



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

December 19, 2012

Mr. George H. Gellrich, Vice President
Calvert Cliffs Nuclear Power Plant, LLC
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, MD 20657-4702

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NO. 1 – RELIEF
REQUEST RR-ISI-04-06 FROM ASME CODE CASE N-770-1 INSPECTION
COVERAGE REQUIREMENT FOR VOLUMETRIC EXAMINATION OF
REACTOR SYSTEM DISSIMILAR METAL BUTT WELDS (TAC NO. ME7791)

Dear Mr. Gellrich:

By letter dated December 29, 2011, as supplemented by letters dated February 9, March 13, and March 19, 2012, Calvert Cliffs Nuclear Power Plant, LLC, the licensee, submitted a request for authorization of a proposed alternative to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(6)(ii)(F) for Calvert Cliffs Nuclear Power Plant, Unit No. 1 (Calvert Cliffs). The requirements, for which alternative is requested, define the volumetric inspection coverage requirements for reactor coolant system dissimilar metal butt welds. The requirements are dependent on the categorization of the welds under Table 1 of the American Society of Mechanical Engineer's Boiler and Pressure Vessel (ASME) Code Case N-770-1, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated With UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, Section XI, Division 1," with conditions imposed in 10 CFR 50.55a(g)(6)(ii)(F).

Specifically, pursuant to 10 CFR 50.55a(a)(3)(ii), the licensee requested to use an alternative on the basis that complying with the specified requirement would result in hardship or unusual difficulty at Calvert Cliffs for the spring 2012 refueling outage. Due to the licensee's hardship to improve its inspection coverage, the Nuclear Regulatory Commission (NRC) staff verbally authorized the licensee's proposed alternative on March 26, 2012.

The NRC staff has concluded that the licensee provided sufficient technical basis to demonstrate that compliance with the requirements of 10 CFR 50.55a(g)(6)(ii)(F) would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concluded that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii), as the proposed alternative provides reasonable assurance of structural integrity and leak tightness. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the NRC staff authorizes the licensee's proposed alternative, RR-ISI-04-06A.

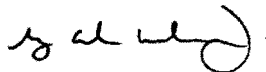
G. Gellrich

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All other ASME Code, Section XI and 10 CFR 50.55a(g)(6)(ii)(F) requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

If you have any questions, please contact the Calvert Cliffs Project Manager, Nadiyah Morgan, at (301) 415-1016.

Sincerely,

A handwritten signature in black ink, appearing to read "G. Wilson".

George Wilson, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-317

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
REQUEST FOR RELIEF (RR-ISI-04-06A) FROM ASME CODE CASE N-770-1 INSPECTION
COVERAGE REQUIREMENT FOR VOLUMETRIC EXAMINATION OF REACTOR SYSTEM
DISSIMILAR METAL BUTT WELDS
CALVERT CLIFFS NUCLEAR POWER PLANT, LLC
CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-317

1.0 INTRODUCTION

By letter dated December 29, 2011, (Agencywide Document Access and Management System (ADAMS) Accession No. ML12009A073), as supplemented by letters dated February 9, (ADAMS Accession No. ML12044A020), March 13, (ADAMS Accession No. ML12074A179), and March 19, 2012 (ADAMS Accession No. ML12080A102), Calvert Cliffs Nuclear Power Plant, LLC, the licensee, submitted a request for authorization of a proposed alternative to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(6)(ii)(F) for Calvert Cliffs Nuclear Power Plant, Unit No. 1 (Calvert Cliffs). The requirements, for which alternative is requested, define the volumetric inspection coverage requirements for reactor coolant system dissimilar metal (DM) butt welds. The requirements are dependent on the categorization of the welds under Table 1 of the American Society of Mechanical Engineer's Boiler and Pressure Vessel (ASME) Code Case N-770-1, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated With UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, Section XI, Division 1," with conditions imposed in 10 CFR 50.55a(g)(6)(ii)(F).

Specifically, pursuant to 10 CFR 50.55a(a)(3)(ii), the licensee requested to use an alternative on the basis that complying with the specified requirement would result in hardship or unusual difficulty at Calvert Cliffs for the spring 2012 refueling outage. Due to the licensee's hardship to improve its inspection coverage, the Nuclear Regulatory Commission (NRC) staff verbally authorized the licensee's proposed alternative on March 26, 2012.

2.0 REGULATORY EVALUATION

The inservice inspection (ISI) of ASME Code Class 1, 2 and 3 components is to be performed in accordance with Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the ASME Code and applicable editions and addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission.

Regulations under 10 CFR 50.55a(g)(6)(ii) states that the Commission may require the licensee to follow an augmented ISI program for systems and components for which the Commission deems that added assurance of structural reliability is necessary. Regulations under 10 CFR 50.55a(g)(6)(ii)(F) requires, in part, augmented inservice volumetric inspection of class 1 piping and nozzle DM butt welds of pressurized water reactors in accordance with ASME Code Case N-770-1, subject to the conditions specified in paragraphs (2) through (10) of 10 CFR 50.55a(g)(6)(ii)(F).

