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SOUTHERN COMPANY

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Docket Nos.: 50-348

NL-14-0145

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

Joseph M. Farley Nuclear Plant – Unit 1
Proposed Alternative for the Fourth Interval Inservice Inspection
(FNP-ISI-ALT-14, Version 1.0)

Ladies and Gentlemen:

Pursuant to 10 CFR 50.55a(a)(3)(i), Southern Nuclear Operating Company (SNC) is hereby submitting Proposed Alternative FNP-ISI-ALT-14, Version 1.0. This alternative proposes use of an alternate tendon examination schedule for tendons affected by repair/replacement activities at Joseph M. Farley Nuclear Plant (FNP) – Unit 1 during the Fourth Inservice Inspection (ISI) Interval, which began December 1, 2007.

The basis for the proposed alternative for FNP - Unit 1 is provided in the Enclosure to this letter.

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/JMC/lac

Enclosure: Proposed Alternative FNP-ISI-ALT-14, Version 1.0, in accordance with 10 CFR 50.55a(a)(3)(i)

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Joseph M. Farley Nuclear Plant – Unit 1
Proposed Alternative for the Fourth Interval ISI

Enclosure

Proposed Alternative FNP-ISI-ALT-14 Version 1.0,
in accordance with 10 CFR 50.55a(a)(3)(i)

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Plant Site - Unit: Joseph M. Farley Nuclear Plant (FNP) – Unit 1

Interval Dates: 4th Inservice Inspection (ISI) Interval – December 1, 2007 through November 30, 2017

Requested Date for Approval: Approval is requested by July 31, 2014.

The repair/replacement activities began in December 2012 and concluded in September 2013. The augmented examination due date is one year (+/- three months) from the conclusion of the repair/replacement activities. Therefore, the requested approval date will allow enough lead time to arrange for vendor services, if necessary.

ASME Code Components Affected: The American Society of Mechanical Engineers (ASME) Code components associated with this alternative are the unbonded post-tensioning system tendons that are part of the reactor containment building.

The affected components include one tendon that was replaced as part of the corrective action to repair the failed tendon, H7AB, in addition to existing tendons that had anchorheads replaced as part of the expanded scope inspection associated with this same effort.

Category and System Details:

ASME Code Class:	Concrete Containment (CC)
Subsection:	Table IWL-2521-2
Description	Augmented Examination Requirements Following Post-Tensioning System Repair/Replacement Activities

Component Identification:

This alternative applies to a limited number of tendons that were affected by the FNP Unit 1 tendon H7AB repair/replacement activities. Following are the specific components affected:

Components: 10 Horizontal Tendons
Tendon and Field Anchorhead Replaced: H7AB
Field Anchorhead Replaced: H25AC, H27AC, H28BC, H29AB, H30AC, H33AB, H35AB, H41AB, and H44AB

Applicable Code Edition and Addenda: The applicable Code edition and addenda is ASME Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," 2001 Edition through the 2003 Addenda.

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Applicable Code Requirements: Subsection IWL-2521.2 of the ASME Section XI Code states that tendons affected by repair/replacement activities shall require augmented examination in accordance with Table IWL-2521-2.

Table IWL-2521-2 requires an initial inspection one year (+/- three months) following completion of an IWL repair/replacement activity that affects the containment post-tensioning system. Table IWL-2521-2 also indicates that subsequent Inservice Inspections will coincide with IWL-2420, Unbonded Post-Tensioning Systems, following completion of repair/replacement activities.

Background: On May 3, 2012, the field end anchorhead on horizontal tendon H7AB failed on FNP - Unit 1. The failed horizontal tendon field anchorhead (H7AB) is part of the post-tensioning system for the Unit 1 FNP Reactor Containment Building. The post-tensioning system consists of horizontal, dome, and vertical tendons based on the spatial orientation around the Containment Building. A total of one hundred thirty-five (135) horizontal tendons are anchored at three vertical buttresses. Three groups of dome tendons, for a total of ninety-three (93) tendons, are anchored at the vertical face of the dome ring girder. One hundred thirty (130) vertical tendons are anchored at the top surface of the ring girder and at the bottom of the base slab. The number of tendons is the same for both units, except one horizontal tendon was not installed on Unit 2 during construction; therefore, there are only one hundred thirty-four (134) horizontal tendons on Unit 2.

