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TECHNICAL EVALUATION OF INTEGRITY OF THE MONTICELLO REACTOR COOLANT BOUNDARY PIPING SYSTEM

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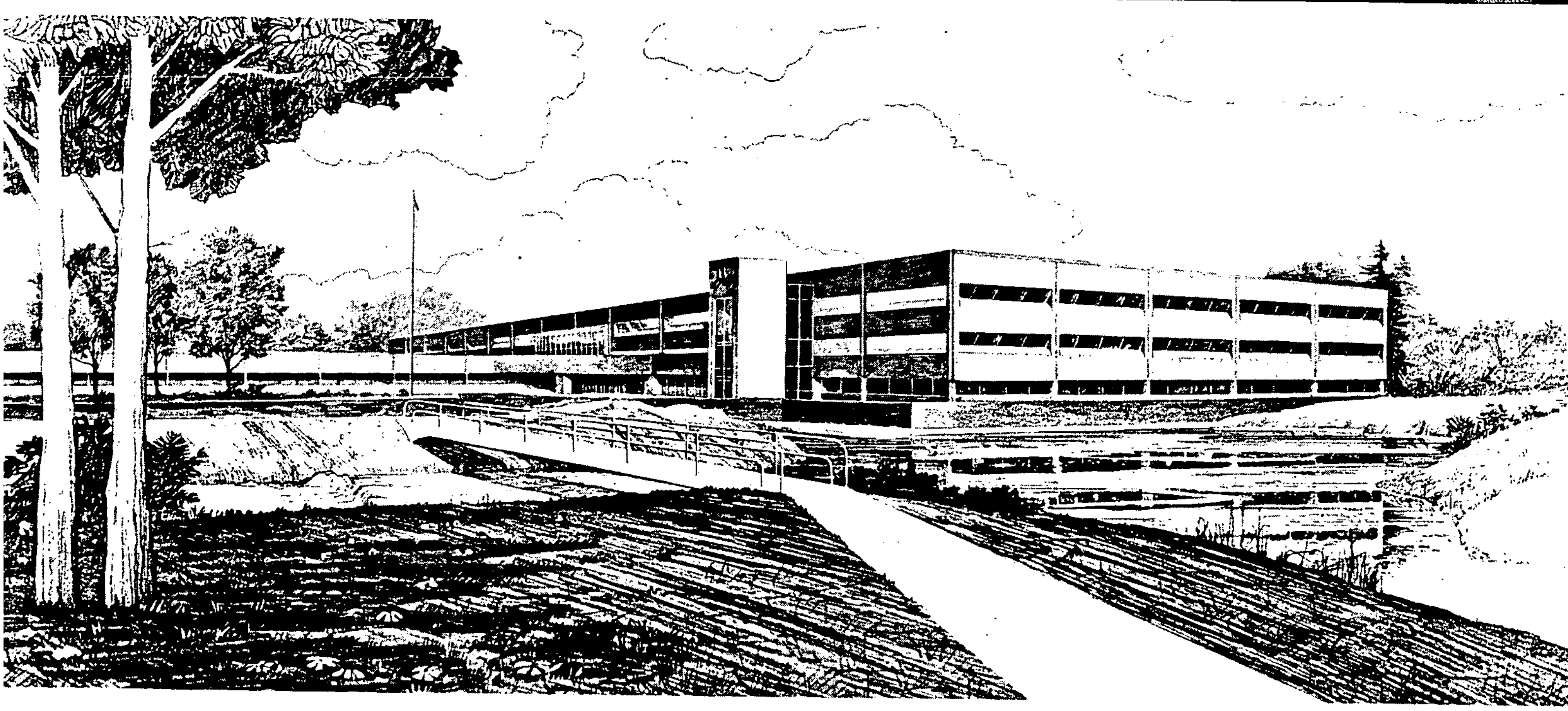
Operated by the U.S. Department of Energy



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ABSTRACT

NUREG-0313, Rev. 1, Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping, is the NRC staff's revised acceptable methods to reduce intergranular stress corrosion cracking in boiling water reactors. The responses to NRC Generic Letter 81-04 of Northern States Power Company concerning whether its Monticello Nuclear Generating Plant meets NUREG-0313, Rev. 1 are evaluated by EG&G Idaho, Inc. in this report. Particular attention was given the leak detection systems described in Regulatory Guide 1.45, Reactor Coolant Pressure Boundary Leak Detection Systems, referenced by Parts IV.B.1.a.(1) and (2) found on pages 7 and 8 of NUREG-0313, Rev. 1.