Alternatives to requirements under 10 CFR 50.55a(g) may be authorized by the Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 50.55a(a)(3)(i) or 10 CFR 50.55a(a)(3)(ii). In proposing alternatives or requests for relief, the licensee must demonstrate that: (1) the proposed alternatives would provide an acceptable level of quality and safety; or (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

By letter dated December 29, 2011, and supplemented by letters dated February 9, 2012, March 13, 2012 and March 19, 2012, the licensee proposed an alternative, RR-ISI-04-06A, in accordance with 10 CFR 50.55a(a)(3)(ii) for relief from the requirements of 10 CFR 50.55a(g)(6)(ii)(F)(2) and 50.55a(g)(6)(ii)(F)(3) for ten DM butt welds at Calvert Cliffs U1. 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

3.1 Licensee Relief Request

3.1.1 Component Identification

DM butt weld identification number 12-SC-1004-1 requires relief from 10 CFR 50.55a(g)(6)(ii)(F)(2), and

DM butt weld identification numbers 30-RC-11A-7, 30-RC-11B-7, 30-RC-12A-7, 30-RC-12B-7, 12-SI-1009-16, and 12-SI-1012-13 require relief from 10 CFR 50.55a(g)(6)(ii)(F)(3).

3.1.2 Code Requirements for Which Relief is Requested

In part, 10 CFR 50.55a(g)(6)(ii)(F)(2) requires that in order for a DM weld mitigated with the mechanical stress improvement process (MSIP™) technique to be re-categorized as category D or E, the criteria of Appendix I of ASME Code Case N-770-1 must be met. Paragraph I-5 of Appendix I requires, "An evaluation shall be performed to confirm that the required examination volume of the mitigated configuration is within the scope of an Appendix VIII supplement or

supplements and that the examination procedures to be used have been qualified in accordance with Appendix VIII." In order to meet this requirement, an Appendix VIII qualified procedure would be required to complete the inspection of essentially 100 percent of the inspection volume of Figure 1 of ASME Code Case N-770-1.

Item 3 of 10 CFR 50.55a(g)(6)(ii)(F) requires, in part, that all category B welds have a baseline examination completed by the first refueling outage, starting after January 20, 2012. Previous examinations are allowed to meet this baseline examination requirement if the exam was performed in accordance with Section XI, Appendix VIII requirements and met the Code required examination volume of essentially 100 percent.

3.1.3 Licensee's Proposed Alternative

The licensee proposed to use previous examinations of the DM butt welds identified above to satisfy the inspection requirements of 10 CFR 50.55a(g)(6)(ii)(F)(2) and (3) to re-categorize DM welds mitigated with MSIP™ as category D or E and satisfy the baseline inspection requirement of category B DM welds, respectively.

3.1.4 Licensee's Duration of Relief Request

The licensee requests relief from 10 CFR 50.55a(g)(6)(ii)(F)(2) to permanently re-categorize weld 12-SC-1004-1 as inspection category D of N-770-1.

The licensee requests relief from 10 CFR 50.55a(g)(6)(ii)(F)(3) to use the previous examinations of welds 30-RC-11A-7, 30-RC-11B-7, 30-RC-12A-7, 30-RC-12B-7, 12-SI-1009-16, and 12-SI-1012-13 from the 2010 refueling outage to meet the baseline inspection requirement for each weld. This is a onetime relief request for the spring 2012 refueling outage.

3.1.5 Licensee's Basis for Relief

The licensee stated that they examined all DM welds using a procedure that has been qualified in accordance with the requirements of Section XI, Appendix VIII, Supplement 10 for the manual phased array ultrasonic testing (UT) examination technique. However, the licensee was not able to obtain full required inspection coverage for certain welds identified above. In the case of weld number 12-SC-1004-1, the licensee was only able to obtain 72 percent coverage versus the required essential 100 percent coverage. The other welds have similar limitations in inspection coverage due to inspection through cast stainless steel, geometric obstructions or surface conditions. The full coverage obtained for each weld is listed in Tables A and B of the licensee's submittals.

The licensee supports their relief request based on inspection coverage obtained of the primary water stress corrosion cracking (PWSCC) susceptible material, the lower temperatures of the category B welds, visual examinations, and the hardship required to use a weld build up on the DM weld to improve inspectability. For each weld under the scope of this request, the licensee stated that 100 percent inspection coverage was obtained for circumferential flaws in the PWSCC susceptible material. The limited inspection coverage for axial flaws is not as significant of a safety concern, as an axial PWSCC flaw will not lead to failure of the piping system, only a potential leak. Further, the lower temperatures of each of the non-mitigated

category B welds significantly lowers the potential for initiation and slows crack growth rates of any potential flaws. The licensee noted that bare metal visual examinations were performed in the previous outage with no indications of leakage. The licensee also noted that bare metal visual examinations and system walkdowns in accordance with the Boric Acid Corrosion Control Program will be performed on these welds to augment the volumetric examinations. Finally, the licensee noted that where appropriate, contouring has been completed on the examination surfaces of the welds to improve inspection coverage. According to the licensee, additional actions are limited by the design minimum wall calculations for the piping. In order to obtain additional axial flaw coverage, the licensee believes it would require a weld buildup of the DM weld, followed by additional contouring and a Construction Code required radiographic examination. The licensee noted that this would be a hardship that does not provide an increase to health and safety of the public due to only increasing inspection coverage for axial flaws.