The root cause investigation, performed due to the anchorhead failure, called for the replacement of the one (1) failed tendon with its field anchorhead as well as the removal, testing, and replacement of fourteen (14) additional field anchorheads.

A total of fifteen (15) different tendons from Units 1 and 2 were affected by the anchorhead replacement activities. The failed tendon, H7AB on Unit 1, was completely replaced. The other fourteen tendons were temporarily detensioned, the field end anchorhead replaced, and subsequently retensioned. The replacement anchorheads are identical in design to the previously installed anchorheads, except that the replacement anchorheads were manufactured with a lower Rockwell "C" hardness number to provide improved resistance to hydrogen embrittlement failure.

For Unit 1, ten (10) horizontal tendons, one (1) dome tendon, and zero (0) vertical tendon were affected by replacement activities. For Unit 2, one (1) horizontal tendon, two (2) dome tendons, and one (1) vertical tendon were affected by replacement activities.

Per Table IWL-2521-2, the lesser of 4% of the affected tendons or ten tendons is the required sample size when the number of affected tendons is greater than or equal to 5% ($N \geq 5\%$.) If less than 3 tendons are affected, then there is no required sample size for augmented examinations.

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Unit & Type of Tendon	Total # of Tendons	5% of Tendons (rounded)	# of Affected Tendons	Required sample size
U1 Horizontal	135	6	10	1
U1 Vertical	130	6	0	N/A
U1 Dome	93	4	1	N/A
U2 Horizontal	134	6	1	N/A
U2 Vertical	130	6	1	N/A
U2 Dome	93	4	2	N/A

Since the number of horizontal tendons on Unit 1 affected by the repair/replacement activities (ten) are greater than 5% of the total, the required sample size, per Table IWL-2521-2, is one horizontal tendon (i.e., the lesser of 4% of the affected tendons or ten tendons). No other type of tendon meets the threshold as can be seen in the table above.

Reason for Request:

The ISI Program commitment to the ASME Section XI, 2001 Edition through the 2003 Addenda, Section IWL-2521.2 and Table IWL-2521-2 establish the specific requirement for the initial inspection at one year (+/- three months) following the completion of repair/replacement activities, followed by subsequent inspections scheduled to coincide with the on-going five year ISI examinations performed in accordance with IWL-2420.

This alternative is being submitted to propose a one-time exemption from the examination frequency requirement in Table IWL-2521-2. It is proposed that the initial examination of the repair/replacement population be performed at the next regularly scheduled tendon examinations (40th year), tentatively scheduled for July 2016. FNP still wishes to use the 12 month grace period allowed by IWL-2420(c) for the next regularly scheduled tendon examination, if needed for scheduling optimization.

The current prescribed schedule for the ISI examination of the impacted tendon is:

- September 2014 - Initial (one year) inspection of horizontal tendon
- 2016 – Subsequent inspection of horizontal tendon to coincide with Fourth-10-year Inservice Inspection Interval (40th year) examination schedule of the original tendon scope.

Note: From 2016 forward, both tendon populations (original population and repair/replacement affected population) will coincide on a five year frequency, utilizing the +/- one year allowance as necessary. That is to say FNP will perform the applicable tendon examinations on a five-year frequency specified in the latter part of IWL-2420(a) and will utilize the +/- one year allowance of IWL-2420(c) since FNP is beyond the 10 year examination. The +/- six month allowance specified in IWL-2420(b) is no longer applicable since FNP is beyond the 5 year examination.

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Proposed Alternative and Basis for Use:

It is proposed that the horizontal tendon requiring augmented examination, in accordance with subparagraph IWL-2521.2, utilize the same inspection interval as the next Unit 1 ASME IWL inspection (40th Year), tentatively scheduled for July 2016. FNP still wishes to utilize the 12 month grace period allowed by IWL-2420(c) if necessary for schedule optimization purposes.

