

Dominion Nuclear Connecticut, Inc.  
Millstone Power Station  
Rope Ferry Road  
Waterford, CT 06385



**Dominion™**

**SEP 18 2003**

Docket No. 50-336  
B18993

RE: 10 CFR 50.55a(a)(3)(i)

U.S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555

Millstone Power Station, Unit No. 2  
10 CFR 50.55a Request RR-89-46 to use ASME Code Case N-597-1 for Analytical  
Evaluation of Pipe Wall Thinning as an Alternative to ASME Code Section XI

Pursuant to the provisions of 10 CFR 50.55a(a)(3)(i), Dominion Nuclear Connecticut, Inc. (DNC) requests U.S. Nuclear Regulatory Commission (NRC) approval for the use of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Case N-597-1, "Requirements For Analytical Evaluation Of Pipe Wall Thinning, Section XI Division 1." DNC has previously applied Code Case N-597 in an evaluation of pipe wall thinning at location no. 66 in the Main Feedwater System (Line No. 18-EBB-6) in the 18-inch Main Feedwater line from the isolation valve to Steam Generator No. 1. The attached request RR-89-46 is an alternative involving the use of the Code Case that has an acceptable level of quality and safety for this application.

Millstone Unit No. 2 is currently in the Third 10-Year Inservice Inspection (ISI) interval, which started on April 1, 1999. The 1989 Edition of Section XI with no Addenda applies to the ISI program and is used as the primary ASME Code Edition for Section XI repair/replacement activities.

DNC requests review and approval to use Code Case N-597-1 for this location to support the Fall 2003 refueling outage (RFO 15). Accordingly, DNC requests review and approval of this alternative by October 30, 2003.

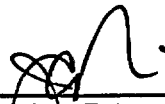
There are no regulatory commitments contained within this letter.

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If you should have any questions regarding this submittal, please contact Mr. David W. Dodson at (860) 447-1791, extension 2346.

Very truly yours,

DOMINION NUCLEAR CONNECTICUT, INC.

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J. Alan Price  
Site Vice President - Millstone

Attachments: (1) 10 CFR 50.55a Request RR-89-46 to use ASME Code Case N-597-1 for Analytical Evaluation of Pipe Wall Thinning as an Alternative to ASME Code Section XI

cc: H. J. Miller, Region I Administrator  
R. B. Ennis, NRC Senior Project Manager, Millstone Unit No. 2  
Millstone Senior Resident Inspector

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**Attachment 1**

**Millstone Power Station, Unit No. 2**

**10 CFR 50.55a Request RR-89-46 to use ASME Code Case N-597-1 for Analytical  
Evaluation of Pipe Wall Thinning as an Alternative to ASME Code Section XI**

Millstone Power Station, Unit No. 2

10 CFR 50.55a Request RR-89-46 to use ASME Code Case N-597-1 for Analytical  
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Millstone Power Station, Unit No. 2

10 CFR 50.55a Request RR-89-46 to use ASME Code Case N-597-1 for Analytical  
Evaluation of Pipe Wall Thinning as an Alternative to ASME Code Section XI

*Proposed Alternative  
In Accordance with 10 CFR 50.55a(a)(3)(i)*

*- Alternative Provides Acceptable Level of Quality and Safety -*

**1.0 ASME CODE COMPONENTS AFFECTED**

System: Main Feedwater System (FW)  
Component: Refueling outage 14 (RFO 14), flow-accelerated corrosion (FAC) inspection location no. 66, points 14, 15, and 16  
Code Class: 2

**2.0 CODE REQUIREMENTS:**

**2.1 Applicable Code Edition and Addenda**

The ASME Code Section XI repair and replacement program is in accordance with the 1989 Edition, no Addenda.

**2.2 Applicable Code Requirement**

ASME Code Section XI, IWA-4300 provides a process for assessing a component for continued service after a defect has been removed. This provision stipulates that where the section thickness has been reduced below the minimum design thickness, the component shall be repaired. As an alternative, the component may be evaluated and accepted in accordance with the design rules of either the Construction Code or Section III.

