TECHNICAL EVALUATION REPORT ON
RESPONSE FROM
NORTHEAST UTILITIES
TO GENERIC LETTER 88-01
PERTAINING TO THE
MILLSTONE NUCLEAR POWER STATION, UNIT NO. 1

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ABSTRACT

This report contains an evaluation of the licensee (Northeast Utilities) submittal for Millstone Nuclear Power Station, Unit No. 1 which was submitted in response to the NRC Generic Letter 88-01 in which Northeast Utilities was requested to: (1) Furnish their current plans relating to piping replacement and other measures to mitigate IGSCC, inspection, repair, and leakage detection. (2) Indicate whether they plan to follow the NRC Staff positions, or propose alternative measures. Northeast Utilities' plans are evaluated in Section 2 of this report in terms of compliance to NRC Staff positions. Section 3 contains an evaluation of an alternative position concerning a change to the Technical Specification on ISI and an alternative position concerning leakage detection.

SUMMARY

The Licensee, Northeast Utilities, submitted a response to the NRC Generic Letter 88-01. Northeast Utilities' response pertaining to the austenitic stainless steel piping in the Millstone Nuclear Power Station, Unit No. 1 (a BWR nuclear power plant) was evaluated in terms of: (1) Their previous and planned actions to mitigate IGSCC to provide assurance of continued long-term service. (2) Their Inservice Inspection (ISI) Program. (3) Their Technical Specifications pertaining to ISI and their plans to ensure that leakage detection will be in conformance with the NRC Staff position. (4) Their plans to notify the NRC of significant flaws identified (or changes in the condition of the welds previously known to be cracked) during inspection.

Northeast Utilities endorses eleven of the 13 NRC Staff positions which are outlined in Generic Letter 88-01. They endorsed one with provisions (i.e., that on HWC because results of a pre-implementation test does not warrant its use), and they presented an alternative position on leakage detection.

Extensive programs of piping/weld replacement and other mitigating actions have been conducted at Millstone, so half of the 410 welds are IGSCC Category A, C, or E welds. Of the remaining welds, all except 21 (eight of which are inaccessible for inspection) have been inspected. Additional replacement or repair is planned on an as-needed basis, and stress improvement (using the Mechanical Stress Improvement Process) is planned for 22 nozzle safe-end welds. Plans for future inspections conform with NRC Staff positions on schedule and on methods and personnel. Details of the plans for the next inspection were provided which confirm Northeast Utilities' plan to conform with the NRC Staff position.

Northeast Utilities presented an alternative position to the NRC Staff position requesting a change to the TS on ISI. They also presented an alternative position on leakage detection. These positions are evaluated in Section 3 of this report.

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1. INTRODUCTION

Intergranular stress corrosion cracking (IGSCC) near weldments in Boiling Water Reactor (BWR) piping has been occurring for almost 20 years. Substantial efforts in research and development have been sponsored by the BWR Owners Group for IGSCC Research, and the results of this program, along with other related work by vendors, consulting firms and confirmatory research sponsored by the NRC, have permitted the development of NRC Staff positions regarding the IGSCC problems. The technical basis for NRC Staff positions is detailed in Reference 1, and further background is provided in Reference 2.

The results of these research and development programs prompted the NRC to issue Generic Letter 88-01 (see Reference 3) requesting all licensees of BWR's and holders of construction permits to:

(1) Furnish their current plans relating to piping replacement, inspection, repair, and leakage detection.

(2) Indicate whether they:
   (a) Plan to follow the staff positions, or
   (b) Propose alternative measures.

Specifically, Generic Letter 88-01 stated that an acceptable licensee response would include the following items:

(1) Current plans regarding pipe replacement and/or other measures taken or to be taken to mitigate IGSCC and provide assurance of continued long-term piping integrity and reliability.

(2) An inservice inspection (ISI) program to be implemented at the next refueling outage for austenitic stainless steel piping.

(3) A change to the Technical Specifications to include a statement

in the section on ISI that the inservice inspection program for piping will be in conformance with the staff positions on schedule, methods and personnel.

(4) Confirmation of plans to ensure that the Technical Specification related to leakage detection will be in conformance with the Staff position on leak detection.

(5) Plans to notify the NRC, in accordance with 10CFR50.55a(o), of any flaws identified that do not meet IWB-3500 criteria of Section XI of the ASME Code for continued operation without evaluation, or a change found in the condition of the welds previously known to be cracked, and an evaluation of the flaws for continued operation and/or repair plans.

This report contains a technical evaluation of the response which Northeast Utilities (sometimes called NU in this report) submitted in response to the NRC Generic Letter 88-01 pertaining to the Millstone Nuclear Power Station, Unit No. 1 (hereafter called Millstone).

2. EVALUATION OF RESPONSE TO GENERIC LETTER 88-01

This evaluation consisted of a review of the response to NRC Generic Letter 88-01 of January 25, 1988 by Northeast Utilities pertaining to Millstone to determine if their performance and plans are in conformance with the NRC Staff positions or if proposed alternatives are acceptable. Proposed inspection schedules and evaluation of Northeast Utilities' adherence to NRC recommendations to amend the Technical Specification were included in the review.

2.1 Documents Evaluated

Review was conducted on the information pertaining to Millstone

provided by the Licensee in the following documents.

"Millstone Nuclear Power Station, Unit No. 1, Response to Generic Letter 88-01 IGSCC in Austenitic Stainless Steel Piping," Docket No. 50-245, Northeast Utilities, P.O. Box 270, Hartford, Connecticut 06141-0270, July 27, 1988.

"Millstone Nuclear Power Station, Unit No. 1, Intergranular Stress Corrosion Cracking, Inspection Plan for the 1989 Refueling Outage," Docket No. 50-245, Northeast Utilities, P.O. Box 270, Hartford, Connecticut 06141-0270, July 27, 1988.

"Millstone Nuclear Power Station, Unit No. 1, Response to Generic Letter 88-01 (Response to Request for Additional Information)," Docket No. 50-245, Northeast Utilities, P.O. Box 270, Hartford, Connecticut 06141-0270, May 19, 1989.

Hereafter, these documents will be referred to as the Northeast Utilities Submittals No. 1, No 2, and No. 3, respectively, and collectively as the Northeast Utilities Submittals.

2.2 Review of Northeast Utilities' Responses to Staff Positions and Implementation of Those Positions.

Generic Letter 88-01 outlines 13 NRC Staff positions pertaining to (1) materials, (2) processes, (3) water chemistry, (4) weld overlay, (5) partial replacement, (6) stress improvement of cracked weldments, (7) clamping devices, (8) crack evaluation and repair criteria, (9) inspection methods and personnel, (10) inspection schedules, (11) sample expansion, (12) leak detection, and (13) reporting requirements. Generic Letter 88-01 states that the licensee should indicate in their submittal whether they endorse these NRC Staff positions or propose alternative positions.

Table 1 contains a summary of Northeast Utilities' responses.

Note that Northeast Utilities accepts eleven of the thirteen NRC Staff positions and applied provisions (or alternate proposals) to two (i.e., those on HWC and leakage detection).

2.3 Review of Previous Mitigating Actions Classification of Welds, and Previous Inspections

2.3.1 Weld Classifications and Overview of Mitigating Actions and Inspections

Northeast Utilities included a copy of their ISI plans for Millstone in Northeast Utilities Submittal No. 1. Included in those plans were listings (by system, pipe diameter, and weld number) of the IGSCC classifications, pipe and weld compositions, previous mitigating actions, past inspection schedules, and inspections planned for the next refueling outage. In addition, descriptions of their long range inspection plans (covering the current 10 year cycle) were also included. Pertinent portions of this information are reproduced in Appendix A of this report. Summaries for each piping diameter for the various piping systems are presented in Appendix B. Overall summaries of mitigating actions and inspections schedules (including those conducted during the last two refueling outages and scheduled for the next refueling outage) are presented in Tables 2 and 3, respectively.

