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SOUTHERN COMPANY

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NL-13-1495

Docket Nos.: 50-348
50-364

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Joseph M. Farley Nuclear Plant
Proposed Inservice Inspection Alternative FNP-ISI-ALT-13, Version 2.0

Ladies and Gentlemen:

By letter dated October 1, 2012, and as supplemented by letters dated May 6, 2013 and May 24, 2013, Southern Nuclear Operating Company (SNC) submitted proposed inservice inspection (ISI) alternative FNP-ISI-ALT-13 Version 1.0. This alternative requested the extension of the inspection requirements of ASME Code Case N-770-1, Inspection Item B for Reactor Pressure Vessel (RPV) Cold Leg (CL) Dissimilar Metal (DM) welds from every second inspection period to once every 10.5-year interval for the Farley Nuclear Plant (FNP) Units 1 and 2.

SNC requested in its letter dated October 1, 2012, that FNP-ISI-ALT-13, Version 1.0 be approved in time to support planning activities for the Unit 1 refueling outage in fall of 2013. In order to facilitate Nuclear Regulatory Commission (NRC) approval in support of the Unit 1 fall 2013 refueling outage, SNC now requests a modification to FNP-ISI-ALT-13 to require ASME Code Case N-770-1, Inspection Item B RPV CL DM welds to be inspected once every five refueling outages based on a nominal cycle length of approximately 1.5 calendar years (approximately every 7.5 calendar years or 7.1 effective full power years), instead of the originally requested once every 10.5 years per FNP-ISI-ALT-13, Version 1.0. This revised alternative FNP-ISI-ALT-13, Version 2.0, which is provided in the Enclosure to this letter, will result in deferral of Unit 1 volumetric examinations currently scheduled for fall of 2013 until spring of 2015, and deferral of Unit 2 volumetric examinations currently scheduled for spring of 2016 until fall of 2017. Please note that this revised request is based on the urgent need for approval based on the upcoming Unit 1 fall refueling outage.

SNC continues to maintain that the originally requested RPV CL volumetric examination requirement (10.5 years) is technically justifiable, but believes the revised requested interval (every five refueling outages based on a nominal cycle length of approximately 1.5 calendar years) minimizes potential deliberations regarding analytical assumptions for the short term. As such, after NRC approval of the revised FNP-ISI-ALT-13, Version 2.0, SNC may elect to pursue NRC approval for volumetric examination of RPV CL DM welds once every 10.5 years.

This letter contains no NRC commitments. If you have any questions, please contact Ken McElroy at (205) 992-7369.

Sincerely,

C. R. Pierce

C.R. Pierce
Regulatory Affairs Director

CRP/RMJ

Enclosure: Proposed Alternative FNP-ISI-ALT-13, Version 2.0 in Accordance with 10 CFR 50.55a(a)(3)(i)

cc: Southern Nuclear Operating Company
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Joseph M. Farley Nuclear Plant
Proposed Inservice Inspection Alternative FNP-ISI-ALT-13 Version 2.0

Enclosure

Proposed Alternative FNP-ISI-ALT-13, Version 2.0
In Accordance with 10 CFR 50.55a(a)(3)(i)

Enclosure
Proposed Alternative FNP-ISI-ALT-13, Version 2.0
In Accordance with 10 CFR 50.55a(a)(3)(i)