**3.0 REASON FOR THE REQUEST**

Regulatory Guide (RG) 1.147, Revision 13, was recently issued and incorporated by reference into 10 CFR 50.55a, "Codes and Standards," under a Final Rule change with an effective date of August 7, 2003.<sup>(1)</sup> The RG conditionally accepted the use of Code Case N-597-1 subject to five conditions. Some of these conditions require prior NRC review and approval to continue to use the Code

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<sup>(1)</sup> Federal Register Notice; Vol. 68, No. 130, Tuesday July 8, 2003, Rules and Regulations, 10 CFR Part 50, RIN 3150-AG86, Incorporation by Reference of ASME BPV and OM Code Cases, Agency: Nuclear Regulatory Commission, Final Rule.

Case, even where a component had been previously evaluated and found to be acceptable under the Code Case.

During refueling outage 14 (RFO 14) the flow accelerated corrosion (FAC) program inspection scope included one location (No. 66) that was evaluated using ASME Code Case N-597. Location no. 66 includes the following three components:

- identification point 16: 18-inch carbon steel (A106 Gr. B) spool with a 90-degree, schedule 160, short radius, long tangent (one side) elbow, with integral steam generator inlet nozzle thermal sleeve
- identification point 15: schedule 60, long tangent (one side) elbow
- identification point 14: 18-inch, schedule 60 pipe in the Main Feedwater System (Line Number 18-EBB-6)

Wall thinning has been identified at location no. 66, which is considered to be the result of FAC and original construction (i.e., machined counter bore region of the elbow to pipe weld). In order to continue to allow these analyzed components to be considered acceptable, the recently issued conditions of the Code Case must be addressed and submitted for NRC review and approval.

#### 4.0 PROPOSED ALTERNATIVE

As an alternative to the requirements of IWA-4300, DNC proposes to use the provisions of the ASME Code Case N-597 / N-597-1 for the analytical evaluation of the RFO 14 location no. 66, subject to the conditions incorporated into the acceptance of the Code Case in RG 1.147, Revision 13.

#### 5.0 BASIS FOR THE ALTERNATIVE

The use of ASME Code Case N-597-1 for the analytical evaluation of the location no. 66 is supported by the original calculation using Code Case N-597. The calculation is supported by observations made from examination during refueling outage (RFO) 14. Confirmatory inspections and evaluation of location no. 66 will be performed during RFO 15.

DNC performed calculation 03-CP-04006M2<sup>(2)</sup> based on examinations during RFO 14 to evaluate the pipe wall thinning encountered at location no. 66, which met the analytical evaluation requirements of ASME Code Case N-597. This evaluation compared the predicted local wall thinning at RFO 16 to the allowable minimum wall thickness permitted by the Code Case. The comparison showed the location was acceptable for continued service until RFO 15 and would continue to be acceptable through RFO 16, provided the location was re-inspected during RFO 15 and wall-thinning rates were confirmed to be compatible with the

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<sup>(2)</sup> DNC Calculation 03-CP-04006M2, "Evaluation of Feedwater Pipe Wall Thinning in Unit 2 Line 18-EBB-6 feed to SG No. 1," dated April 21, 2003.

calculation assumptions. For the location evaluated in the calculation there are no significant technical differences between the original Code Case (N-597) and the revision to the Code Case (N-597-1) that was conditionally accepted for use by RG 1.147, Revision 13. Thus the original evaluation remains valid provided the derived wall-thinning rates originally assumed in the evaluation are re-validated by inspection during RFO 15.

Additional information is provided in the balance of this section to address the five conditions in the RG for the use of Code Case N-597-1.

#### 5.1 Condition 1:

*Code Case must be supplemented by the provisions of EPRI Nuclear Safety Analysis Center Report 202L-R2, April 1999, "Recommendations for an Effective Flow Accelerated Corrosion Program," for developing the inspection requirements, the method of predicting the rate of wall thickness loss, and the value of the predicted remaining wall thickness. As used in NSAC-202L-R2, the terms "should" and "shall" have the same expectation of being completed.*

The current FAC program incorporates the supplemented provisions of EPRI NSAC-202L-R2 and the terms "should" and "shall" have the same expectation of being completed.