2.3.2 IGSCC Category A Welds

A total of 117 IGSCC Category A welds exist at Millstone. The large number of welds of this category is the result

Table 1

Summary of Northeast Utilities' Responses to Staff Positions

Staff Position	NU Accepts NRC Staff Position	NU Has/Will Applied In Past	NU Has/Will Consider for Future Use
1. Materials	yes	yes	yes
2. Processes	yes	yes	yes
3. Water Chemistry	yes(a)	no(a)	yes(a)
4. Weld Overlay	yes	yes	yes
5. Partial Replacement	yes	yes	yes
6. Stress Improvement of Cracked Weldments	yes	yes	yes
7. Clamping Devices	yes	no	yes
8. Crack Evaluation and Repair Criteria	yes	yes	yes
9. Inspection Method and Personnel	yes(b)	yes	yes(b)
10. Inspection Schedule	yes(b)	yes	yes(b)
11. Sample Expansion	yes(b)	yes	yes(b)
12. Leak Detection	yes(c)	yes	yes(c)
13. Reporting Requirements	yes	yes	yes

(a) HWC pre-implementation test preformed in 1987. Based on results of that test, a decision was made not to implement HWC.

(b) Credit is taken for 1985 and 1987 inspections which were performed per requirements of Generic Letter 88-01. Also Millstone contains some un-inspectable welds. Northeast Utilities declined to change TS on ISI to include a statement that ISI will conform with the NRC Staff position.

(c) Northeast Utilities Submittal No. 2 states that they accept this item with provisions; however, they actually propose an alternate position. See text for discussion.

Table 2

Summary of Mitigating Treatments Applied to Welds in Millstone

IGSCC Categ	No. of Welds	Number of Welds with Indicated Treatment*					
		SHT	HSW	CRC	IHSI	O.L.	I+O
A[a]	117	8	19	22	0	0	0
B	0	-	-	-	-	-	-
C	76	0	0	0	76	0	0
D	184	0	0	0	0	0	0
E[b]	12	0	0	0	3	5	4
F	0	-	-	-	-	-	-
G_1[c]	13	0	0	0	0	0	0
G_2[c]	8	0	0	0	0	0	0
Totals	410	8	19	22	79	5	4

* Explanation of Abbreviations

SHT - Solution Heat Treatment
HSW - Heat Sink Welding
CRC - Corrosion Resistant Cladding
IHSI - Induction Heating Stress Improvement
O.L. - Overlay
I+O - IHSI plus Overlay

Notes:

(a) All IGSCC Category A welds that have not received mitigating treatements are in corrosion resistant piping (i.e., the composition in compliance with IGSCC Category A as delineated in Generic Letter 88-01.

(b) The three IGSCC Category E welds that have been treated with IHSI contain flaws. Four IGSCC Category E welds were overlayed after being treated with IHSI.

(c) Both the IGSCC Category G_1 and G_2 welds are IGSCC Category G welds, but G_1 welds are accessible for inspection while G_2 welds are not.

Table 3

Summary of Previous Inspections[a] and
Inspections Planned for 1989 at Millstone

IGSCC Categ.	No. in Categ.	No. Inspected Past 85	No. Inspected Past 87	No. Inspected Schd 1989	% Inspected Past 85	% Inspected Past 87	% Inspected Schd 1989	Required by Generic Letter 88-01
A	117	11	11	13	9	9	11	25% every 10 years (at least 12% in 6 years)
B	0	-	-	-	-	-	-	50% every 10 years (at least 25% in 6 years)
C[b]	76	9	76	16	12	100	21	All within the next 2 refueling cycles, then all every 10 years (at 50 % in 6 years)
D	184	62	122	92	34	66	50	All every 2 refueling cycles
E[c]	12	9	4	11	75	33	91	50% next refueling cycle, then all every 2 refueling cycles
F	0	-	-	-	-	-	-	All every refueling outage
G_1[d]	13	0	0	13	0	0	100	All next refueling outage
G_2[d]	8	0	0	0	0	0	0	

Notes:

(a) No flaws were reported except those in IGSCC Category E welds.

(b) All IGSCC Category C welds were inspected in 1987 so inspections for these welds will follow the second phase of the requirements, i.e., 100% re-inspection in 10 years.

(c) The one IGSCC Category E weld not to be inspected in 1989 was inspected in both 1985 and 1987. The other welds of this category were inspected in either 1985 or 1987 but not both.

(d) IGSCC Category G_1 welds are accessible and all will be inspected in 1989. IGSCC Category G_2 welds are inaccessible for inspection and will be continuously monitored (see text for discussion).

of extensive piping replacement, weld replacement, and other mitigating actions so that the IGSCC Category A welds include the following:

(a) Resistant material welded to resistant material.

(b) Resistant material welded to nonresistant material with Heat Sink Welding (HSW) or Corrosion Resistant Cladding (CRC) applied.

(c) Welds which join nonresistant material to nonresistant material which were welded using HSW or which were solution treated or clad (using CRC) after welding.

Confirmation of these statements is available from the weld histories, weld compositions, and piping compositions contained in Northeast Utilities Submittal No. 1. It may be noted by reference to Table 2, Appendix A, or Appendix B that of the 117 IGSCC Category A welds: 8 were solution treated, 19 were welded using HSW, and 22 were clad with CRC. Although not shown in Table 2 or either of the appendices, the remaining 68 IGSCC Category A welds are composed of resistant materials.

2.3.3 Stress Improvement

Induction Heating Stress Improvement (IHSI) treatments were applied to a total of 83 welds. In each case, ultrasonic inspection was performed before and after the application of IHSI. Seventy-nine of these welds were found to be free of flaws, and inasmuch as the IHSI treatments were applied after more than two years of service, these welds were classified as IGSCC Category C welds in keeping with the guidelines provided in NUREG 0313, Revision 2 and Generic

Letter 88-01. Three of the welds that were treated with IHSI contain flaws. These welds are Classified as IGSCC Category E welds, although descriptions of the severity of the flaws was not provided. In addition, four of the IHSI-treated welds were later weld overlaid and are classified as IGSCC Category E welds.

2.3.4 Weld Overlays

A total of 9 welds have been repaired with weld overlays (including the four previously mentioned welds that had been treated with IHSI) because they contained (or were suspected of containing) cracks. In all cases, the overlays were standard overlays which were acceptable per guidelines presented in NUREG 0313, Revision 2. Thus, these welds, are classified as IGSCC Category E welds.

2.3.5 Previous Inspection Programs

Inspections have been performed at Millstone since 1973. In 1985 a revised ISI program was implemented which incorporated examinations that were qualified under the NDE Coordination Plan agreed upon by the NRC, EPRI, and the BWR Owners Group. Inspections were performed in 1985 and 1987 that were qualified under that plan, and those inspections are credited by Northeast Utilities in the development of their response to Generic Letter 88-01. Inspections performed prior to 1985 are not credited.

As previously indicated, the inspection schedules for 1985 and 1987 (along with the inspection schedule planned for 1989 to be discussed in a later section) are shown in Appendix A (on a weld-by-weld basis), Appendix B (summary on a system-by-system basis), and Table 3 (which summarizes the total

plant inspection schedules). As can be seen by referring to those tables, 18% of the IGSCC Category A welds and 100% of the IGSCC Category C, D, and E welds were inspected in either 1985 or 1987. Only 21 (eight of which are inaccessible for inspections) of the 410 welds at Millstone remain uninspected. Flaws were found or suspected in the 12 welds. Nine of these flawed welds were repaired with weld overlays. The other three flawed welds were mitigated with IHSI, but the severity of the flaws was not disclosed.

2.3.6 Evaluation of Previous Mitigating Actions and Previous Inspections

An extensive program has been conducted at Millstone so that mitigating actions in the form of piping/weld replacement, HSW, SHT, CRC, IHSI, and/or weld overlay repairs have been applied to half (205) of the 410 welds that fall within the scope of Generic Letter 88-01. An extensive ISI program has also been pursued at Millstone. Since the inspection methods and personnel used during the 1985 and 1987 inspections were qualified under the NRC/EPRI/BWR coordination program, it is recommended that those inspections should be accepted for purposes of implementing the NRC Staff inspection guidelines.

2.4 Current Plans for Mitigating Actions

The Millstone Countermeasures Program, according to the Northeast Utilities Submittals, is an aggressive program for the detection and mitigation of IGSCC which allows for the repair or replacement of degraded welds that cannot be justified for service, on a case by case basis. In addition, stress improvement treatments are planned, and implementation of Hydrogen Water Chemistry (HWC) is

being evaluated. These plans are discussed below in greater detail.

