



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

November 23, 2016

Mr. Charles R. Pierce  
Regulatory Affairs Director  
Southern Nuclear Operating Company, Inc.  
P.O. Box 1295 / Bin 038  
Birmingham, AL 35201-1295

SUBJECT: EDWIN I. HATCH NUCLEAR PLANT, UNIT NOS. 1 AND 2 – REQUEST FOR  
ALTERNATIVE HNP-ISI-ALT-05-03, VERSION 1.0, REGARDING REACTOR  
PRESSURE VESSEL FLANGE LEAK-OFF PIPING (CAC NOS. MF8141 AND  
MF8142)

Dear Mr. Pierce:

By letter dated July 6, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16188A313), as supplemented by letter dated October 26, 2016 (ADAMS Accession No. ML16300A430), Southern Nuclear Operating Company, Inc. (the licensee) submitted Request for Alternative HNP-ISI-ALT-05-03, Version 1.0, to the U.S. Nuclear Regulatory Commission (NRC) for approval. The licensee proposed an alternative to a certain requirement of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME B&PV Code), Section XI, for the Edwin I. Hatch Nuclear Plant (HNP), Unit Nos. 1 and 2. The proposed alternative is related to the ASME B&PV Code inservice inspection (ISI) requirement of IWB-5220, "System Leakage Test," for the system leakage test of the reactor pressure vessel flange leak-off piping.

The NRC staff has determined that proposed Alternative HNP-ISI-ALT-05-03, Version 1.0, provides reasonable assurance of structural integrity and leak tightness of the subject system piping and that complying with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in Title 10 of the *Code of Federal Regulations* 50.55a(z)(2). Therefore, the NRC staff authorizes the use of the licensee's requested Alternative HNP-ISI-ALT-05-03, Version 1.0, for HNP, Unit Nos. 1 and 2, for the fifth 10-year ISI interval.

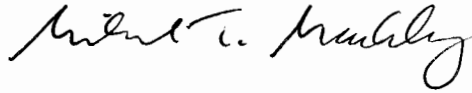
All other ASME B&PV Code requirements for which relief was not specifically requested and approved in the subject request remains applicable.

C. Pierce

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If you have any questions, please contact the Project Manager, Michael Orenak, at 301-415-3229 or [Michael.Orenak@nrc.gov](mailto:Michael.Orenak@nrc.gov).

Sincerely,

A handwritten signature in black ink, appearing to read "Michael T. Markley". The signature is fluid and cursive, with the first name "Michael" and last name "Markley" clearly distinguishable.

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

Docket Nos. 50-321 and 50-366

Enclosure:  
Safety Evaluation

cc w/enclosure: Distribution via Listserv



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR ALTERNATIVE HNP-ISI-ALT-05-03, VERSION 1.0

REGARDING REACTOR PRESSURE VESSEL FLANGE LEAK-OFF PIPING

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

EDWIN I. HATCH NUCLEAR PLANT, UNIT NOS. 1 AND 2

DOCKET NOS. 50-321 AND 50-366

1.0 INTRODUCTION

By letter dated July 6, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16188A313), as supplemented by letter dated October 26, 2016 (ADAMS Accession No. ML16300A430), Southern Nuclear Operating Company, Inc. (SNC, the licensee) submitted Request for Alternative HNP-ISI-ALT-05-03, Version 1.0, to the U.S. Nuclear Regulatory Commission (NRC) for approval. Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(2), the licensee proposed an alternative to a certain requirement of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME B&PV Code), Section XI, for the Edwin I. Hatch Nuclear Plant (HNP), Unit Nos. 1 and 2. The proposed alternative is related to the ASME B&PV Code inservice inspection (ISI) requirement of IWB-5220, "System Leakage Test," for the system leakage test of the reactor pressure vessel (RPV) flange leak-off piping. Specifically, the licensee proposed an alternative to the system leakage test on the basis that complying with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), ASME B&PV Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME B&PV Code, Section XI, "Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations in 10 CFR 50.55(a) require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME B&PV Code, incorporated by reference in 10 CFR 50.55a(b), 12 months prior to the start of the 120-month interval, subject to the conditions listed therein.