Given this hardship, the licensee believes that the UT examination coverages, which include 100 percent of the PWSCC susceptible material for circumferential flaws, combined with the periodic visual examinations and walkdowns, provide an acceptable level of quality and safety for identifying degradation from PWSCC, prior to the development of a safety significant flaw.

3.2 NRC STAFF'S EVALUATION

The NRC staff notes that the generic rules for the volumetric examination of DM butt welds were established to provide reasonable assurance of the structural integrity and leak tightness of the reactor coolant pressure boundary. As such, the NRC staff finds that plant specific analysis could be used to provide a basis for inspection relief if the inspection requirement presents a significant hardship. The NRC staff reviewed the licensee's proposed alternative under the requirements of 10 CFR 50.55a(a)(3)(ii), such that;

"Compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety."

The licensee explained its hardship to improve the inspection coverage that included weld buildup, additional contouring and radiographic examination. As the licensee had assured the NRC staff that they had taken all steps possible to improve their inspection coverage for the welds listed above, the NRC staff found the licensee had a sufficient basis for a radiological dose hardship. Therefore, the NRC staff reviewed the licensee's deterministic assessment and supporting inspection results to access the authorization of RR-ISI-04-06A.

Weld identification number 12-SC-1004-1 is a 12-inch diameter DM weld connecting the shutdown cooling line to the reactor coolant system hot leg. This weld was previously mitigated against PWSCC by implementation of the MSIP™. This mitigation technique creates a compressive stress on the inner 1/3rd thickness of the weld, which acts to prevent any continued crack growth in this area and new initiation of flaws. In order to be categorized as Item D of ASME Code Case N-770-1, the mitigation process was required by 10 CFR 50.55a(g)(6)(ii)(F)(2) to meet Appendix I of ASME Code Case N-770-1. Appendix I requires that the weld be inspected to meet the requirements of Section XI of the ASME Code. The inspection performed by the licensee did not wholly meet these requirements; however, 100 percent of the susceptible material of this weld was inspected for both circumferential and axial scans. Given the hardship identified above and the complete inspection coverage of the

susceptible material, the NRC staff finds the previous inspection of this weld was sufficient to re-categorize this weld as Item D of Table 1 of ASME Code Case N-770-1.

Weld identification numbers 30-RC-11A-7, 30-RC-11B-7, 30-RC-12A-7, 30-RC-12B-7, 12-SI-1009-16, and 12-SI-1012-13 require relief from the baseline inspection requirements of 10 CFR 50.55a(g)(6)(ii)(F)(3) because the licensee's inspection coverage was less than required for axial flaw coverage in accordance with Section XI, Appendix VIII. The NRC staff notes that the primary concern for axial flaws is leakage rather than a loss of structural integrity for each of the six welds. Further, in each case, the NRC staff recognizes that the licensee's obtained volumetric inspection coverage does allow for the finding of larger axial flaws if they were to initiate and grow. As well, each of these welds is in a cold leg temperature line. The NRC staff found that due to the effect of cold leg temperature on PWSCC for each of these welds, a flaw would take a longer period of time to grow to an unacceptable depth than the required re-inspection frequency for each weld in accordance with Code Case N-770-1. Finally the NRC staff also considered that, for each of these welds, 100 percent coverage was obtained for circumferential flaws in the susceptible material, which is the structural integrity concern. Given the hardship identified above and the coverage obtained for each of these welds, the NRC staff finds the previous examinations of each of these welds are sufficient to meet the baseline inspection requirement of 10 CFR 50.55a(g)(6)(ii)(F)(3).

Therefore for each weld identified above, with due consideration for the hardship of obtaining full inspection coverage, the NRC staff finds the licensee provided sufficient information from the previous inspections to provide reasonable assurance of the structural integrity and leak tightness of the welds identified in the licensee's proposed alternative. Further, compliance with the specified inspection coverage requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

4.0 CONCLUSION

As set forth above, NRC staff has concluded that the licensee provided sufficient technical basis to demonstrate that compliance with the requirements of 10 CFR 50.55a(g)(6)(ii)(F) would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concluded that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii), as the proposed alternative provides reasonable assurance of structural integrity and leak tightness. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the NRC staff authorizes the licensee's proposed alternative, RR-ISI-04-06A.

All other ASME Code, Section XI and 10 CFR 50.55a(g)(6)(ii)(F) requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principle Contributor: J. Collins

Date: December 19, 2012

G. Gellrich

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All other ASME Code, Section XI and 10 CFR 50.55a(g)(6)(ii)(F) requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

If you have any questions, please contact the Calvert Cliffs Project Manager, Nadiyah Morgan, at (301) 415-1016.

Sincerely,

/RA/

George Wilson, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-317

Enclosure:
Safety Evaluation

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***See memo dated November 30, 2012**

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