FOREWORD

This report is supplied as part of the Selected Operating Reactor Issues Program being conducted for the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Division of Licensing, by EG&G Idaho, Inc., Materials Engineering Branch.

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SUMMARY

NUREG-0313, Rev. 1, Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping, is the NRC staff's revised acceptable methods to reduce intergranular stress corrosion cracking in boiling water reactors. The responses to NRC Generic Letter 81-04 of Northern States Power Company concerning whether its Monticello Nuclear Generating Plant meets NUREG-0313, Rev. 1 are evaluated by EG&G Idaho, Inc. in this report. Particular attention was given the leak detection systems described in Regulatory Guide 1.45, Reactor Coolant Pressure Boundary Leak Detection Systems, referenced by Parts IV.B.1.a.(1) and (2) found on pages 7 and 8 of NUREG-0313, Rev. 1.

As may be observed in the following table, except for IV.B.1.a.(2), Monticello does not meet any of the parts of NUREG-0313, Rev. 1 evaluated in this document.

The following table is a synopsis of the EG&G Idaho, Inc. evaluation of Northern States Power Company's response to NRC Generic Letter 81-04.

Part of NUREG-0313, Rev. 1 Evaluated	Evaluation[a]	Additional Data Required[b]	Discrepancy
Section II.			
II.C.	Does not meet NUREG-0313, Rev. 1	No	Minor
Section III.			
Section IV.			
IV.B.1.a.(1)	Does not meet NUREG-0313, Rev. 1	Yes	Major
IV.B.1.a.(2)	Meets NUREG-0313, Rev. 1	No	None
IV.B.1.b.	Provides alternative to NUREG-0313, Rev. 1	Yes	Minor
IV.B.1.b.(3)	Did not provide data in response to NRC Generic Letter 81-04	Yes	Minor
IV.B.1.b.(4)	Did not provide data in response to NRC Generic Letter 81-04	Yes	Minor
IV.B.2.a.	The comments for Parts IV.B.1.a.(1) and IV.B.1.a.(2) apply here.		

Part of NUREG-0313, Rev. 1 Evaluated	Evaluation[a]	Additional Data Required[b]	Discrepancy
IV.B.2.b.	Provides alternative to NUREG-0313, Rev. 1	Yes	Minor
IV.B.2.b.(6)	Did not provide data in response to NRC Generic Letter 81-04	Yes	Minor
Section V.			

[a]See Tables 1 and 3 for additional information.

[b]See Tables 1 and 4 for additional information.

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TABLES

TECHNICAL EVALUATION OF INTEGRITY OF
THE MONTICELLO REACTOR COOLANT
BOUNDARY PIPING SYSTEM

1. INTRODUCTION

Intergranular stress corrosion cracking (IGSCC) of austenitic stainless steel (SS) piping has been observed in boiling water reactors (BWRs) since December 1965.[1] The NRC established a Pipe Crack Study Group (PCSG) in January 1975 to study the problem.[2] The PCSG issued two documents, NUREG-75/067 Technical Report, Investigation and Evaluation of Cracking in Austenitic Stainless Steel Piping of Boiling Water Reactors[3] and an implementation document, NUREG-0313, Rev. 0.[2] After cracking in large-diameter piping was discovered for the first time in the Duane Arnold BWR in 1978, a new PCSG was formed. The new PCSG in turn issued two reports, NUREG-0531, Investigation and Evaluation of Stress-Corrosion Cracking in Piping of Light Water Reactor Plants[4] and NUREG-0313, Rev. 1, Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping.[5] NUREG-0313, Rev. 1 is the implementing document of NUREG-0531 and discusses the augmented inservice inspection (ISI) and leak detection requirements "for plants that cannot comply with the material selection, testing, and processing guidelines" of NUREG-0313, Rev. 1.[5]

NRC Generic Letter 81-04 requested each licensee "to review all ASME Code Class 1 and 2 pressure boundary piping, safe ends, and fitting material, including weld metal to determine if (they) meet the material selection, testing and processing guidelines in" NUREG-0313, Rev. 1.[6] The generic letter offered the option of providing a description, schedule, and justification for alternative actions that would reduce the susceptibility of pressure boundary piping and safe ends to intergranular stress corrosion cracking (IGSCC) or increase the probability of early detection of leakage from pipe cracks.

