September 22, 2005

Mr. David A. Christian
Sr. Vice President and Chief Nuclear Officer
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5000 Dominion Boulevard
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SUBJECT: RELIEF REQUEST FOR MILLSTONE POWER STATION, UNIT NO. 3 (TAC NO. MC4631)

Dear Mr. Christian:

By letter dated September 23, 2004, as supplemented March 28, 2005, Dominion Nuclear Connecticut, Inc. (DNC) submitted to the Nuclear Regulatory Commission (NRC), Relief Request No. RR-89-52, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g)(5)(iii), requesting approval of an alternative to the requirements of American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Section XI. The alternative would allow for a temporary non-ASME Code repair to brazed joints on service water piping.

Based upon the review of the information provided by DNC, the NRC concluded that the proposed alternative provides reasonable assurance of structural integrity and finds that performance of the ASME Code repair at this time would be impractical. The staff finds, therefore, that your proposed alternative is authorized pursuant to 10 CFR 50.55a(g)(6)(i). The NRC staff's Safety Evaluation is enclosed.

Sincerely,

/RA/

Darrell J. Roberts, Chief, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-423

Enclosure: As stated

cc w/encl: See next page

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Millstone Power Station, Unit No. 3

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Millstone Power Station, Unit No. 3

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SECOND TEN-YEAR INTERVAL INSERVICE INSPECTION

REQUEST FOR RELIEF NO. RR-89-52

MILLSTONE POWER STATION, UNIT NO. 3

DOMINION NUCLEAR CONNECTICUT, INC.

DOCKET NUMBER 50-423

1.0 INTRODUCTION

By letter dated September 23, 2004, as supplemented March 28, 2005, Dominion Nuclear Connecticut, Inc. (DNC or the licensee) submitted to the Nuclear Regulatory Commission (NRC or the Commission), Relief Request No. RR-89-52, requesting approval of an alternative to the requirements of American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Section XI. The alternative would allow for a temporary non-ASME Code repair to brazed joints on service water (SW) piping.

During operation, the licensee detected leakage at five brazed joints in the SW piping associated with a safety injection pump cooler. The ASME Code of record for the current Millstone Power Station, Unit No. 3 (MPS3) inservice inspection (ISI) interval is the 1989 Edition of the ASME Code Section XI, no Addenda. The ASME Code requires that the degraded piping be repaired or replaced due to the flaw exceeding the acceptance criteria.

The permanent repair for this condition could potentially require an unnecessary shutdown of MPS3 without a commensurate safety benefit. As an alternative, the licensee proposes to use a compensatory monitoring plan and perform an evaluation similar to the guidance in Generic Letter (GL) 90-05, "Guidance for Performing Temporary Non-Code Repair of ASME Code Class 1, 2 and 3 Piping", dated June 15, 1990. The licensee will perform the ASME Code-required repairs during the next cold shutdown of sufficient duration or the next refueling outage, whichever comes first.

2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g) requires nuclear power facility piping and components to meet the applicable requirements of Section XI of the ASME Code. Section XI of the ASME Code specifies Code-acceptable repair methods for flaws that exceed ASME Code acceptance limits in piping that is in service. An ASME Code repair is required to restore the structural integrity of flawed ASME Code piping, independent of the

Attachment

operational mode of the plant when the flaw is detected. Those repairs not in compliance with Section XI of the ASME Code are non-Code repairs. The implementation of required ASME Code (weld) repairs to ASME Code Class 1, 2 or 3 systems is often impractical for nuclear licensees since the repairs normally require an isolation of the system requiring the repair, and often a shutdown of the nuclear power plant.

Alternatives to ASME Code requirements may be used by nuclear licensees when authorized by the NRC if the proposed alternatives to the requirements are such that they are shown to provide an acceptable level of quality and safety in lieu of the ASME Code requirements (10 CFR 50.55a(a)(3)(i)), or if compliance with the ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety (10 CFR 50.55a(a)(3)(ii)).

A licensee may also submit requests for relief from certain ASME Code requirements when a licensee has determined that conformance with certain Code requirements is impractical for its facility (10 CFR 50.55a(g)(5)(iii)). Pursuant to 10 CFR 50.55a(g)(6)(i), the Commission will evaluate determinations of impracticality and may grant relief and may impose alternative requirements as it determines is authorized by law.

GL 90-05 provides guidance for performing temporary non-ASME Code repairs of ASME Code Class 1, 2, and 3 piping. Specifically, for ASME Code Class 1 and 2 piping, the licensee is required to perform ASME Code repairs or request the NRC to grant relief for temporary repairs on a case-by-case basis regardless of pipe size.