#### 5.2 Condition 2:

*Components affected by flow accelerated corrosion to which this Code Case are applied must be repaired or replaced in accordance with the Construction Code of record and the Owner's requirements or a later NRC approved edition of Section III of the ASME Code prior to the value of  $t_p$  reaching the allowable minimum wall thickness,  $t_{min}$ , as specified in -3622.1(a)(1) of this Code Case. Alternatively, use of the Code Case is subject to NRC review and approval.*

The measured local wall thicknesses at location no. 66 are expected to be below the  $t_{min}$ , specified in subparagraph -3622.1(a)(1) of the Code Case following the examination scheduled during the upcoming RFO 15. DNC is complying with this condition and has submitted this request to use the Code Case to address these expected measurements. In the balance of this discussion on Condition 2, DNC provides additional information based upon suggested content in an NRC memorandum, dated August 6, 2003.<sup>(3)</sup>

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<sup>(3)</sup> NRC Memorandum, James W. Clifford to Richard B. Ennis, Summary of July 22, 2003, Internal Meeting Concerning Code Case N-597, Requirements For Analytical Evaluation of Pipe Wall Thinning, Dated: August 6, 2003.

5.2.1 Markup of piping isometric showing location where piping is less than  $t_{min}$  :

See Figure 1, "25203-20150 SH.514," page 9 of this attachment. Only location no. 66 is expected to have thickness less than  $t_{min}$ .

5.2.2 Affected System:

Main Feedwater System

5.2.3 System normal operating temperature (NOT), normal operation pressure (NOP), and design pressure (DP):

NOT = 437° F, NOP = 885 Psig, and DP = 1100 Psig

5.2.4 Pipe size and nominal pipe wall thickness ( $t_{nom}$ ):

18-inch schedule 60 (0.750-inch); (elbow component 16 is schedule 160, 1.781-inch nominal wall, in order to permit machining required to match an adjoining thermal sleeve for the steam generator nozzle)

5.2.5 Code-allowable  $t_{min}$  :

Location no. 66 Construction Code-allowable  $t_{min}$  for uniform wall thinning is 0.641-inch. It is based on the limiting values for hoop stress, sustained stress, occasional stress and 30 percent of  $t_{nom}$  (FAC program criteria); hoop stress governs in this case.

5.2.6 Current measured wall thickness ( $t_{meas}$ ) and date measurement was made:

See Table 1.

5.2.7 Estimated wall thinning wear rate:

See Table 1.

5.2.8 Predicted wall thickness ( $t_p$ ) at the next scheduled inservice examination:

See Table 1. Values are provided for both RFO 15 and RFO 16. The values include additional margin on assumed operating cycle duration.

5.2.9 Discuss how pressure spikes associated with anticipated system transients are accounted for in establishing  $t_{min}$ .

All pressure surges due to anticipated system design transients are considered and bounded by the design pressure used as an input to



$t_{min}$ . Since there are no intervening valves between location no. 66 and the main steam relief valves, the main steam relief valves limit pressure in the feedwater piping. The volume of steam in the generator and main steam line acts to cushion any pressure spikes that could be caused by sudden actuation of the feedwater regulating or isolation valves.

5.2.10 Provide licensee's basis for determining the wear thinning rate.

The wear rate was developed using ultrasonic test (UT) thickness data specific to the component, i.e., CHECWORKS, and consideration for wear rates on other feedwater components with trends based on "point to point" data. This approach is the most conservative methodology used by the FAC program and is used due to having only one inspection. During RFO 15 additional measurements will be made at the same points on location no. 66, thus permitting greater confidence in the conservatism in the rates assumed for future wall loss.

5.2.11 Provide licensee's criteria for repairing or replacing piping and the basis for the criteria.

The Millstone FAC program generally endeavors to replace or repair piping elements prior to reaching a predicted wall thickness less than Code  $t_{min}$ . In the specific case of feedwater location no. 66, it was recognized during RFO 14 that the weld counter-bore region was designed for a wall thickness of 0.688-inches, while the minimum Code thickness was 0.641-inches. The measured wall thickness was slightly less but could be qualified to the requirements of Code Case N-597 for service through to at least RFO 16. Since the assumed rate of wall loss was considered to be conservative, a plan to repair or replace the components was deferred to RFO 16. The criteria that will be used during RFO 15 to determine if repair or replacement is needed as an emergent scope during RFO 15 as follows:

- (a) updated wear rates based on new measurements for the subject locations will be estimated;
- (b) if an update of the evaluation to Code Case N-597-1 requirements does not indicate continued acceptability of the components for one cycle through to RFO 16 they will be repaired or replaced during RFO 15.