2.4.1 Plans for Piping Replacement and Weld Overlays

Northeast Utilities Submittal No. 1 contains the following statements:

> "Pipe replacements will utilize Nuclear Grade stainless steel, (<0.035% carbon), an inventory of which is maintained at the Millstone site. Welding will be performed using heat sink welding or corrosion resistant cladding techniques. Weld filler materials for replacement welds will be low carbon Type 308L or 316L stainless steel, having a minimum delta ferrite of 8FN and a maximum of 17FN. For degraded welds that cannot be feasibly replaced, weld overlay repairs will be performed using low carbon type 308L stainless steel weld wire. The Gas Tungsten Arc Welding process will be employed using automated equipment and techniques to every extent possible."

> "Whenever weld overlay repairs or partial replacements are performed, additional stresses are accounted for in the affected piping stress analysis, and in the fracture mechanics analyses of crack growth in cracked welds of the piping, as applicable."

2.4.2 Stress Improvement

Northeast Utilities Submittal No. 2 states that 22 nozzle safe-end welds with Inconel 182 will be treated during the 1989 refueling outage with Mechanical Stress Improvement Process (MSIP). The nozzle welds to be treated are shown

in Table 4 of this report, as reproduced from Attachment 1 of Northeast Utilities Submittal No. 2.

Table 4

Welds to be Treated with MSIP at Millstone

Nozzle/System	Diameter, inches	Number of Nozzle Welds
Head Instrument	9	1
Head Spray	9	1
Head Vent	6	1
Isolation Condenser	14	2
CRD Cap	5	1
Core Spray (2 nozzles, 2 welds in each)	10	4
Recirculation Inlet	12	10
Recirculation Outlet	28	2

2.4.3 Hydrogen Water Chemistry

A Hydrogen Water Chemistry pre-implementation test was completed in the fall of 1987. The results of that test are being evaluated to determine whether HWC will be implemented in the future at Millstone.

2.4.4 Evaluation of Conformance to Staff Positions and Recommendation

Since (1) plans exist for replacement of piping/welds on an as needed basis, (2) plans exist for application of MSIP treatment to 22 welds, (3) extensive mitigating actions have already been applied at Millstone, (4) Hydrogen Water Chemistry (if it is introduced) should further reduce the possibility of IGSCC at Millstone, and (5) an aggressive ISI program is being applied (as discussed in the next section of this report), Northeast Utilities' current plans concerning mitigating treatments are reasonable. Therefore, acceptance or Northeast Utilities' plans is recommended.

2.5 Plans for Future Inspections

Northeast Utilities stated that an augmented inspection program will be conducted at Millstone which was constructed based on the NRC Staff position as delineated in Generic Letter 88-01. That plan pertains to the current 10 year cycle, beginning with the 1985 and including the 1987 inspections previously described. Both their overall plan for the 10 year cycle (which will include a minimum of 5 refueling outages) and the specific, weld-by-weld schedule for the 1989 refueling outage (descriptions of which are included in Northeast Utilities Submittal No. 1) are discussed in the following sections.

2.5.1 Summary of Inspection Plans for 10 year Cycle

The following is a summary of inspection plans, based on information supplied in Northeast Utilities Submittal No. 1.

The Northeast Utilities ISI program is computer based and includes listings of all welds within the scope of Generic Letter 88-01 and NUREG 0313, Revision 2.

For IGSCC Category A welds: The minimum number of welds to be examined during each refueling outage is 5% of the total and a minimum of 25% during the 10 year cycle (with at least 12% in 6 years).

For IGSCC Category C welds: Recall that 100% of the welds of this category were inspected (using methods and personnel qualified per NRC Staff guidelines) in 1987. Beginning in 1989, a minimum of 20% of the total number of welds of this category will be inspected during each refueling outage. All of the welds will be inspected during 10 years, and at least 50% will be inspected in 6 years.

For IGSCC Category D welds: 100% of these welds will be examined every 2 refueling cycles (50% per refueling cycle).

For IGSCC Category E welds: 100% of these welds will be examined every 2 refueling cycles.

For IGSCC Category G welds: All of the welds of this category welds which are accessible for inspection will be inspected during the next refueling cycle.

Inaccessible welds are discussed in a later section.

2.5.2 Summary of Inspection Schedule for the 1989 Refueling Outage

It can be seen by reference to Appendix A, Appendix B or Table 3 that the plans as presented in Northeast Utilities Submittal No. 1 and outlined in the previous section are being implemented starting with the 1989 refueling cycle.

In addition to the above, Northeast Utilities Submittal No. 2 contains the following statement pertaining to welds scheduled for MSIP treatments:

> "A pre-MSIP ultrasonic test inspection will be performed on those welds that were not inspected to the upgraded 1985 EPRI NDE Center Qualification Program. The post-MSIP ultrasonic test inspection will be performed on all 22 nozzles welds."

2.5.3 Plans for Inaccessible Welds

Information provided in Northeast Utilities Submittal No. 1 pertaining to inaccessible welds is summarized below.

> Millstone contains eight inaccessible IGSCC Category G welds. These welds will be continuously monitored for leakage by the drywell sump monitoring system to restricted leakage limits; however, the leakage limits to be imposed and the effectiveness of this monitoring were not provided in Northeast Utilities Submittal No. 1. The applicability of a local leak detection system utilizing acoustic emission is being evaluated for 5 of the inaccessible weldments (those that are < 10 inch diameter), but they have not found a vendor's system that is totally reliable.

The above information was supplemented with the following statement in Northeast Utilities Submittal No. 2:

> "Installation of an acoustic local leak detection system on the X-16B Core Spray piping penetration (a Category G weld as defined in NUREG-0313, Rev. 2). The system will be used to collect background noise level data during Cycle 13. No plans beyond Cycle 13 have yet been made regarding this system."

2.5.4 Methods and Personnel

Both the inspection methods and inspection personnel qualifications for inspection that have been conducted since 1985 as well as those that will be conducted in the future are qualified per guidelines presented in Generic Letter 88-01 and NUREG 0313, Revision 2, i.e., through the NRC/EPRI/BWROG coordination plan.

2.5.5 Sample Expansion

Northeast Utilities Submittal No. 1 contains plans for sample expansion in the augmented inspection program that will conform to the NRC Staff position as delineated in Letter 88-01. A summary of those plans follows.

For IGSCC Category A and C welds: If one or more welds are found to contain suspected cracks, then an additional number of welds will be examined. The additional sample of welds will be approximately equal to the original sample. Welds will be distributed by the same pipe size, system, and location parameters used for the selection of the original sample, unless it is determined that there is a technical reason to select a different

distribution. If suspected cracks are found in the additional sample, then all welds of the same category shall be examined.

For IGSCC Category D welds: Although not required by Generic Letter 88-01, the same provisions will be applied to IGSCC Category D welds as for IGSCC Category A and C welds.

For IGSCC Category E welds: Descriptions of plans for sample expansion for these welds precisely follow the write-up of requirements provided in Generic Letter 88-01.

2.5.6 Evaluation and Recommendations

The ISI program for accessible (inspectable) welds complies in every respect (schedule, methods and personnel qualification, and sample expansion) with the NRC Staff positions as delineated in Generic Letter 88-01 and NUREG 0313, Revision 2. Therefore, acceptance of Northeast Utilities' ISI program for Millstone is recommended.

Northeast Utilities' plans for inaccessible welds, although partly in the developmental stage, follow guidelines presented in Generic Letter 88-01. Thus, acceptance of Northeast Utilities' plans for inaccessible welds is also recommended.

2.6 Changes in the Technical Specification Concerning ISI

Northeast Utilities proposed an alternative position to the NRC Staff position concerning a change to the Technical Specification. This alternative position is discussed in Section 3 of this report.

2.7 Confirmation of Leak Detection in the Technical Specification

Northeast Utilities proposed an alternative position to the NRC Staff position concerning leakage detection. This alternative position is discussed in Section 3 of this report.

2.8 Plans for Notification of the NRC of Flaws

The Northeast Utilities Submittal states that the NRC will be notified of flaws in accordance with the NRC Staff position as delineated in Generic Letter 88-01. Specifically:

> "Examination results will be reported in the Inservice Inspection Outage Summary Report provided to the NRC within 90 days following completion of the scheduled refueling outage."
>
> "A summary of inspection results of welds that do not meet the acceptance criteria of ASME Section XI IWB-3500 for continued operation without evaluation will be provided to the NRC. This summary will also provide information relative to any change found in the condition of welds previously known to be cracked. The evaluation of such flaws and/or repair plans performed or planned will be included in the subject report."