The regulation 10 CFR 50.55a(z), "Alternatives to codes and standards requirements," states, in part, that:

Alternatives to the requirements of paragraphs (b) through (h) of this section or portions thereof may be used when authorized by the Director, Office of Nuclear Reactor Regulation, or Director, Office of New Reactors, as appropriate. A proposed alternate must be submitted and authorized prior to implementation. The applicant or licensee must demonstrate that:

- (1) *Acceptable level of quality and safety.* The proposed alternative would provide an acceptable level of quality and safety; or
- (2) *Hardship without a compensating increase in quality and safety.* Compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(z)(2), the licensee has requested approval to use an alternative to the requirements of 10 CFR 50.55a for the fifth 10-year ISI interval on the basis that complying with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Based on the above, the NRC staff finds that there is a regulatory basis for the licensee to request, and the NRC to authorize, the proposed alternative, subject to the following technical evaluation.

### 3.0 TECHNICAL EVALUATION

#### 3.1 ASME B&PV Code Components Affected

The components affected by this request are ASME B&PV Code Class 1, IWB-2500, Table IWB-2500-1, Examination Category B-P, Item No. B15.10, RPV flange seal leak-off piping for the RPV flange leak detection and collection system. The licensee provided detailed material and design information of the HNP, Unit No. 1, components for which it proposed an alternative:

NPS [nominal pipe size] 1" and 3/8 " Reactor Pressure Vessel Flange Seal Leak-off Piping

The 1" piping is A-312 TP 304 stainless steel, schedule 80. Design pressure is 600 psig [pounds per square inch gauge] at 850°F.

The 3/8 " tubing is A-213 GR TP 304 or 316. Wall thickness is 0.065 ". Design pressure is 600 psig at 850°F.

Design pressure at 563°F is 1118 psig [pounds per square inch gauge].

The HNP, Unit No. 2, components for which the licensee proposed an alternative are as follows:

NPS 1", 3/4" and 3/8" Reactor Pressure Vessel Flange Seal Leak-off Piping  
The 1" piping is SA-106 GR 8 carbon steel, schedule 160. Design pressure is 900 psig at 850°F.  
The 3/4" piping is SA-106 GR 8, schedule 160. Design pressure is 900 psig at 850°F.  
The 3/8" tubing is SA-213 GR TP 304 or 316. Wall thickness is 0.065".  
Design pressure is 900 psig at 850°F.  
Design pressure at 575°F is 1250 psig.

### 3.2 Applicable Code Requirement

The HNP, Unit Nos. 1 and 2, applicable code of record for the fifth 10-year ISI interval is the ASME B&PV Code, Section XI, 2007 Edition, through the 2008 Addenda. In accordance with ASME B&PV Code, Section XI, Table IWB-2500-1, Examination Category B-P, Item No. B15.10, all pressure retaining components shall have a VT-2 examination in accordance with subsection IWB-5221(a). Subsection IWB-5221(a) states that the system leakage test shall be conducted at a pressure not less than the pressure corresponding to 100 percent rated reactor power.

### 3.3 Reason for Request

The licensee stated that the reactor vessel flange leak-off lines are not capable of being pressure tested at the normal reactor operating pressure (i.e., 1,045 psig) without compromising the integrity of the O-rings used to seal the RPV during normal operations. Specifically, the licensee stated that the RPV flanges are sealed with two concentric metal O-rings designed to permit no detectable leakage through the inner or outer O-ring seals at any operating condition. The licensee stated that in order to detect leakage past the O-ring, a vent tap is located between the two O-rings. The licensee also stated that a monitor line is attached to the tap to provide an indication of leakage from the inner O-ring seal. When the leak-off line is pressurized, an alarm will provide an indication of leakage to the main control room. The licensee further stated that the RPV configurations are such that the reactor vessel flange leak-off lines are not capable of being pressure tested at the normal reactor operating pressure unless the inner O-ring seal fails or is intentionally failed.

The licensee stated that a possible option would be a design change by installation of a device, such as a threaded plug, to isolate the piping and perform the ASME B&PV Code required leakage test. However, the licensee stated that this option is not considered viable due to the potential introduction of foreign material into the RPV, as well as the considerable dose that would result from exercising this option. The licensee concluded that compliance with the specified requirements would result in hardship or difficulty without a compensating increase in the level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(z)(2), SNC requested authorization to use the proposed alternative for the duration of the fifth 10-year ISI interval for HNP, Unit Nos. 1 and 2.

