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

April 12, 2017

Mr. James J. Hutto
Regulatory Affairs Director
Southern Nuclear Operating Company, Inc.
P.O. Box 1295 / Bin 038
Birmingham, AL 35201-1295

SUBJECT: JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2 – INSERVICE TESTING ALTERNATIVE FOR SERVICE WATER PUMPS AND TRANSFER PUMPS PRESSURE ACCURACY (RR-PR-03) (CAC NOS. MF9265, MF9266)

Dear Mr. Hutto:

By letter dated February 6, 2017, Southern Nuclear Operating Company Inc. (SNC or the licensee) submitted three alternative requests for the Joseph M. Farley Nuclear Plant, Unit 1 and Unit 2. The three alternative requests are:

- RR-VR-01: Establish 1st interval grace periods per Code Case OMN-20.
- RR-PR-02: Establish test flow reference ranges per Code Case OMN-21.
- RR-PR-03: Service Water Pumps and Transfer Pumps Pressure Accuracy.

This letter applies to only the alternative request RR-PR-03. Alternative requests RR-VR-01 and RR-PR-02 continue to be under Nuclear Regulation Commission (NRC) review. RR-PR-03 was supplemented by letter dated March 28, 2017 (ADAMS Accession No. ML17087A218). In the alternative RR-PR-03, the licensee requested an alternative test plan in lieu of certain inservice testing (IST) requirements of the 2004 Edition through 2006 Addenda of the American Society of Mechanical Engineers (ASME) *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code) for the IST program during the fifth ten-year IST program interval, which will start on December 1, 2017.

The licensee submitted the request pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Section 50.55a(z)(1), on the basis that the alternative provides an acceptable level of quality and safety.

The NRC staff has reviewed the proposed alternative (RR-PR-03 Version 1) and concludes, as set forth in the enclosed safety evaluation, that the alternative provides an acceptable level of quality and safety for components listed in table RR-PR-03. The NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1).

All other ASME B&PV Code or ASME OM Code requirements for which relief was not specifically requested and approved remain applicable.

If you have any questions, please contact the Project Manager, Shawn Williams, at 301-415-1009 or by e-mail at Shawn.Williams@nrc.gov.

Sincerely,

Benjamin Beasley for

Michael T. Markley, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-348, 50-364

Enclosure:
Safety Evaluation

cc w/enclosure: Distribution via Listserv

UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ALTERNATIVE REQUEST RR-PR-03 VERSION 1.0 RELATED TO THE

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

INSERVICE TESTING PROGRAM FIFTH 10-YEAR INTERVAL

JOSEPH M. FARLEY NUCLEAR PLANT UNITS 1 AND 2

DOCKET NUMBERS 50-348 AND 50-364

1.0 INTRODUCTION

By letter dated February 6, 2017, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17037D324), Southern Nuclear Operating Company Inc. (SNC or the licensee) submitted three alternative requests for the Joseph M. Farley Nuclear Plant (FNP), Unit 1 and Unit 2. The three alternative requests are:

- RR-VR-01, Version 1: Establish 1st interval grace periods per Code Case OMN-20.
- RR-PR-02, Version 1: Establish test flow reference ranges per Code Case OMN-21.
- RR-PR-03, Version 1: Service Water Pumps and Transfer Pumps Pressure Accuracy.

This safety evaluation addresses only RR-PR-03. RR-PR-03, Version 1, was supplemented by letter dated March 28, 2017 (ADAMS Accession No. ML17087A218). The licensee requested an alternative test plan in lieu of certain inservice testing (IST) requirements of the 2004 Edition through 2006 Addenda of the American Society of Mechanical Engineers (ASME) *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code) for the IST program at FNP, Units 1 and 2, during the fifth 10-year IST program interval.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Section 50.55a(z)(1), the licensee requested to use proposed alternative RR-PR-03 on the basis that the alternative provides an acceptable level of quality and safety.

2.0 REGULATORY EVALUATION

Paragraph 10 CFR 50.55a(f), "Inservice Testing Requirements," requires, in part, that IST of certain ASME Code Class 1, 2, and 3 components must meet the requirements of the ASME

OM Code and applicable addenda, except where alternatives have been authorized pursuant to paragraphs 10 CFR 50.55a(z)(1) or 10 CFR 50.55a(z)(2).

In proposing alternatives, a licensee must demonstrate that the proposed alternatives provide an acceptable level of quality and safety (10 CFR 50.55a(z)(1)) or compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety (10 CFR 50.55a(z)(2)).

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request and the Commission to authorize the alternative requested by the licensee.

3.0 TECHNICAL EVALUATION

3.0.1 Applicable ASME OM Code

The following request is an alternative test plan in lieu of certain IST requirements of the 2004 Edition through 2006 Addenda of ASME OM Code for the IST program at FNP Units 1 and 2 for the fifth interval which is currently scheduled to start on December 1, 2017.