In response to NRC Generic Letter 81-04, Northern States Power Company (NSP) submitted a letter on July 6, 1981.[7] Requests for information from the NRC staff elicited other letters from NSP on November 22, 1982[8] and January 21, 1983.[9] EG&G Idaho personnel evaluated these responses, and this report provides:

1. A brief summary of the licensee's response to each part of NUREG-0313, Rev. 1.

2. A discussion of areas where the licensee does not meet the guidelines or requirements of NUREG-0313, Rev. 1.[a]

3. A brief discussion of the licensee's proposed alternatives to NUREG-0313, Rev. 1; however, no determination of acceptability is made on these alternatives.

4. An identification of all areas where the licensee has not provided sufficient information to judge the licensee's program.

There is an effort underway to revise NUREG-0313, Rev. 1 by NRC in light of research on IGSCC and recent instances of IGSCC at Nine Mile Point (March 1982) and Monticello (October 1982). Because of this contemplated revision of NUREG-0313, Rev. 1, the following issues will not be evaluated.

1. The licensee's proposed Technical Specifications to implement the requirements, with the exception of the leak detection requirements in NUREG-0313, Revision 1, Sections IV.B.1.(a)(1) and IV.B.1.(a)(2).

2. The acceptability of licensee-proposed augmented inservice inspection (ISI) sampling criteria.

3. Credit for past operating experience and inspection results.

4. The acceptability of induction heating stress improvement (IHSI), heat sink welding (HSW), and weld overlay as alternates to augmented ISI.

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a. Part III of NUREG-0313, Rev. 1 contains guidelines; Part IV contains requirements.

2. EVALUATION

2.1 NUREG-0313, Rev. 1 Guidelines

The guidelines and requirements outlined in NUREG-0313, Rev. 1 form the basis of this evaluation. The NUREG-0313, Rev. 1 guidelines are found in Parts III and V and the requirements in Parts II and IV of that document. Part II discusses implementation of material selection, testing, and processing guidelines. Part III summarizes acceptable methods to minimize IGSCC susceptibility with respect to the material selection, testing, and processing guidelines. Part IV deals with leak detection and inservice inspection requirements of nonconforming (i.e., not meeting the guidelines of Part III of NUREG-0313, Rev. 1) piping. Part V discusses general recommendations.

2.2 Discussion of Tables

Table 1 has the complete text Parts II through V of NUREG-0313, Rev. 1 on the left side so that the reader may be able to refer to it as the topics are discussed. The right side summarizes the licensee's responses, lists the differences between the licensee's proposed implementation program and NUREG-0313, Rev. 1, and identifies the additional data required to evaluate the licensee's response.

Many sections in Parts II through IV of NUREG-0313, Rev. 1 are not discussed in the right hand column. In these cases, one of the comments below will be used.

- o Not applicable because the construction permit for this plant has been issued.

- o Not applicable because the operating license for this plant has been issued.

- o Not applicable because the plant has been constructed.

- o The licensee has not furnished data on this topic in his responses to NRC Generic Letter 81-04.

- o No comment made because alternative plans were not evaluated.

Table 2 lists the summaries of the licensee's responses to NRC questions on implementation of NUREG-0313, Rev. 1 guidelines. Therefore, in Table 2 the reader is able to read all the summaries in one table without having to search Table 1 for all the summaries. The same compilation applies to Tables 3 and 4. Table 3 lists the differences between the licensee's proposed implementation program and that recommended in NUREG-0313, Rev. 1. Table 4 lists the areas where additional information is required to properly evaluate the licensee's proposed implementation program. All the items in Tables 2, 3, and 4 are listed in their respective tables in the order they appear in Table 1.

2.3 Discrepancies

Any alternate proposal that did not meet a specific guideline or requirement of NUREG-0313, Rev. 1 was considered a discrepancy. Evaluation of alternate proposals was outside the scope of this task, as indicated in Section 1 of this report. Licensees have submitted definitions of "nonservice sensitive" and augmented ISI proposals that differ from NUREG-0313, Rev. 1. These differences are considered minor because the NRC staff is considering major modifications to those requirements. An example of a minor discrepancy is the use of the stress rule index (SRI) to choose which welds would be subjected to augmented ISI.