For Class 3 piping, licensees can perform temporary non-ASME Code repairs following the guidance in GL 90-05. The licensee is required to document the repair by requesting the NRC to grant a relief for temporary non-ASME Code repairs of Class 3 piping. The NRC staff uses the guidance of GL 90-05 as its criteria for evaluating relief requests for temporary non-ASME Code repairs of ASME Code Class 3 piping.

3.0 TECHNICAL EVALUATION

3.1 ASME Code Components Affected

The affected components include ASME Code Class 3 SW brazed joints, Cu-Ni SB-465 piping, and associated bronze SB-62 socket fittings, for 2-inch and 1.5-inch nominal piping. The affected joints leak SW and are located in the piping associated with the ‘A’ safety injection pump cooler (3CCI*E1A). There are five affected joints, identified as FW-50, FW-53, FW-55, FW-63 and FW-66.

Four of the leaks are at 2-inch joints within the boundary of the heat exchanger and one leak is at a 1.5-inch joint immediately downstream of the heat exchanger. The ‘A’ safety injection pump cooler is a heat exchanger composed of a series of four pipe-within-a-pipe segments that are connected by brazed fittings.

System:	Service Water
Design Code:	ASME III 1971
Safety Code Class:	Class 3
Piping Size:	2-inch and 1.5-inch
Nominal Thickness:	0.156 inches / 0.150 inches
Material (pipe/fitting):	Cu-NI SB 466 / Bronze SB 62
Design Pressure:	100 psi design / 63 psi max. operating
Temperature:	75 EF design max. / 33 EF min.
Code Minimum Wall:	0.01 inches (thickness)

3.2 Applicable ASME Code Edition and Addenda

MPS3 is currently operating in the second 10-year ISI interval, which started on April 23, 1999. The code of record for the second 10-year ISI interval is the 1989 Edition with no Addenda, of the ASME Code Section XI.

3.3 Applicable ASME Code Requirement

The ASME Code requirements are those contained in ASME Code Section XI, IWA-4000, "Repair and Replacement," of the 1989 ASME Code Edition. GL 90-05 provides guidance for performing temporary non-ASME Code repairs of ASME Code Class 1, 2 and 3 piping.

3.4 Licensee's Reason for Request

The permanent repair for this condition could potentially require an unnecessary shutdown of MPS3 without a commensurate safety benefit. The structural analysis of the current piping configuration using this temporary non-ASME Code repair indicates that all required functions would be maintained for postulated design-basis accidents and transients.

3.5 Licensee's Proposed Alternative and Basis for Use

<u>Flaw Characterizations and Mechanism of Degradation</u>

Non-destructive examination (NDE) included ultrasonic testing (UT) on the affected piping, elbow and union sockets. Visual examination (VT-1) on flaws, adjacent components and augmented inspections were performed.

The extent of the braze disruption is very small and not distinguishable by visual examination. The resulting leakage is slow and can be characterized as weeping (less than 1 drop per minute). Adjacent pipe material and fittings have no cracking or wastage. UT examination showed no deterioration in the piping or the fittings and, consequently, erosion rate estimates are not applicable to this condition.

The degradation mechanism appears to be limited to the adequacy of the braze material fill in the affected joints which have resulted in through-braze leaks and assumed braze material failures. Fittings and piping are intact. Therefore, any potential leakage area is limited to the annular area (derived from nominally 0.005 inches of gap within the joint) between the subject pipe and sockets.

Augmented Inspections

The are four SW system coolers that have the same brazed piping and fittings with a pipe-within-pipe configuration like the 'A' safety injection pump cooler (3CCI*E1A). The other three coolers are the 'B' safety injection pump cooler (3CCI*E1B), and the 'A' and 'B' charging pump coolers (3CCE*E1A and 3CCE*E1B). A visual inspection was performed of the other three coolers, which included a total of 81 separate field joints, and no additional brazed joint leaks were identified.

Additional examinations of similar pipe designs and adjacent piping were performed to provide assurance that other brazed joints were not leaking and that no damage had occurred due to leaking SW.

Structural Assessment

The flaws are located in brazed joints and, therefore, previously-approved methodologies to show structural integrity are not applicable. The operability determination conservatively assumes a potential for total loss of the braze material in joints FW-50, FW-53, FW-55, FW-63 and FW-66. The structural integrity of the SW system is adequate based on the joint design and the location of new supports to assure that the affected piping will remain within the fitting sockets even if the braze material were to totally fail. The 3CCI*E1A SW piping is subject to deadweight, thermal, seismic inertial, and fluid pressure thrust loading. The new supports from this temporary non-ASME Code repair ensure affected piping is structurally intact for all design loading conditions for this application.