Plant Site-Unit:	Joseph M. Farley Nuclear Plant (FNP) – Units 1 & 2.
Interval Dates:	4th Inservice Inspection (ISI) Interval – December 1, 2007 through November 30, 2017.
Requested Date for Approval :	Approval is requested by July 31, 2013.
ASME Code Components Affected:	The affected components are Examination Category ASME Code Case N-770-1 Item B. The specific components are provided in Table 1.
Applicable Code Edition and Addenda:	The applicable Code edition and addenda (for the 4th ISI interval) is ASME Section XI, "Rules for Inservice Inspection of Nuclear Power Plant components," 2001 Edition through the 2003 Addenda.
Applicable Code Requirements:	10CFR50.55a (g)(6)(ii)(F) requires licensees of existing, operating pressurized-water reactors as of July 21, 2011 to implement the requirements of ASME Code Case N–770–1. Code Case N-770-1, Inspection Item B requires unmitigated butt weld at Cold Leg temperatures ≥ 525°F and < 580°F to be volumetrically examined every second inspection period.
Reason for Request:	MRP-349 (Enclosure 2 to Reference 1) and the Farley specific flaw growth evaluation (Reference 3) provides the overall basis for extension of the current volumetric inspection interval for the Reactor Pressure Vessel (RPV) Cold Leg (CL) Dissimilar Metal (DM) welds from every second inspection period, as currently required by Code Case N-770-1, to a five refueling outage (approximately 7.5 calendar year) inspection interval based on a nominal cycle length of approximately 1.5 years. This technical basis demonstrates that the re-examination interval can be extended to five refueling outages based on a nominal cycle length of approximately 1.5 calendar years (approximately 7.5 calendar years) while maintaining an acceptable level of quality and safety. Therefore, Southern Nuclear Operating Company (SNC) is requesting approval of this alternative to allow the use of the ISI interval extension for the affected FNP - Unit 1 and 2 components.

Proposed Alternative:	SNC is requesting extension of the requirements of Code Case N-770-1, Inspection Item B for the RPV CL DM Welds from every second inspection period to once per five refueling outages based on a nominal cycle length of approximately 1.5 calendar years (approximately 7.5 calendar years or 7.1 effective full power years). Specifically, this proposed alternative would permit the deferral of the CL volumetric examinations currently scheduled for fall of 2013 for Unit 1 (baseline exams performed in fall of 2007) to be moved to the spring of 2015. For Unit 2, this would allow examinations currently scheduled for the spring of 2016 (baseline exams performed in the spring of 2010) to be moved to the fall of 2017. In addition to the volumetric exams performed to the specifications of ASME Appendix VIII, a supplemental eddy current test will be performed to the specifications of Code Case N-773. This matches the eddy current techniques that our vendor, Westinghouse, has previously used for qualification, coverage, and examination.
Basis for Use:	The overall basis used to demonstrate the acceptability of extending the inspection intervals for Code Case N-770-1, Inspection Item B components is contained in MRP-349 and the independent axial flaw evaluation performed in response to previous request for additional information (RAIs) submitted on May 24, 2013. In summary, the basis for extending the intervals from two ISI periods to once every five refueling outages based on a nominal cycle length of approximately 1.5 calendar years (approximately 7.5 calendar years) is: (1) there has been no service experience with cracking found in RPV CL DM welds, (2) crack growth rates in RPV CL DM welds are small, (3) likelihood of cracking or through wall leaks is very small in RPV CL DM welds, and (4) the Farley specific axial flaw evaluation shows that the maximum thru wall flaw would not grow to a critical length in less than 7.5 years. <u>Service Experience</u> Each unit's baseline exams were performed using remote mechanized examinations from the Inside Diameter (ID) in accordance with Appendix VIII using performance demonstrated methods where 100% of the flaws were detected. The technique used in site specific exams included 100% coverage for axial and circumferential flaws. Data is obtained using encoded techniques; therefore, data may be reviewed by multiple qualified examiners. Site specific mock-ups were not used because of the flat, uniform surface associated with performance of these examinations from the ID. These techniques provide a strong assurance that flaws will be detected during inspections. Each FNP CL is exposed to approximately 538°F (CL Temperature) during normal plant operation. All dissimilar metal welds in pipes 4" Nominal Pipe Size (NPS) and greater, including those containing Alloy 82/182, in ASME Section XI Category B-F,

