Accordingly, the requirement in WCAP-16168-A for a license condition to address the evaluation of future ISI data (see Section 2.3, item 2) is no longer necessary in conjunction with this requested alternative. However, in order to obtain the NRC staff's approval, a subsequent updated alternative that seeks to extend an ISI interval from 10 to 20 years for the subject component examinations should include the evaluation of a facility's most recent ISI data in accordance with the criteria in the final alternative PTS Rule, 10 CFR 50.61a. For purposes of technical and regulatory consistency, the NRC staff's SE for WCAP-16168-A will be revised to reflect these changes regarding the implementation of ISI interval extensions based on WCAP-16168-A. Therefore, the staff approves the proposed alternative FNP-ISI-ALT-09 only for the fourth ISI interval that will now end on 2027 for the subject component examinations.

In summary, the licensee has demonstrated through the submittal that the RPV for Farley Unit 2 is bounded by WCAP-16168-A. The submittal demonstrates that there is no significant additional risk associated with extending the ISI interval for Category B-A and B-D components from 10 years to 20 years.

5.0 CONCLUSION

The NRC staff has completed its review of the January 4, 2010, submittal for FNP-ISI-ALT-09 regarding Farley Unit 2. The staff concludes that increasing the ISI interval for Category B-A and B-D components from 10 years to 20 years results in no appreciable increase in risk. The staff comes to this conclusion based on the fact that the plant-specific information provided by SNC is bounded by the data in WCAP-16168-A and the request meets all the conditions and limitations described in WCAP-16168-A. Therefore, Relief Request FNP-ISI-ALT-09 provides

an acceptable level of quality and safety and the alternative is granted pursuant to 10 CFR 50.55a(a)(3)(i) until the end of the 4th ISI interval for Categories B-A and B-D components at Farley Unit 2 in 2027.

All other requirements of the ASME Code, Section XI, not specifically included in the request for the proposed alternatives, remain in effect.

Principal Contributor: Patrick Purtscher, NRR/DCI

Date: July 12, 2010

M. Ajluni

- 2 -

All other requirements of ASME Code, Section XI, for which relief has not been specifically requested remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Sincerely,

/RA/

Gloria Kulesa, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-364

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv

DISTRIBUTION:

PUBLIC
LPL2-1 R/F
RidsAcrsAcnw_MailCTR Resource
RidsNrrDorLpl2-1 Resource
NSanfilippo, EDO R-II
CFairbanks, NRR

RidsNrrDciCvib Resource
RidsNrrLAMOBrien Resource (hard copy)
RidsNrrPMFarley Resource (hard copy)
RidsRgn2MailCenter Resource
MMitchell, NRR
PPurtscher, NRR

ADAMS Accession No. ML101750402

*concurrence via email ML101750201

OFFICE	NRR/LPL2-1/PM	NRR/LPL2-1/LA	NRR/CVIB/BC	NRR/LPL2-1/BC
NAME	RMartin	MO'Brien	MMitchell*	GKulesa
DATE	07/02/10	06/30/10	06/22/10	07/12/10

OFFICIAL RECORD COPY