3.6 Licensee's Proposed Alternative

The licensee has determined that leakage from the failed brazed joint at the subject locations are acceptable without crediting pressure boundary integrity of the joint itself. No pressure-retaining temporary repair is proposed. The subject piping and support configuration are credited to maintain leakage to an acceptable level.

The ASME Code repair has been found to be impractical. The licensee proposes to monitor the leaking joints until the ASME Code repairs can be performed during the next cold shutdown of sufficient duration or the next refueling outage, whichever comes first.

The licensee proposes the following compensatory measures be performed:

> Leakage monitoring of the 3CC1*E1A safety injection pump cooler shall be performed. The degraded joints will be observed at least once per 12-hour shift during normal operator rounds and any significant increase in leakage will be evaluated.
>
> Periodic follow-up non-destructive examinations (NDE) for erosion rate and structural assessments will be performed within 90 days from the last examination. These periodic NDE examinations will include UT examinations of the piping at the five affected brazed joints and visual inspection. These follow-up examinations shall continue until permanent [ASME] Code compliant butt-welded replacement field welds to this cooler are performed.

Any significant changes that are observed in the condition of the degraded joints that could affect system(s) operability or structural integrity will be evaluated. Based upon the observations from this monitoring plan, any needed evaluations will determine if further remedial measures or corrective actions are needed.

3.7 Staff Evaluation

Although GL 90-05 is not directly applicable for the flaw evaluation of the leaking of the subject brazed joints in the SW system, the licensee addressed the four evaluation elements specified in GL 90-05: (1) impracticality determination, (2) root cause determination and flaw characterization, (3) flaw evaluation, and (4) augmented inspection.

The ASME Code-required repair of the subject piping would require isolation of the affected piping which results in loss of cooling to the ‘A’ train safety injection pump and unavailability of the corresponding safety injection pump. The plant Technical Specification (TS) 3.5.2 requires that two independent emergency core cooling system (ECCS) subsystems be operable. Each subsystem requires one operable safety injection pump. In addition, TS 3.5.2 requires any inoperable ECCS subsystem be made operable within 72 hours or commence shutdown to hot standby. The estimated repair time, with reasonable allowances for contingencies, exceeds the 72-hour allowance of the TS.

The leaking brazed joints were inspected and evaluated by the licensee. The NRC staff reviewed the licensee’s evaluations and justifications for continued operation. The licensee calculated potential loss of flow and the impacts of operating with the SW leaks of the subject brazed joints. The licensee determined that even with a total loss of the brazed material in the subject joints, the required flow to the 3CCI*E1A cooler remains adequate. Other SW heat exchangers on the same branch line with 3CCI*E1A also maintain adequate required flow rates by the licensee’s analysis. The licensee also addressed flooding and spray on adjacent components. The licensee determined that spray and flooding is not a concern based on the location of the joints and the operator rounds to observe the degraded joints every 12 hours would identify any increased leakage. Identification of any significant increased leakage would allow adequate time to isolate the leakage well before any safety-related components could become affected.

The leakage is located in brazed joints and the available methodologies to explicitly show structural integrity are not applicable. The licensee’s operability determination assumes a total loss of braze material. The licensee determined that the structural integrity of the SW system is adequate, based on the joint design and location of supports (i.e., the pipe will remain within the socket even if the braze were to totally fail).

The licensee will continue to monitor the leakage of the subject brazed joints. The licensee stated that a walkdown of the area will be performed once every 12-hour shift. Periodic NDE will be performed within 90 days to assess erosion and structural assessments of the joints.

Additional examinations of similar pipe designs and adjacent piping was performed to provide assurance that other brazed joints are not leaking and that no damage has occurred due to the leaking salt water.

Based on the licensee's evaluations, examinations and monitoring procedures, the NRC staff finds that the proposed actions provide reasonable assurance that the joint will maintain the structural performance of the line.

4.0 CONCLUSION

The NRC staff finds that the licensee's evaluation meets the intent of the guidelines of GL 90-05. The performance of ASME Code repairs by the licensee at this time would be impractical and the proposed alternative provides reasonable assurance of structural integrity. The staff concludes that granting relief where ASME Code requirements are impractical and imposing alternative requirements is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest, given due consideration to the burden upon the licensee and facility that could result if the ASME Code requirements were imposed on the facility.

Principal Contributors: A. Keim

Date: September 22, 2005