Basis for Use: (Continued)	have been volumetrically examined every 10-years in accordance with ASME Section XI. There have been multiple instances in the industry in which Primary Water Stress Corrosion Cracking (PWSCC) have occurred in Alloy 82/182 nozzle-to-safe-end weld region of the outlet nozzle where temperatures range typically from 608°F to 621°F; however, there are no known instances of PWSCC occurring in large bore (diameter greater than 14" NPS) that operate at or near CL temperatures (approximately 538°F) noted within the nuclear industry. In summary, to date there have been no safety or structural integrity concern that has resulted from PWSCC in CL butt welds in the nuclear industry. Crack Growth Rates (Flaw Tolerance) All of the flaw tolerance analyses performed to date have shown that the critical crack sizes in large-diameter butt welds operating at CL temperatures are very large. Assuming that a flaw initiates, the time required to grow to through-wall is in excess of 20 years in most cases analyzed. The time to grow from a through-wall leak to a crack equal to the critical crack size can be in excess of 40 years. More recent analyses have been performed for the RPV nozzles using through-wall residual stress distributions that were developed based on the most recent guidance. These analyses have shown that the flaw tolerance of these locations is high and postulated circumferential flaws will not reach the maximum ASME allowable depth in less than 10 years. Crack growth analysis is given for limiting plants part-circumferential through-wall flaws in Table 5-2 of MRP-349. Probability of Cracking or Through Wall Leaks Analyses have been performed to calculate the probability of failure for Alloy 82/182 welds using both probabilistic fracture mechanics and statistical methods. Both approaches have shown that the likelihood of cracking or through-wall leaks, in large-diameter CL welds, is very small. Furthermore, sensitivity studies performed using probabilistic fracture mechanics have shown that even for the more limiting high temperature locations, more frequent inspections than required by Section XI, such as that in MRP-139 or Code Case N-770, have only a small benefit in terms of risk. Though past service experience may not be an absolute indicator of the likelihood of future cracking, the experience does give an indication of the relative likelihood of cracking in CL temperature locations versus hot leg temperature locations. While there is a significant amount of PWSCC service experience in hot leg locations, the number of indications in large-bore butt welds is still small relative to the number of potential locations. Also, all indications have been detected before they were a safety concern. Therefore, if hot leg PWSCC is a leading indicator for CL PWSCC, and the higher

Basis for Use: (Continued)	frequency of inspections will be maintained for the hot leg locations, it is reasonable to conclude that a moderately less rigorous inspection schedule would be capable of detecting any CL indications before they became large enough to be a concern. Farley Specific Flaw Evaluation The maximum end-of-evaluation period allowable flaw size was determined in accordance with the ASME Section XI IWB-3600 evaluation procedure and acceptance criteria (Reference 3). Based on the PWSCC crack growth curve developed, an undetected flaw in a baseline inspection with a flaw depth of 0.24 inch, which is 7.5% of the original weld thickness, would not reach the maximum end-of-evaluation period allowable flaw depth of 75% of the original wall thickness in less than five refueling outages based on a nominal cycle length of approximately 1.5 calendar years (approximately 7.5 calendar years). Conclusion FNP - Units 1 and 2 incurs very minimal risk with extending volumetric intervals from two ISI periods to once per five refueling outages based on a nominal cycle length of approximately 1.5 calendar years (approximately 7.5 calendar years) because there have been no service experience with cracking found in RPV CL DM welds, crack growth rates in RPV CL DM welds are small, likelihood of cracking or through wall leaks is very small in RPV CL DM welds, and the FNP specific flaw evaluation showing a 7.5 year inspection interval is conservative; therefore, the use of this proposed alternative will provide an acceptable level of quality and safety. For these reasons, it is requested that the NRC authorize this proposed alternative in accordance with 10 CFR 50.55a(a)(3)(i).
Duration of Proposed Alternative:	The 4th ISI Interval.
Precedents:	There are no previous precedents to this alternative.
References:	1. SNC letter NL-12-2014 to NRC, "Joseph M. Farley Nuclear Plant – Units 1 & 2 Proposed Inservice Inspection Alternative FNP-ISI-ALT-13, Version 1.0," dated October 1, 2012. 2. SNC letter NL-13-0948 to NRC, "Joseph M. Farley Nuclear Plant , Response to Request for Additional Information Concerning the Deferral of Inservice Inspection of Reactor Pressure Vessel Cold Leg Nozzle Dissimilar Metal Weld – Questions 1, 3, and 5," dated May 6, 2013. 3. SNC letter NL-13-1073 to NRC, "Joseph M. Farley Nuclear Plant

	Response to Request for Additional Information Concerning the Deferral of Inservice Inspection of Reactor Pressure Vessel Cold Leg Nozzle Dissimilar Metal Weld – Questions 2, 4, and 6," dated May 24, 2013.
Status:	Under NRC Review