2.8.1 Evaluation and Recommendation

Northeast Utilities' plans comply with the NRC Staff position, so it is recommended that the plans for reporting of flaws should be accepted.

3. ALTERNATIVE POSITIONS

3.1 Alternative Position Concerning ISI in the Technical Specification

3.1.1 Northeast Utilities' Position

Northeast Utilities Submittal No. 1 contains the following statements:

> "The IGSCC Inspection Program provided in the attachment is consistent with the guidelines of NUREG-0313, Revision 2. The program is controlled in accordance with our Nuclear Engineering and Operations Group procedures, and will be implemented in accordance with the same."
>
> "In light of the above, NNECO does not believe that a change to the Technical Specifications is warranted. Furthermore, the computer based IGSCC Program presented herein can be readily updated to reflect revised NRC requirements and current program status, as required. A new, updated inspection plan will also be developed for each succeeding refueling outage, and will be submitted to the NRC prior to the outage. NNECO has historically submitted the IGSCC inspection plan to the NRC at least three months prior to each refueling outage, at the request of the NRC. This submittal process will be continued using the updated IGSCC Program described herein."

3.1.2 Evaluation and Recommendation

Northeast Utilities' ISI program including the computer based system which can be readily updated is excellent, and the

continuance of this program is recommended. However, this does not adequately fulfill or substitute for the requirement specifically delineated in Generic Letter 88-01 to change the Technical Specification to include a statement that the section on ISI will conform with the NRC Staff position on schedule, methods and personnel, and sample expansion. Thus, rejection of the Northeast Utilities position is recommended, and Northeast Utilities should amend the Technical Specification to include the statement on ISI that is required by Generic Letter 88-01.

3.2 Alternative Position Leakage Detection in the Technical Specification

3.2.1 Northeast Utilities' Position

Northeast Utilities Submittal No. 1 contains the following statement:

> "The staff position on leak detection, as defined in NUREG 0313, Revision 2, and Generic Letter 88-01, is incorporated in Technical Specifications 3.6.D, and in plant operating procedures. While Technical Specification 4.6.D requires that reactor coolant leakage into the primary containment be checked and recorded at least once per day, Surveillance Procedure No. SP 635.1, 'Reactor Coolant System Leakage Check,' requires the monitoring of reactor coolant leakage every four hours."

Northeast Utilities Submittal No. 3 contains additional information and clarification of their position:

> "Surveillance Procedure No. 635.1 is controlled by the

Technical Specifications: Section 6.8, page 6-16. This requires that all operating procedures be established, implemented and maintained in accordance with the Technical Specification. Secondly, changes thereto shall be reviewed by the PORC/SORC, as applicable, and approved by the Unit Superintendent prior to implementation."

In addition, the information shown in Table 5 is contained in Northeast Utilities Submittal No. 3. The following footnotes are applicable to that table:

(a) "Millstone Unit No. 1 currently determines unidentified leakage into the drywell with the drywell floor drain sumps. This function is performed in accordance with Station Procedure SP 635.1."

"NNECO has previously addressed the issue of compliance with Regulatory Guide 1.45 in response to SEP Topic V-5: Reactor Coolant Pressure Boundary Leakage Detection. In doing so NNECO established a Limiting Condition for Operation (LCO), consistent with the Standard Technical Specifications, based on the availability of existing instrumentation in calculating the rate of reactor coolant leakage from unidentified sources into the drywell. Included in that amendment are changes to the provisions of the Technical Specifications pertaining to the definition of 'OPERABLE,' and reactor coolant system leakage monitors. The Staff accepted the above resolution and approved the subject amendment to the Standard Technical Specifications."

Note: Northeast Utilities then referred to the correspondence listed as references 4, 5, and 6 in

Table 5

Licensee Positions on Leakage Detection

Position	Already Contained in TS	TS will be Changed to Include	Alternate Position Proposed
1. Conforms with Position C of Regulatory Guide 1.45	no	no[a]	yes[a]
2. Plant shutdown should be initiated when:			
(a) within any period of 24 hours or less, an increase is indicated in the rate of unidentified leakage in excess of 2 gpm, or	no	no[a]	yes[b]
(b) the total unidentified leakage attains a rate of 5 gpm.	no	no[a]	yes[b]
3. Leakage monitored at four hour intervals or less.	no	no[a]	yes[c]
4. Unidentified leakage includes all except:			
(a) leakage into closed systems, or	no	no[a]	yes[d]
(b) leakage into the containment atmosphere from sources that are located, do not interfere with monitoring systems, or not from throughwall crack.	no	no[a]	yes[d]
5. Provisions for shutdown within 24 hours due to inoperable measurement instruments in plants with Category D, E, F, or G welds.	yes[a]	-	-

Note: See text for footnotes (a) through (d).

Section 5 of this report.

(b) "Millstone Unit No. 1 Station Procedure SP-635.1 requires surveillance of the drywell floor drain sumps every 4 hours. If the floor drain leak rate is 2.5 gpm, an orderly shutdown must commence, having the reactor in cold shutdown condition in 24 hours (as defined in Technical Specification 3.6.D)."

(c) "Station Procedure SP-635.1 requires surveillance every 4 hours."

(d) "Station Procedure SP-635.1 has provisions for determining leak rates of both unidentified and identified leakage."

3.2.2 Evaluation and Recommendation

The Millstone requirements for leakage detection are largely contained in the Station Operating Procedures rather than in the Technical Specification. However, this does not adequately fulfill or substitute for the requirement specifically delineated in Generic Letter 88-01 to include leakage requirements in the Technical Specification. In addition, as may be seen by an examination of Table 5 and the footnotes to that table, the Millstone requirements do not completely satisfy the requirements delineated in Generic Letter 88-01. Thus, it is recommended that Northeast Utilities' position on leakage detection should be rejected. It is further recommended that they should change their Technical Specification to reflect the leakage detection requirements listed in Generic Letter 88-01.

4. CONCLUSIONS AND RECOMMENDATIONS

Concerning the thirteen NRC Staff positions as delineated in Generic Letter 88-01: Northeast Utilities endorsed eleven of the thirteen NRC Staff positions (i.e., those pertaining to materials, processes, weld overlay, partial replacement, stress improvement of cracked weldments, clamping devices, crack evaluation and repair criteria, inspection methods and personnel, inspection schedule, sample expansion, and reporting requirements). Based on the results of a pre-implementation test, Northeast Utilities decided not to implement Hydrogen Water Chemistry. Northeast Utilities presented an alternate position to the NRC Staff's position on leakage detection.

An extensive program has been applied to mitigate IGSCC at Millstone including piping/weld replacement, solution treating, heat sink welding, application of corrosion resistant cladding, application of induction heating stress improvement, and repair of welds using weld overlays. As a result, half of the 410 welds have received some form of mitigating treatment. Of the remainder, 184 have been inspected using methods and personnel consistent with NRC Staff guidelines. Only 21 uninspected corrosion-susceptible welds remain. Eight of these are inaccessible for inspection.

Northeast Utilities plans piping replacement or weld overlays for mitigating degraded welds, on an as-needed case-by-case basis. In addition stress improvement treatments (using the MSIP process) will be performed on 22 nozzle safe-end welds during the 1989 refueling outage.

An inservice inspection program (ISI) has been developed for Millstone which complies with the requirements of Generic Letter 88-01 pertaining to schedule, methods and personnel, and plans for reporting flaws. Inspections in 1985 and 1987 were conducted using methods and personnel that comply with NRC Staff requirements, so those inspections were

credited in the development of the plan to be implemented during the 1989 refueling outage. Detailed, weld-by-weld inspection schedules and descriptions of mitigating actions, weld histories and compositions are contained in Northeast Utilities Submittal No. 1 which confirm that the ISI plan for inspectable welds at Millstone conform with NRC Staff positions. The Northeast Utilities position on sample expansion and reporting requirements also comply with NRC Staff positions.

Eight welds are inaccessible for inspection. These welds will be monitored using restricted leakage measurements. Acoustic emission monitoring of five of the welds (those less than 10 inches in diameter) is under evaluation. Installation of an acoustic local leak detection system on the S-16B Core Spray piping penetration is planned, and that system will be used to collect background noise level data.