Discussion / Analysis:

The ten (10) horizontal tendons that are impacted by the repair/replacement activities utilize the same prestressing system, are identical in design (except for a lower hardness value), and will be exposed to, or protected from, the same outside environment as the existing tendons, which have been in service for the last thirty-five plus years. Nine ISI examinations have been completed to date. The existing horizontal tendons have met all the post-tensioning test and examination acceptance criteria. The repair/replacement activities that impacted the horizontal tendons will not result in any unique condition that may subject the horizontal tendons to a different potential for structural or tendon deterioration.

The purpose for conducting the inspections is to monitor the post-tensioning system for degradation and to verify that actual loss of pre-stress is consistent with predicted values used in design. For new containments, the main reason for performing the one year tendon inspection, as required by subarticle IWL-2420, is to benchmark the tendon losses shortly after the Structural Integrity Test (SIT) when pre-stress losses (which are due to elastic shortening, creep, shrinkage and relaxation) occur at the highest rate. For the re-tensioned and replaced tendon in the FNP containment structure, pre-stress losses will be much smaller than those for the original tendons.

Elastic shortening:

The elastic shortening loss is a function of the pre-stress load, the elastic modulus for the steel tendon and the elastic modulus of the concrete. The pre-stress load and tendon material are identical to the original design. The elastic shortening loss for the new and re-tensioned tendons will therefore be the same as the original tendons.

Creep:

Creep is a time dependent function of the concrete. Creep is represented by a creep coefficient which is the ratio of creep strain to elastic strain. The creep loss will be the same for the new and re-tensioned tendons.

Relaxation:

Steel relaxation losses will be lower for the replaced and re-tensioned tendons because of the shorter remaining life of the plant (i.e., forty years for original design, sixty years including license renewal, versus five years remaining until the end of the original forty years.)

Shrinkage:

Shrinkage losses will similarly be the same.

The tendons were re-tensioned to a value above the predicted losses but less than 70% of the specified ultimate tensile strength of the tendon per IWL-2523.3(a).

Since the losses in the replaced and re-tensioned horizontal tendons is less than the original design losses (tendons re-tensioned to values above these predicted forces), there is additional margin in the post-tensioning system.

There is a high degree of confidence that the postponement of the first scheduled inspection of the horizontal tendon by two to three years will not involve an increase in radiological risk and would not adversely affect public health and safety.

Additional Considerations:

To perform tendon examinations, a large mobile crane must be located near the containment building, in order to lift tendon work platforms and the hydraulic rams used to perform tendon tension tests. There are some inherent risks associated with these rigging and lifting activities. Approving this alternative, to defer the initial examination of the one horizontal tendon to coincide with the more extensive examination in 2016 would avoid these risk sources for performing only one examination.

Conclusion:

Considering the adequate performance of the existing tendons, which have been in service for the last thirty-five plus years, there is low probability of a condition existing that is adverse to quality and safety within the first two to three years after completion of the repair/replacement activities. Past performance of the existing tendons is an important consideration since the tendons that are impacted by the repair/replacement activities utilize the same pre-stressing system, are identical in design, and are similarly exposed to or protected from the outside environment.

Therefore, it is proposed that the horizontal tendon requiring augmented examination in accordance with subparagraph IWL-2521.2 undergo initial inspection and utilize the same inspection interval as the next scheduled Unit 1 ASME IWL inspection (40th Year) of July 2016 (with a 12 month grace period as specified by IWL-2420(c)) in lieu of the specified one year (+/- three months). There would be no deviation from Section XI requirements for subsequent Inservice Inspections since they would be scheduled every five years (+/- one year) as required by Table IWL-2521-2 and paragraph IWL-2420(c). SNC considers that this proposed alternative schedule will provide an acceptable level of quality and safety, consistent with the provisions of 10 CFR 50.55a(a)(3)(i).

Enclosure

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in accordance with 10 CFR 50.55a(a)(3)(i)

Duration of Proposed Relief Request:	This alternative is requested for the remainder of the current Fourth Inservice Inspection Interval, which began December 1, 2007 and is scheduled to end on November 30, 2017.
Precedents:	Crystal River Nuclear Plant – Unit 3 received approval of a relief request for a similar issue. (ML091970477)
References:	1. ASME Section XI 2001 Edition through the 2003 Addenda
Status:	Pending NRC Approval