3.1.1 Licensee's Relief Request RR-PR-03 Version 1.0

ASME OM Code Requirements:

ISTB-3510(a) "Accuracy", states that "Instrument accuracy shall be within the limits of Table ISTB-3510-1. If a parameter is determined by analytical methods instead of measurement, then the determination shall meet the parameter accuracy requirement of Table ISTB-3510-1 (e.g., flow rate determination shall be accurate to within ±2 percent of actual). For individual analog instruments, the required accuracy is percent of full scale. For digital instruments, the required accuracy is over the calibrated range. For a combination of instruments, the required accuracy is loop accuracy."

Alternative testing is requested for the following pumps:

Table RR-PR-03

Pump ID	Function	Class	Group
Q1P16P001A-A	Service Water Pump (SWP)	3	A
Q1P16P001B-A	SWP	3	A
Q1P16P001C-AB	SWP	3	A
Q1P16P001D-B	SWP	3	A
Q1P16P001F-B	SWP	3	A
Q2P16P001A-A	SWP	3	A
Q2P16P001B-A	SWP	3	A
Q2P16P001C-AB	SWP	3	A
Q2P16P001D-B	SWP	3	A
Q2P16P001E-B	SWP	3	A

Reason for Request

Table ISTB-3510-1 specifies the pressure instrument accuracy to ±0.5 percent during the comprehensive pump test. Due to the design of the Service Water (SW) pumps (vertical line shaft), the suction pressure is determined using the SW wet pit level (WPL) and pump elevation. The WPL is recorded by reading the gauge on a concrete column in the wet pit. This gauge does not meet the accuracy requirements of Table ISTB-3510-1 for determining pressure.

Proposed Alternative

The SW pumps draw suction from the Service Water Intake Structure (SWIS) wet pit. The WPL determines the suction pressure when determining the pump differential pressure for inservice testing of the SW pumps. Pump inservice testing is performed by setting the pump differential pressure to within a fixed "band" based on WPL and discharge pressure. This results in a differential pressure within a 2 percent band around a reference differential pressure (ΔPr) value of 82.37 psig. The flow rate is then measured and compared to OM Code acceptance ranges.

The target specific differential pressure (D/P) range as established in the pump testing procedures is based on the normal service condition of the SW pumps to meet the design basis requirements. Normal WPL is maintained between 185.0 to 185.5 ft. The SW system withdraws water from the SWIS wet pit and either discharges the water to the river through the dilution line or recirculates the discharge water back to the SW pond. The river water system is available and is capable of providing make-up to the service water pond at a rate equal to the pumping rate of the SW system. The FNP design evaluation for balancing SW flow to meet all cooling load requirements resulted in establishing a reference D/P of 82.37 psig. It is recognized by the industry that it may not be possible to control the D/P to an exact value; therefore, the use of a limited target D/P range can allow for plant operational capabilities. The range of discharge pressures that can be controlled is identified in the pump testing procedures as being between 78 and 81 psig as shown in the table below.

Table 1 – Pump Differential Pressure

Wet Pit Level (WPL)	Discharge Pressure (PD)			
	78.00		81.00	
	ΔP	ΔP/ ΔPr	ΔP	ΔP/ ΔPr
185.0	81.08	0.98	84.08	1.02
185.5	80.86	0.98	83.86	1.02

Table 1, which can also be found in each pump testing procedure, shows how the minimum and maximum suction and discharge pressures limit the target D/P as close as practicable. If the target D/P cannot be obtained, the pump test is not acceptable and will not be performed. Testing the SW pumps at this repeatable service condition allows for consistent trending of the pump flow rate at the target D/P.

Establishing the required target D/P range as described above and measuring the corresponding flow rate have proven effective in monitoring SW pump degradation. Farley

Nuclear Plant staff reviews the pump performance and establishes flow reference values by comparing the reference values with the minimum required (degraded) performance curve established by design to ensure that the SW pumps can provide the required flow rates to all required cooling loads. In addition to establishing acceptable reference values and trending of the flow rate to monitor rate of declining performance, the Code establishes alert and required action ranges for pump performance. Plant documentation is available for review to show that the trending of the pump tests effectively monitors pump degradation. As expected, there are instances where the pump performance has degraded and the plant has taken corrective action to restore the pump performance. Looking over the history of the last 15 years, there have been no instances identified where the pump performance has degraded to the point that pump performance did not meet minimum design requirements prior to corrective action.

Instrument Accuracy/Precision:

A WPL gauge located on the wet pit concrete column is used to determine the SW pump suction pressure. The WPL gauge is a 5 foot gauge that is divided into increments of 0.2 foot. The best possible reading of this gauge is to the 0.1 foot markings due to location and system conditions. Therefore, the best accuracy for the suction pressure reading is 2 percent (0.1 ft/5.0 ft) which does not meet the accuracy requirement of Table ISTB-3510-1 for the comprehensive pump test.