Northeast Utilities declined to change the Technical Specification on ISI. Rather they proposed to rely on their Inservice Inspection Program. Their ISI program is excellent, but such action was specifically rejected in Generic Letter 88-01.

Leakage requirements at Millstone are governed primarily by Surveillance Procedures rather than by the Technical Specification. This is unacceptable because the Surveillance Procedures do not carry the same weight as the Technical Specification. In addition, some differences in leakage requirements exist (some aspects of the Millstone requirements are less restrictive).

As a result of this technical evaluation, the following recommendations are made.

(1) Acceptance of Northeast Utilities' ISI program including credit for 1985 and 1987 inspections, the schedule for the next refueling outage (scheduled for 1989), the plan for the 10 year cycle, plans for sample expansion, and their position

on reporting of flaws to the NRC.

(2) Acceptance of Northeast Utilities' plan for monitoring inaccessible welds

(3) Rejection of Northeast Utilities' position concerning changes to the Technical Specification on ISI. It is further recommend that Northeast Utilities should amend their Technical Specification on ISI to include the required statement that the ISI program will conform to the NRC Staff position on schedule, methods and personnel, and sample expansion.

(4) Rejection of the Northeast Utilities position on leakage detection. Northeast Utilities should amend their Technical Specification on leakage detection to include the requirements listed in Generic Letter 88-01.

(5) Acceptance of the remaining portions of Northeast Utilities Submittals.

5. REFERENCES

1. "Technical report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping," NUREG 0313, Revision 2, U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, January, 1988.

2. "Investigation and Evaluation of Stress-Corrosion Cracking in Piping of Light Water Reactor Plants," NUREG 0531, U. S. Nuclear Regulatory Commission, February, 1979.

3. "NRC Position on IGSCC in BWR Austenitic Stainless Steel Piping," Generic Letter 88-01, U.S. Nuclear Regulatory Commission, January 25, 1988.

4. NRC letter to Mr. W. G. Counsil from James J. Shea, "MILLSTONE 1 IPSAR SECTIONS 4.9; 4.10.16.1(5)," dated June 29, 1983.

5. NNECO letter to Mr. Dennis M. Crutchfield from W. G. Counsil, "MILLSTONE 1 PROPOSED TECHNICAL SPECIFICATION CHANGE COOLANT LEAKAGE MONITORING," dated November 1, 1983.

6. NRC letter to Mr. W. G. Counsil from Dennis M. Crutchfield, "REDEFINITION OF THE WORK OPERABLE _ COOLANT LEAKAGE MONITORING," dated May 23, 1984.

Appendix A

Mitigating Treatments, Previous Inspections, and Inspections Planned for 1989 for Welds in Millstone

IGSCC Categ	System*	Weld Number	Dia. inch.	Treatment					Inspections Past		Schd
				SHT	HSW	CRC	IHSI	O.L.	85	87	1989
A	LPCI	CCBJ-6	16			X			X		
A	LPCI	CCBJ-9	16			X			X		
A	Core Spray	CSAJ-1	10								
A	Core Spray	CSAJ-2	10							X	X
A	Core Spray	CSAJ-3	10							X	
A	Core Spray	CSAJ-4	10							X	
A	Core Spray	CSAJ-5	10							X	
A	Core Spray	CSAJ-6	10								
A	Core Spray	CSAJ-7	10							X	
A	Core Spray	CSAJ-8	10								
A	Core Spray	CSAJ-9	10								
A	Core Spray	CSAJ-10	10			X					
A	Core Spray	CSBC-G-1A	10		X						
A	Core Spray	CSBC-G-2A	10		X						
A	Core Spray	CSBJ-1	10								X
A	Core Spray	CSBJ-2	10							X	
A	Core Spray	CSBJ-3	10								X
A	Core Spray	CSBJ-4	10								
A	Core Spray	CSBJ-5	10								
A	Core Spray	CSBJ-6	10								
A	Core Spray	CSBJ-7	10								
A	Core Spray	CSBJ-8	10								
A	Core Spray	CSBJ-9	10								
A	Core Spray	CSBJ-10	10			X					
A	Core Spray	CSBJ-12A	10		X						
A	Core Spray	CSBJ-13A	10		X						

* See page A-2 for explanation of abbreviations of systems

IGSCC Categ	System	Weld Number	Dia. inch.	Treatment					Inspections Past		Schd
				SHT	HSW	CRC	IHSI	O.L.	85	87	1989
A	RWCU-Supply	CUAJ-1	8						X		X
A	RWCU-Supply	CUAJ-2	8			X					X
A	RWCU-Supply	CUAJ-7A	8		X				X		
A	RWCU-Supply	CUAJ-8A	8								
A	RWCU-Supply	CUAJ-9A	8								
A	RWCU-Supply	CUAJ-10A	8								
A	RWCU-Supply	CUAJ-11A	8								
A	RWCU-Supply	CUAJ-11B	8		X					X	
A	RWCU-Supply	CUAJ-14A	8		X						
A	RWCU-Supply	CUAJ-15A	8								
A	RWCU-Supply	CUAJ-16A	8								
A	RWCU-Supply	CUAJ-17A	8								
A	RWCU-Supply	CUAJ-18A	8								
A	RWCU-Supply	CUAJ-19A	8		X					X	
A	RWCU-Supply	CUAJ-19B	8								
A	RWCU-Supply	CUAJ-22A	8								
A	RWCU-Supply	CUAJ-23A	8								
A	RWCU-Supply	CUAJ-24A	8								
A	RWCU-Supply	CUAJ-25A	8		X						
A	RWCU-Return	CUAJ-10	8		X						
A	RWCU-Return	CUAJ-11	8		X						

Explanation of Abbreviations of Systems

RPV	Reactor Pressure Vessel
CRD	Control Rod Drive
Jet Pump	RPV Jet Pump Instrumentation
Head Vent	RPV Head Vent
Head Inst	RPV Head Instrument
Recirc	Reactor Recirculation
RWCU-Supply	Reactor Water Cleanup Supply
RWCU-Return	Reactor Water Cleanup Return
Shut Cool	Shutdown Cooling
LPCI	Low Pressure Coolant Injection
Isoc-Supply	Isolation Condenser Supply
Isoc-Return	Isolation Condenser Return

IGSCC Categ	System	Weld Number	Dia. inch.	Treatment					Inspections Past		Schd
				SHT	HSW	CRC	IHSI	O.L.	85	87	1989
A	Isoc-Supply	ICAC-F-1A	16			X				X	
A	Isoc-Supply	ICAC-F-3A	16		X					X	
A	Isoc-Supply	ICAC-F-4A	16								
A	Isoc-Supply	ICAC-F-5A	16								
A	Isoc-Supply	ICAC-F-6A	16								
A	Isoc-Supply	ICAC-F-7A	16								
A	Isoc-Supply	ICAC-F-7B	16		X						
A	Isoc-Supply	ICAJ-1	14			X					
A	Isoc-Supply	ICAJ-3	14							X	
A	Isoc-Supply	ICAJ-4	14								
A	Isoc-Supply	ICAJ-5	14								
A	Isoc-Supply	ICAJ-6	14								
A	Isoc-Supply	ICAJ-7	14								
A	Isoc-Supply	ICAJ-8	14								
A	Isoc-Supply	ICAJ-9	14								
A	Isoc-Supply	ICAJ-10	14								
A	Isoc-Supply	ICAJ-11	14								
A	Isoc-Supply	ICAJ-13	14			X					
A	Isoc-Supply	ICAJ-14	14			X					X
A	Isoc-Supply	ICAJ-15	14								X
A	Isoc-Supply	ICAC-BF-1	12			X					
A	Isoc-Supply	ICAC-BF-2	12			X					
A	Isoc-Supply	ICAC-F-16A	12						X		X
A	Isoc-Supply	ICAC-F-17	12								
A	Isoc-Supply	ICAC-F-18	12								
A	Isoc-Supply	ICAC-F-19	12								
A	Isoc-Supply	ICAC-F-21	12		X						
A	Isoc-Supply	ICAC-F-21A	12		X						
A	Isoc-Supply	ICAC-F-21B	12		X						
A	Isoc-Supply	ICAC-F-22A	12								
A	Isoc-Supply	ICAC-F-23A	12								
A	Isoc-Supply	ICAC-F-24A	12								
A	Isoc-Supply	ICAC-F-24B	12								
A	Isoc-Supply	ICAC-F-24C	12		X						
A	Isoc-Supply	ICAC-F-25A	12			X					
A	Isoc-Supply	ICAC-F-26	12								
A	Isoc-Supply	ICAC-F-27	12								
A	Isoc-Supply	ICAC-F-28	12								
A	Isoc-Supply	ICAC-F-29	6								X
A	Isoc-Supply	ICAC-F-30	6								
A	Isoc-Supply	ICAC-F-31	6								X