### 3.4 Proposed Alternative

The licensee proposed an alternative to IWB-5221(a). Specifically, the licensee proposes to perform the VT-2 visual examinations of the accessible areas of the subject system piping components during each refueling outage when the RPV flange leak-off piping is subjected to a static pressure head of 9.7 psig for at least 4 hours during the reactor vessel cavity flood-up for refueling. The static pressure head of 9.7 psig is produced from the normal refueling water level of approximately 22 feet and 4 inches above the reactor vessel flange when the reactor cavity is flooded during a refueling outage. The licensee stated that these examinations will be performed by certified VT-2 examiners. The licensee also stated that the test shall be conducted at ambient temperature after the reactor cavity is filled and the RPV closure head removed. The licensee further stated that this method of testing is consistent with what was previously approved by the NRC for the fourth 10-year ISI interval at HNP, Unit Nos. 1 and 2, in the NRC's safety evaluation dated February 12, 2014 (ADAMS Accession No. ML14038A192). The licensee stated that the VT-2 examinations performed during every refueling outage per the proposed alternative provide a reasonable assurance that gross indications of leakage will be detected during the outage, should the inner O-ring seal fail.

### 3.5 NRC Staff Evaluation

The NRC staff evaluated the licensee's proposed Alternative HNP-ISI-ALT-05-03, Version 1.0, pursuant to 10 CFR 50.55a(z)(2). The NRC staff's review focused on whether compliance with the specified requirements of 10 CFR 50.55a(g), or portions thereof, would result in hardship or unusual difficulty, and if there is a compensating increase in the level of quality and safety, despite the hardship, if the licensee complied with the requirement.

In order to test the subject piping after the RPV head is removed for refueling, the licensee would have to make design modifications to the existing RPV flange face. The modifications could introduce foreign materials into the reactor coolant system, which would introduce risk of foreign material in the RPV as well as expose persons performing this task to incur additional radiation dose. In addition, in order to conduct the required system testing before the RPV head is removed for refueling, the licensee would have to install new test connections and valves to existing piping to be able to externally pressurize the leak-off piping. Licensee personnel performing these tasks and conducting the associated testing would again be exposed to additional dose.

The NRC staff has determined that compliance with the ASME B&PV Code subparagraph IWB 5221(a) requirement for leak testing of the RPV closure head flange leak-off line piping would result in a hardship. This hardship is due to the existing design and configuration of the RPV closure head flange, O-ring seals, and the flange leak-off line that makes system leakage testing of the leak-off piping at full reactor coolant system pressure, either before or after the RPV head is removed, unusually difficult.

In the proposed alternative, the RPV leak-off piping will be subjected to the highest pressure that can be obtained without major design modifications to the existing configurations of the RPV flange face and the flange leak-off piping. Based on the licensee's proposed Alternative HNP-ISI-ALT-05-03, Version 1.0, the flange leak-off line piping will be pressurized by the static pressure head (i.e., 9.7 psig) developed from the refueling water level above the reactor vessel flange during the vessel cavity flood-up, and will be examined by VT-2 qualified examiners for

leakage during each refueling outage. Existing through-wall flaws that could result in leakage should the RPV O-ring seal fail can be detected by the proposed alternate examinations. In addition, if the proposed alternative was not entirely effective in identifying a through-wall flaw that would result in leakage, it would be contained in the drywell and would be detected by leak-off line instrumentation, as well as drywell instrumentation, and corrected. The NRC staff finds that the proposed Alternative HNP-ISI-ALT-05-03, Version 1.0, is acceptable because it provides reasonable assurance of structural integrity and leak tightness of the RPV flange leak-off line piping.

#### 4.0 CONCLUSION

As set forth above, the NRC staff has found that the proposed alternative provides reasonable assurance of structural integrity and leak tightness of the subject system piping and that complying with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, the NRC staff authorizes the use of the licensee's requested alternate HNP-ISI-ALT-05-03, Version 1.0, for HNP, Unit Nos. 1 and 2, for the fifth 10-year ISI interval that started on January 1, 2016, and is scheduled to end on March 1, 2026. All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the staff remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: R. Kalikian

Date: November 23, 2016.

C. R. Pierce

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If you have any questions, please contact the Project Manager, Michael Orenak, at 301-415-3229 or [Michael.Orenak@nrc.gov](mailto:Michael.Orenak@nrc.gov).

Sincerely,

**/RA/**

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

Docket Nos. 50-321 and 50-366

Enclosure:  
Safety Evaluation

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