The test procedures include an acceptance criterion that requires the WPL remain in a "band" between 185.0 and 185.5 feet (6 inch range). For an acceptable test, the variance in the WPL can be no more than the difference between the upper and lower acceptance criteria limits. By restricting the WPL range, the suction pressure for each SW pump test is essentially a constant value. A constant WPL reference of 185.25 feet can be assigned by the test procedure resulting in the maximum level difference of 0.25 feet, which equates to a maximum pressure difference of 0.109 pounds per square inch (psi) [(0.25 ft)/ (2.31 ft per psi)].

The maximum difference in suction pressure equates to only 0.14 percent of the minimum reference value for the pump differential pressure [(0.109 psi / 80.86 psi)]. The precision of the suction pressure reading based on the WPL results in an acceptable method for setting the reference value for pump differential pressure.

FNP proposes to perform SW pump preservice Group A and comprehensive pump testing using the installed WPL gauge to confirm the near constant suction pressure for the SW pumps. All other measurements for SW pump testing will comply with OM Code requirements.

Using the provisions of this request, as an alternative to the specific requirements of ISTB Table 3510-1 identified above, will provide an acceptable level of quality and safety for testing the pumps listed in Table RR-PR-03. Therefore, pursuant to 10 CFR 50.55a(z)(1), FNP requests approval of this proposed alternative to these specific ISTB requirements.

The proposed alternative is requested for use during the fifth 10-year IST interval currently scheduled to begin on December 1, 2017 and end on November 30, 2027.

3.1.2 NRC Staff Evaluation

Service Water Pumps listed in Table RR-PR-03 are vertical line shaft centrifugal pumps and considered to be Group A as defined by the ASME OM Code which states that Group A pumps are "pumps that are operated continuously or routinely during normal operation, cold shutdown, or refueling operations." The ASME OM Code requires Group A vertical line shaft pumps to be tested quarterly by test procedure ISTB-5221 and tested biennially by the comprehensive test procedure ISTB-5223. Both tests require that the pump operate at a specific flow reference point or alternatively at a specific differential pressure (D/P) point. When performing the comprehensive pump test, the accuracy of the instrumentation for measuring the pump pressure must be within ±0.5 percent per Table ISTB-3510-1.

The licensee has proposed to perform the comprehensive pump test using the installed service water pit wet level (WPL) gauge that has an accuracy of ±2 percent by setting the service water pit level to a known constant that would equate to a maximum difference of suction pressure to be within ±0.14%. With the WPL set to a constant value, the system resistance is varied until the reference D/P is set to within a 2 percent band.

The ASME OM Code 2004 Edition through 2006 Addenda does not allow for variance from a fixed reference value stating only that the resistance of the system shall be varied until either the measured D/P or the measured flow rate equals the corresponding reference value. ASME has recently addressed this issue by including in the 2012 Edition of the ASME OM Code an allowed tolerance setting of + 2 / - 1 percent of the reference value when setting flow or + 1 / - 2 percent of the reference value when setting D/P.

As noted in NUREG-1482 Revision 2, section 5.3 "Allowable Variance from Reference Points and Fixed-Resistance Systems", the NRC staff concludes that a total of 3 percent allowable variance on the reference point provides for a reasonable throttling control range while minimizing the impact on trending.

The NRC staff has reviewed the licensee's proposal to perform the comprehensive pump test using the installed service water WPL gauge that has an accuracy of ±2 percent by setting the service water pit level to a known constant that would equate to a maximum difference of suction pressure to be within ±0.14 percent and using a ±2 percent band when setting the D/P as the reference point. The variance allowed in the suction pressure reading results in an insignificant difference when setting the D/P. The ±2 percent band is based on historical performance and the ability to set a reasonable repeatable service condition. In addition, the licensee states that the 2 percent accuracy of the WPL gauge used to determine pump suction pressure has been accounted for in the acceptance criteria. The NRC staff has reviewed an example of a service water pump performance data over a five year period. The data obtained supports the fact that service water pump performance can be easily trended for declining capacity when setting the D/P reference point as described. The NRC staff has determined that proposed alternative RR-PR-03 Version 1.0 provides an acceptable level of quality and safety for trending service water pump performance.

4.0 CONCLUSION

As set forth above, the NRC staff finds that the proposed alternative described in alternative request RR-PR-03 Version 1.0 provides an acceptable level of quality and safety for components listed in table RR-PR-03. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1).

All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject requests for relief remain applicable.

Therefore, the NRC staff authorizes the proposed alternative in RR-PR-03 Version 1.0 for the Fifth 10-Year IST interval at FNP Units 1 and 2 which is currently scheduled to start on December 1, 2017 and end on November 30, 2027.

Principal Contributor: M. Farnan, NRR

Date: April 12, 2017.

SUBJECT: JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2 – INSERVICE TESTING ALTERNATIVE FOR SERVICE WATER PUMPS AND TRANSFER PUMPS PRESSURE ACCURACY (RR-PR-03) (CAC NOS. MF9265, MF9266) DATE: APRIL 12, 2017.

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