IGSCC Categ	System	Weld Number	Dia. inch.	Treatment					Inspections Past		Schd
				SHT	HSW	CRC	IHSI	O.L.	85	87	1989
A	Isoc-Return	ICBJ-CAP	14						X		
A	Isoc-Return	ICBJ-8	10			X			X		
A	Isoc-Return	ICBJ-9	10								
A	Isoc-Return	ICBJ-10	10								
A	Isoc-Return	ICBJ-11	10			X					
A	Isoc-Return	ICBC-F-11	8			X					X
A	Isoc-Return	ICBC-F-12A	8			X					
A	Isoc-Return	ICBC-F-14A	8		X						
A	Isoc-Return	ICBC-F-14B	8		X						
A	Jet Pump	JPAF-1A	5								
A	Jet Pump	JPBF-1A	5								
A	Recirc	RCAJ-9	28								
A	Recirc	RCBJ-9	28								
A	Recirc	RMAJ-RRA	22	X							
A	Recirc	RMAJ-RRB	22	X							
A	Recirc	RMAJ-RRD	22	X							
A	Recirc	RMAJ-RRE	22	X							
A	Recirc	RMAJ-RRF	22	X							
A	Recirc	RMAJ-RRG	22	X							
A	Recirc	RMAJ-RRJ	22	X							
A	Recirc	RMAJ-RRK	22								
A	Recirc	RCAJ-30	4			X			X		
A	Recirc	RCAJ-32	4			X					
A	Recirc	RCBJ-32	4			X					
A	Recirc	RCBJ-34	4			X					
A	Shut Cool	SCAJ-1	14			X			X		
A	Shut Cool	SCAJ-2	14								X
A	Shut Cool	SCAJ-3	14			X					
A	Shut Cool	SCAJ-CU1	14						X		X

IGSCC Categ	System	Weld Number	Dia. inch.	Treatment					Inspections Past		Schd
				SHT	HSW	CRC	IHSI	O.L.	85	87	1989
C	LPCI	CCAJ-6	16				X			X	X
C	Recirc	RCAJ-1A	28				X		X	X	
C	Recirc	RCAJ-2	28				X		X	X	
C	Recirc	RCAJ-3	28				X			X	
C	Recirc	RCAJ-4	28				X			X	
C	Recirc	RCAJ-5	28				X			X	X
C	Recirc	RCAJ-6	28				X			X	X
C	Recirc	RCAJ-8	28				X			X	X
C	Recirc	RCAJ-10	28				X			X	
C	Recirc	RCAJ-11	28				X			X	
C	Recirc	RCAJ-12	28				X			X	
C	Recirc	RCAJ-13	28				X			X	
C	Recirc	RCAJ-14	28				X			X	
C	Recirc	RCAJ-15	28				X			X	
C	Recirc	RCBJ-1	28				X			X	
C	Recirc	RCBJ-1A	28				X			X	
C	Recirc	RCBJ-2	28				X			X	
C	Recirc	RCBJ-3	28				X			X	X
C	Recirc	RCBJ-4	28				X			X	X
C	Recirc	RCBJ-6	28				X			X	X
C	Recirc	RCBJ-7	28				X			X	X
C	Recirc	RCBJ-8	28				X			X	X
C	Recirc	RCAJ-10	28				X			X	
C	Recirc	RCAJ-11	28				X			X	
C	Recirc	RCAJ-12	28				X			X	
C	Recirc	RCAJ-13	28				X			X	
C	Recirc	RCAJ-14	28				X			X	
C	Recirc	RCAJ-15	28				X			X	
C	Recirc	RCBJ-16	28				X			X	
C	Recirc	RMAJ-RRC	28				X		X	X	
C	Recirc	RMBJ-RRH	28				X			X	X
C	Recirc	RMAJ-1	22				X			X	X
C	Recirc	RMAJ-2	22				X			X	
C	Recirc	RMAJ-3	22				X			X	
C	Recirc	RMAJ-4	22				X		X	X	
C	Recirc	RMAJ-5	22				X			X	
C	Recirc	RMBJ-2	22				X			X	
C	Recirc	RMBJ-3	22				X			X	
C	Recirc	RMBJ-4	22				X			X	X
C	Recirc	RMBJ-5	22				X			X	

IGSCC Categ	System	Weld Number	Dia. inch.	Treatment					Inspections Past		Schd
				SHT	HSW	CRC	IHSI	O.L.	85	87	1989
C	Recirc	RCAJ-SC1	16				X		X	X	
C	Recirc	RCAJ-CC1	16				X			X	
C	Recirc	RRAJ-1	12				X			X	
C	Recirc	RRAJ-2	12				X			X	
C	Recirc	RRAJ-3	12				X			X	
C	Recirc	RRBJ-3	12				X			X	
C	Recirc	RRBJ-4	12				X			X	
C	Recirc	RRCJ-1	12				X		X	X	
C	Recirc	RRCJ-2	12				X		X	X	
C	Recirc	RRCJ-4	12				X		X	X	
C	Recirc	RRDJ-1	12				X			X	
C	Recirc	RRDJ-2	12				X			X	
C	Recirc	RRDJ-3	12				X			X	
C	Recirc	RRDJ-4	12				X			X	
C	Recirc	RREJ-1	12				X			X	X
C	Recirc	RREJ-2	12				X			X	
C	Recirc	RREJ-4	12				X			X	
C	Recirc	RRFJ-2	12				X			X	
C	Recirc	RRFJ-3	12				X		X	X	
C	Recirc	RRFJ-4	12				X			X	
C	Recirc	RRGJ-1	12				X			X	
C	Recirc	RRGJ-2	12				X			X	
C	Recirc	RRGJ-3	12				X			X	
C	Recirc	RRGJ-4	12				X			X	
C	Recirc	RRHJ-1	12				X			X	
C	Recirc	RRHJ-2	12				X			X	X
C	Recirc	RRHJ-3	12				X			X	
C	Recirc	RRHJ-4	12				X			X	X
C	Recirc	RRJJ-1	12				X			X	
C	Recirc	RRJJ-2	12				X			X	
C	Recirc	RRJJ-3	12				X			X	
C	Recirc	RRJJ-4	12				X			X	
C	Recirc	RRKJ-1	12				X			X	
C	Recirc	RRKJ-2	12				X			X	
C	Recirc	RRKJ-3	12				X			X	
C	Recirc	RRKJ-4	12				X			X	X

IGSCC Categ	System	Weld Number	Dia. inch.	Treatment SHT	HSW	CRC	IHSI	O.L.	Inspections Past 85	87	Schd 1989
D	LPCI	CCAJ-2	18						X		X
D	LPCI	CCAJ-3	18						X		X
D	LPCI	CCAJ-4	18						X		X
D	LPCI	CCAJ-5	18						X		X
D	LPCI	CCAJ-6	18						X		X
D	LPCI	CCAJ-7	18						X		X
D	LPCI	CCAJ-8	18						X		X
D	LPCI	CCAJ-9	18						X		X
D	LPCI	CCAJ-12	18						X		X
D	LPCI	CCAJ-13	18						X		X
D	LPCI	CCAJ-14	18						X		X
D	LPCI	CCAJ-15	18						X		X
D	LPCI	CCAJ-16	18						X		X
D	LPCI	CCAJ-17	18						X		X
D	LPCI	CCAJ-18	18						X		X
D	LPCI	CCAJ-19	18						X		X
D	LPCI	CCAJ-20	18						X		X
D	LPCI	CCAJ-21	18						X		X
D	LPCI	CCBJ-1	18						X		X
D	LPCI	CCBJ-2	18						X		X
D	LPCI	CCBJ-3	18						X		X
D	LPCI	CCBJ-4	18						X		X
D	LPCI	CCBJ-10	18						X		X
D	LPCI	CCBJ-11	18						X		X
D	LPCI	CCBJ-12	18						X		X
D	LPCI	CCBJ-13	18						X		X
D	LPCI	CCBJ-14	18						X		X
D	LPCI	CCBJ-15	18						X		X
D	LPCI	CCBJ-16	18						X		X
D	LPCI	CCBJ-17	18						X		X
D	LPCI	CCBJ-18	18						X		X
D	LPCI	CCBJ-19	18						X		X
D	LPCI	CCBJ-20	18						X		X
D	LPCI	CCAJ-10	16						X		X
D	LPCI	CCAJ-11	16						X		X
D	LPCI	CCBJ-5	16						X		X