The Code Case evaluation will include application of limits in -3622.4 (Local Thinning - Unlimited Transverse Extent), -3623 (Piping Stress Evaluation), and -3625 (Evaluation for Cyclic Operation). The basis for applying Code Case requirements as an alternative to original Construction Code requirements is supported as follows:

- (a) there will be confirmation of wall loss rates from the new measurements taken during the outage;
- (b) due to its location adjacent to the steam generator there is no likelihood of a pressure spike exceeding the 1100 psig design pressure of the piping;
- (c) for this case of limited axial extent of wall thinning the Code equation for  $t_{min}$  as given in -3622.1(a)(1) overestimates the thickness required to maintain stresses within Code limits, and the evaluation in accordance with the Code Case criteria limits stresses to an acceptable level with no reduction in safety.

5.2.12 Discuss what evaluation methods and criteria the licensee plans to use for performing analytical evaluations of pipe wall thinning in Class 1 carbon steel piping subjected to FAC.

Millstone Unit No. 2 has no Class 1 carbon steel piping within the bounds of the FAC program.

5.2.13 Discuss what evaluation methods and criteria the licensee plans to use for performing analytical evaluations of pipe wall thinning in non-Code class 1 carbon steel piping subjected to FAC.

Analytical evaluations are performed in accordance with ASME Section III, ANSI B31.1 and the Electric Power Research Institute NSAC 202L Rev.2, "Recommendation for an effective FAC Program," for all non-Code class 1 (Category 1) carbon steel piping subjected to FAC.

### 5.3 Condition 3:

*For Class 1 piping not meeting the criteria of -3221, the use of evaluation methods and criteria is subject to NRC review and approval.*

Millstone Unit No. 2 has no Class 1 carbon steel piping within the bounds of the FAC program.

### 5.4 Condition 4:

*For those components that do not require immediate repair or replacement, the rate of wall loss is to be used to determine a suitable inspection frequency so that repair or replacement occurs prior to reaching allowable minimum wall thickness,  $t_{min}$ .*

The RFO 14 location no. 66 did not require immediate repair/replacement based on the criteria provided in 5.2.11 above, but a suitable inspection

frequency was determined that will require the location to be inspected during the upcoming refueling outage RFO 15. The results of this inspection will be used to update the evaluation with respect to wear rates, predicted thickness, and acceptability for continued service using a Code Case N-597-1 evaluation for this location. If the evaluation is not acceptable the component will be repaired or replaced.

#### 5.5 Condition 5:

*For corrosion phenomenon other than flow-accelerated corrosion, use of the Code Case is subject to NRC review and approval. Inspection plans and wall thinning rates may be difficult to justify for certain degradation mechanisms such as MIC and pitting.*

RFO 14 location no. 66 wall loss is believed to be the result of FAC at points 14 and 15, and FAC and associated original construction counter bore machining at point 16. No other corrosion phenomenon is suspected at this location.

### 6.0 DURATION OF PROPOSED ALTERNATIVE

The alternative to apply Code Case N-597-1 to feedwater location no. 66 is requested for the duration of time that the analytical evaluation can support the acceptability of the components at this location or until they are repaired or replaced.

### 7.0 PRECEDENCE

There are no precedents for this request.

TABLE 1: COMPONENT INFORMATION

Component ID, RFO 14 Location No. 66	Thickness Measured in RFO 14 (inches)	Estimated Wear Rate	Thickness Predicted in RFO 15 (inches)	Thickness Predicted in RFO 16 (inches)	Comments
20150-514-014 Point 14 Downstream	0.609	4 mils/year	0.602	0.595	
20150-514-015 Point 15	0.657	5 mils/year	0.647	0.637	
20150-514-016 Point 16	0.643	24 mils/year	0.598	0.553	See remark below.