IGSCC Categ	System	Weld Number	Dia. inch.	Treatment SHT	HSW	CRC	IHSI	O.L.	Inspections Past 85	Past 87	Schd 1989
D	Core Spray	CSAC-G-1	10							X	
D	Core Spray	CSAC-G-2	10							X	
D	Core Spray	CSAC-G-3	10							X	
D	Core Spray	CSAJ-13	10							X	
D	Core Spray	CSAJ-14	10							X	
D	Core Spray	CSAJ-15	10							X	
D	Core Spray	CSAJ-16	10							X	
D	Core Spray	CSBC-G-2	10							X	X
D	Core Spray	CSBJ-13	10							X	X
D	Core Spray	CSBJ-14	10						X		X
D	Core Spray	CSBJ-15	10						X		X
D	Core Spray	CSBJ-16	10						X		X

IGSCC Categ	System	Weld Number	Dia. inch.	Treatment SHT	HSW	CRC	IHSI	O.L.	Inspections Past 85	87	Schd 1989
D	RWCU-Supply	CUA-2	10							X	
D	RWCU-Supply	CUA-3	10							X	
D	RWCU-Supply	CUA-4	10							X	
D	RWCU-Supply	CUA-5	10							X	
D	RWCU-Supply	CUA-6	10							X	
D	RWCU-Supply	CUA-8	10							X	
D	RWCU-Supply	CUA-11	10							X	
D	RWCU-Supply	CUA-12	10							X	
D	RWCU-Supply	CUA-13	10							X	
D	RWCU-Supply	CUA-14	10							X	
D	RWCU-Supply	CUA-15	10							X	
D	RWCU-Supply	CUA-16	10							X	
D	RWCU-Supply	CUA-17	10							X	
D	RWCU-Supply	CUA-18	10							X	
D	RWCU-Supply	CUA-19	10							X	
D	RWCU-Supply	CUA-20	10							X	
D	RWCU-Supply	CUA-21	10							X	
D	RWCU-Supply	CUA-22	10							X	
D	RWCU-Supply	CUA-23	10							X	
D	RWCU-Supply	CUA-24	10							X	
D	RWCU-Supply	CUA-25	10							X	
D	RWCU-Supply	CUA-26	10							X	
D	RWCU-Supply	CUA-1	8							X	
D	RWCU-Supply	CUA-9	8							X	
D	RWCU-Supply	CUA-10	8							X	
D	RWCU-Supply	CUA-27	8							X	
D	RWCU-Supply	CUA-28	8							X	
D	RWCU-Supply	CUA-29	8							X	
D	RWCU-Supply	CUA-30	8							X	
D	RWCU-Supply	CUA-30A	8							X	
D	RWCU-Supply	CUA-31	8							X	
D	RWCU-Supply	CUA-32	8							X	
D	RWCU-Supply	CUAJ-3	8							X	
D	RWCU-Supply	CUAJ-4	8						X		X
D	RWCU-Supply	CUAJ-5	8						X		X
D	RWCU-Supply	CUAJ-6	8						X		X
D	RWCU-Supply	CUAJ-7	8						X		X
D	RWCU-Supply	CUAJ-12	8							X	
D	RWCU-Supply	CUAJ-13	8							X	
D	RWCU-Supply	CUAJ-14	8							X	

IGSCC Categ	System	Weld Number	Dia. inch.	Treatment SHT	HSW	CRC	IHSI	O.L.	Inspections Past 85	87	Schd 1989
D	RWCU-Return	CUB-1	8							X	
D	RWCU-Return	CUB-2	8							X	
D	RWCU-Return	CUB-3	8							X	
D	RWCU-Return	CUB-4	8							X	
D	RWCU-Return	CUB-5	8							X	
D	RWCU-Return	CUB-6	8							X	
D	RWCU-Return	CUB-7	8							X	
D	RWCU-Return	CUB-8	8							X	
D	RWCU-Return	CUB-9	8							X	
D	RWCU-Return	CUB-10	8							X	
D	RWCU-Return	CUB-11	8							X	
D	RWCU-Return	CUB-12	8							X	
D	RWCU-Return	CUB-13	8							X	
D	RWCU-Return	CUBJ-2	8							X	X
D	RWCU-Return	CUBJ-3	8							X	X
D	RWCU-Return	CUBJ-4	8							X	X
D	RWCU-Return	CUBJ-5	8							X	X
D	RWCU-Return	CUBJ-6	8							X	X
D	RWCU-Return	CUBJ-7	8							X	
D	RWCU-Return	CUBJ-8	8							X	
D	RWCU-Return	CUBJ-9	8							X	
D	RWCU-Return	CUBJ-12	8							X	
D	RWCU-Return	CUBJ-13	8							X	
D	RWCU-Return	CUBJ-14	8							X	
D	RWCU-Return	CUBJ-15	8							X	
D	RWCU-Return	CUBJ-16	8							X	
D	RWCU-Return	CUBJ-17	8							X	
D	RWCU-Return	CUBJ-18	8						X		X
D	RWCU-Return	CUBJ-19	8						X		X
D	Head Inst	HIBF-1	9							X	
D	Head Spr	HIBF-1	9							X	

IGSCC Categ	System	Weld Number	Dia. inch.	Treatment SHT	HSW	CRC	IHSI	O.L.	Inspections Past 85	87	Schd 1989
D	Recirc	RCBF-1	28							X	
D	Recirc	RCBF-IC1	14							X	X
D	Recirc	RRCF-1	12						X		X
D	Recirc	RRDF-1	12							X	
D	Recirc	RREF-1	12						X		X
D	Recirc	RRFF-1	12						X		X
D	Recirc	RRGF-1	12						X		X
D	Recirc	RCAJ-PB1	4						X		X
D	Recirc	RCAJ-PB2	4						X		X
D	Recirc	RCBJ-PB1	4						X		X
D	Recirc	RCBJ-PB2	4						X		X
D	Shut Cool	SCAF-2	14							X	
D	Shut Cool	SCAJ-4	14							X	
D	Isoc-Supply	ICAC-F-2	16							X	X
D	Isoc-Supply	ICAC-F-8	16						X		X
D	Isoc-Supply	ICAC-F-9	16							X	X
D	Isoc-Supply	ICAC-F-10	16							X	X
D	Isoc-Supply	ICAC-F-11	16							X	X
D	Isoc-Supply	ICAC-F-20	16							X	X
D	Isoc-Supply	ICAC-F-1	14							X	X
D	Isoc-Supply	ICBF-1	14							X	
D	Isoc-Supply	ICAC-F-12	12						X		X
D	Isoc-Supply	ICAC-F-12A	12						X		X
D	Isoc-Supply	ICAC-F-14	12						X		X
D	Isoc-Supply	ICAC-F-15	12						X		X
D	Isoc-Supply	ICAC-F-16	12						X		X

IGSCC Categ	System	Weld Number	Dia. inch.	Treatment SHT	HSW	CRC	IHSI	O.L.	Inspections Past 85	Past 87	Schd 1989
D	Isoc-Return	ICBC-F-1	10							X	
D	Isoc-Return	ICBC-F-2	10							X	
D	Isoc-Return	ICBC-F-3	10							X	
D	Isoc-Return	ICBC-F-4	10							X	
D	Isoc-Return	ICBC-F-5	10							X	
D	Isoc-Return	ICBC-F-6	10							X	
D	Isoc-Return	ICBC-F-7	10							X	
D	Isoc-Return	ICBC-F-8	10							X	
D	Isoc-Return	ICBC-F-9	10							X	X
D	Isoc-Return	ICBC-F-10	10							X	X
D	Isoc-Return	ICBC-F-21	10							X	X
D	Isoc-Return	ICBJ-1	10							X	X
D	Isoc-Return	ICBJ-2	10							X	X
D	Isoc-Return	ICBJ-3	10							X	X
D	Isoc-Return	ICBJ-4	10							X	X
D	Isoc-Return	ICBJ-5	10						X		X
D	Isoc-Return	ICBJ-6	10						X		X
D	Isoc-Return	ICBJ-7	10						X		X
D	Isoc-Return	ICBJ-12	10							X	
D	Isoc-Return	ICBJ-13	10							X	
D	Isoc-Return	ICBJ-14	10							X	
D	Isoc-Return	ICBC-F-12	8							X	
D	Isoc-Return	ICBC-F-13	8							X	
D	Isoc-Return	ICBC-F-15	8							X	
D	Isoc-Return	ICBC-F-16	8							X	X
D	Isoc-Return	ICBC-F-17	8							X	X
D	Isoc-Return	ICBC-F-18	8							X	X
D	Isoc-Return	ICBC-F-19	8							X	X
D	Isoc-Return	ICBC-F-20	8							X	X
D	Isoc-Return	ICBC-F-22	8							X	X
D	Isoc-Return	ICBC-F-22A	8							X	X
D	Isoc-Return	ICBC-F-23	8							X	X
D	Isoc-Return	ICBC-F-24	8							X	
D	Isoc-Return	ICBC-F-25	8							X	
D	Isoc-Return	ICBC-F-26	8							X	
D	Isoc-Return	ICBC-F-27	8							X	
D	Isoc-Return	ICBC-F-28	8							X	
D	Isoc-Return	ICBC-F-29	8							X	
D	Isoc-Return	ICBC-F-30	8							X	

IGSCC Categ	System	Weld Number	Dia. inch.	Treatment					Inspections Past		Schd
				SHT	HSW	CRC	IHSI	O.L.	85	87	1989
E	Isoc-Supply	ICAC-F-3	16					X	X		X
E	Isoc-Supply	ICAC-F-13	12					X	X	X	
E	Recirc	RCAJ-1(f)	28				X		X		X
E	Recirc	RCAJ-7(f)	28				X			X	X
E	Recirc	RCBJ-5(f)	28				X			X	X
E	Recirc	RMBJ-1	22				X	X		X	X
E	Recirc	RRAJ-4	12					X	X		X
E	Recirc	RRBJ-1	12				X	X	X		X
E	Recirc	RRBJ-2	12				X	X	X		X
E	Recirc	RRCJ-3	12				X	X	X		X
E	Recirc	RREJ-3	12					X	X		X
E	Recirc	RRFJ-3	12					X	X		X

Note: (f) on weld number indicates weld is flawed.

Appendix A (continued)

IGSCC Categ	System	Weld Number	Dia. inch.	Treatment SHT	HSW	CRC	IHSI	O.L.	Inspections Past 85	87	Schd 1989
G_1	CRD	CRDF-1	5								X
G_1	Core Spray	CSAF-1	10								X
G_1	Core Spray	CSAF-2	10								X
G_1	Core Spray	CSBF-1	10								X
G_1	Core Spray	CSBF-2	10								X
G_1	Head Vent	HIAF-1	6								X
G_1	Isoc-Supply	ICAF-1	14								X
G_1	Recirc	RCAF-1	28								X
G_1	Recirc	RRAF-1	12								X
G_1	Recirc	RRBF-1	12								X
G_1	Recirc	RRHF-1	12								X
G_1	Recirc	RRJF-1	12								X
G_1	Recirc	RRKF-1	12								X

Appendix A (continued)

IGSCC Categ	System	Weld Number	Dia. inch.	Treatment SHT	HSW	CRC	IHSI	O.L.	Inspections Past 85	87	Schd 1989
G_2	Isoc-Supply	(A)X-10A	14								
G_2	RWCU-Supply	(A)X-14	8								
G_2	Core Spray	(A)X-16A	10								
G_2	LPCI	(A)X-43	18								
G_2	Isoc-Return	(B)X-11B	10								
G_2	RWCU-Return	(B)X-15	8								
G_2	Core Spray	(B)X-16B	10								
G_2	LPCI	(B)X-45	18								

Appendix B

System-by-System Summary of Mitigating Treatments, Previous Inspections, and Inspections Planned for 1989 for Welds in Millstone

IGSCC Categ	System	Dia. Inch	No. of Welds	Number of Welds with Indicated Treatment*						No. Inspect. Past		Sched 1989
				SHT	HSW	CRC	IHSI	O.L.	I+O	85	87	
A	LPCI	16	2			2				2		
A	Core Spray	10	24		4	2				1	6	3
A	RWCU-Supply	8	19		5	1				2	2	2
A	RWCU-Return	8	2		2							
A	Iso-Supply	16	7		2	1					2	
		14	13			3					1	2
		12	18		4	3				1		1
		6	3									2
A	Iso-Return	14	1							1		
		10	4			2				1		
		8	4		2	2						1
A	Jet Pump	5	2									
A	Recirc	28	2									
		22	8	8								
		4	4			4				1		
A	Shut Cool	14	4			2				2		2
Total IGSCC Categ A Welds			117	8	19	22	0	0	0	11	11	13

Explanation of Abbreviations

SHT - Solution Heat Treatment
HSW - Heat Sink Welding
CRC - Corrosion Resistant Cladding
IHSI - Induction Heating Stress Improvement
O.L. - Overlay
I+O - OHSI plus O.L.

Appendix B (continued)

IGSCC Categ	System	Dia. Inch	No. of Welds	Number of Welds with Indicated Treatment						No. Inspect. Past		Schd
				SHT	HSW	CRC	IHSI	O.L.	I+O	85	87	1989
C	LPCI	16	1				1				1	1
C	Recirc	28	30				30			3	30	9
		22	9				9			1	9	2
		16	2				2			1	2	
		12	34				34			4	34	4
Total IGSCC Categ C Welds			76	0	0	0	76	0	0	9	76	16

IGSCC Categ	System	Dia. Inch	No. of Welds	Number of Welds with Indicated Treatment						No. Inspect. Past		Schd
				SHT	HSW	CRC	IHSI	O.L.	I+O	85	87	1989
D	LPCI	18	33							33		33
		16	3							3		3
D	Core Spray	10	12							3	9	5
D	RWCU-Supply	10	22								22	
		8	18							4	14	4
D	RWCU-Return	8	29							2	27	7
D	Head Vent and Inst	9	2								2	
D	Recirc	28	1								1	
		14	1								1	1
		12	5							4	1	4
		4	4							4		4
D	Shut Cool	14	2								2	
D	Isoc-Supply	16	6							2	5	6
		14	2								2	1
		12	5							4		5
D	Isoc-Return	10	21							3	18	10
		8	18								18	9
Total IGSCC Categ D Welds			184	0	0	0	0	0	0	62	122	92

IGSCC Categ	System	Dia. Inch	No. of Welds	Number of Welds with Indicated Treatment						No. Inspect. Past		Schd
				SHT	HSW	CRC	IHSI	O.L.	I+O	85	87	1989
E	Isoc-Supply	16	1					1		1		1
		12	1					1		1	1	
E	Recirc	28	3				3			1	2	3
		22	1						1		1	1
		12	6					3	3	6		6
Total IGSCC Categ E Welds			12	0	0	0	3	5	4	9	4	11

IGSCC Categ	System	Dia. Inch	No. of Welds	Number of Welds with Indicated Treatment						No. Inspect. Past		Schd
				SHT	HSW	CRC	IHSI	O.L.	I+O	85	87	1989
G_1	CRD	5	1									1
G_1	Core Spray	10	4									4
G_1	Heat Vent	6	1									1
G_1	Isoc-Supply	14	1									1
G_1	Recirc	28	1									1
		12	5									5
Total IGSCC Categ G_1 Welds			13	0	0	0	0	0	0	0	0	13

IGSCC Categ	System	Dia. Inch	No. of Welds	Number of Welds with Indicated Treatment						No. Inspect. Past		Schd
				SHT	HSW	CRC	IHSI	O.L.	I+O	85	87	1989
Total IGSCC Categ G_2 Welds			8	0	0	0	0	0	0	0	0	0