Remark: Thickness measurement was in the upstream end counter bore region that had been machined to 0.688-inch prior to installation in 1992. The currently estimated wear rate conservatively assumes no machining.

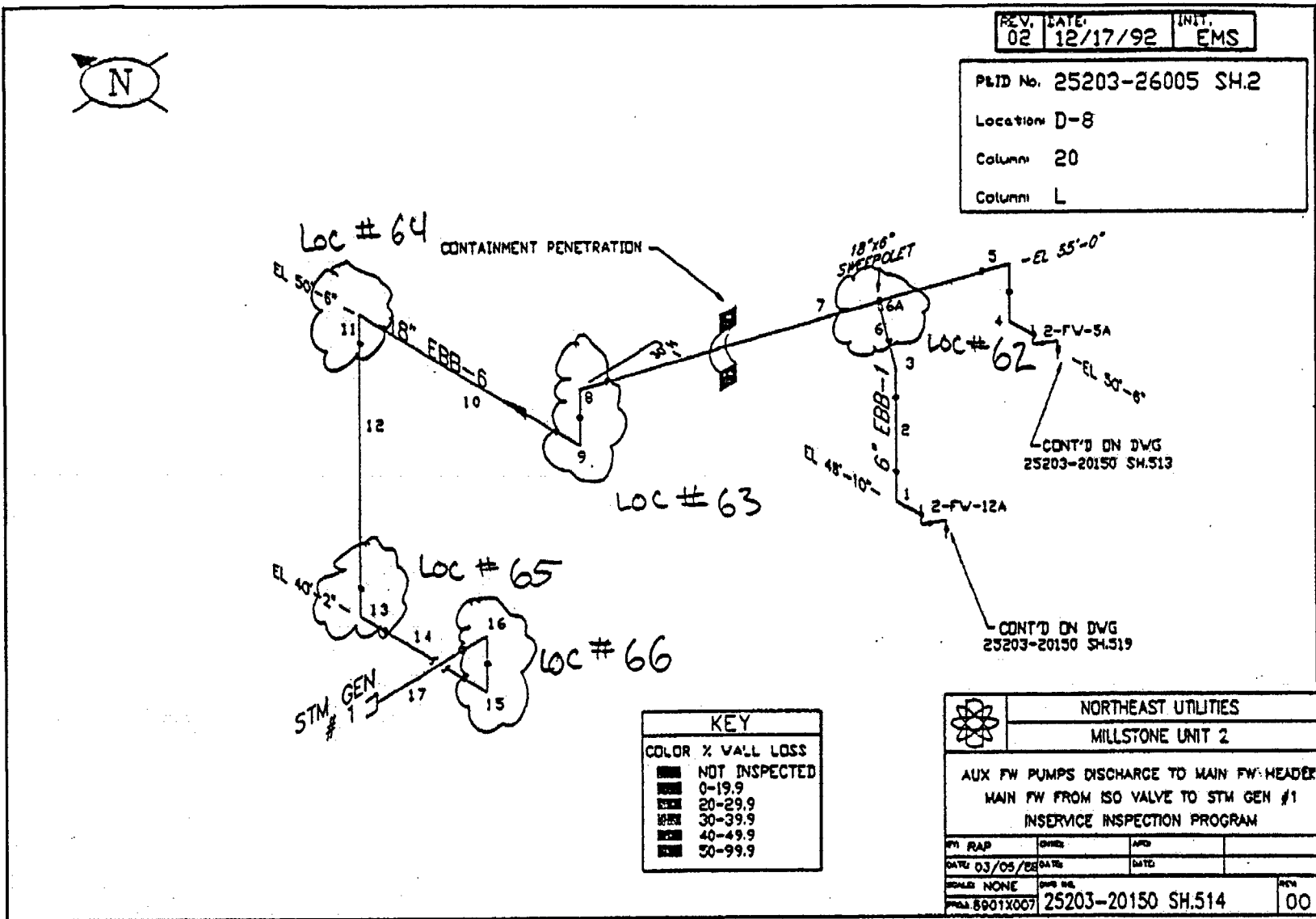


FIGURE 1: DRAWING 25203-20150 SH.514