If the alternate proposal to leak detection does not meet the requirements in NUREG-0313, Rev. 1, it was considered a major discrepancy because NRC is not considering major modifications to those requirements. An example of a major discrepancy is a licensee's not proposing Technical Specifications to implement leak detection requirements in NUREG-0313, Rev. 1.

Only major discrepancies are listed in the Conclusions section.

3. CONCLUSIONS

Monticello has the following major discrepancy.

Part IV.B.1.a.(1) Leak Detection and Monitoring Systems

> NSP's description of Monticello's leak detection methods is not detailed enough to determine whether they meet Section C of Regulatory Guide 1.45.

There are minor discrepancies as well as the major one listed above. These minor discrepancies are not listed here. However, while the licensee's alternate proposals that have been classified as minor discrepancies might be acceptable under the anticipated revision of NUREG-0313, Rev. 1, it should not be inferred that approval of those alternate proposals has been given.

The licensee has not supplied sufficient information to evaluate his responses to topics IV.B.1.a.(1) and (2); IV.B.1.b.; IV.B.1.b.(3) and (4); IV.B.2.a.; IV.B.2.b.; and IV.B.2.b.(6). Table 4 lists the required information for each topic.

II. IMPLEMENTATION OF MATERIAL SELECTION, TESTING, AND PROCESSING GUIDELINES

II.A. For plants under review, but for which a construction permit has not been issued, all ASME Code Class 1, 2, and 3 lines should conform to the guidelines stated in Part III.

II.B. For plants that have been issued a construction permit but not an operating license, all ASME Code Class 1, 2, and 3 lines should conform to the guidelines stated in Part III unless it can be demonstrated to the staff that implementing the guidelines of Part III would result in undue hardship. For cases in which the guidelines of Part III are not complied with, additional measures should be taken for Class 1 and 2 lines in accordance with the guidelines stated in Part IV of this document.

II.C. For plants that have been issued an operating license, NRC designated "Service Sensitive" lines (Part IV. 8) should be modified to conform to the guidelines stated in Part III, to the extent practicable. When "Service Sensitive" and other Class 1 and 2 lines do not meet the guidelines of Part III, additional measures should be taken in accordance with the guidelines stated in Part IV of this document. Lines that experience cracking during service and require replacement should be replaced with piping that conforms to the guidelines stated in Part III.

III. SUMMARY OF ACCEPTABLE METHODS TO MINIMIZE CRACK SUSCEPTIBILITY--MATERIAL SELECTION, TESTING, AND PROCESSING GUIDELINES

A. Not applicable because the construction permit for this plant has been issued.

B. Not applicable because the operating license for this plant has been issued.

C. SUMMARY

Northern States Power Company (NSP) presently has no firm plans to replace "service sensitive" lines.

NSP does not meet NUREG-0313, Rev. 1 in this matter.

DIFFERENCES

NUREG-0313, Rev. 1 requires that all NRC-designated "service sensitive" lines be replaced with corrosion-resistant materials. Also, lines that experience cracking should be replaced with corrosion-resistant materials.

NSP has no firm plans to replace "service sensitive" piping. Replacement materials have been obtained for the core spray and recirculation bypass branch connections as pipe replacement appears to be a practical and cost effective means of eliminating the potential for IGSCC.[7]

ADDITIONAL DATA REQUIRED

None.

III.A. Selection of Materials

Only those materials described in Paragraphs 1 and 2 below are acceptable to the NRC for installation in BWR ASME Code Class 1, 2, and 3 piping systems. Other materials may be used when evaluated and accepted by the NRC.

A. The licensee has not furnished data on this paragraph in his responses to NRC Generic Letter 81-04. See comments on Part II.C. above.

III.A.1. Corrosion-Resistant Materials

All pipe and fitting material including safe ends, thermal sleeves, and weld metal should be of a type and grade that has been demonstrated to be highly resistant to oxygen-assisted stress corrosion in the as-installed condition. Materials that have been so demonstrated include ferritic steels, "Nuclear Grade" austenitic stainless steels,* Types 304L and 316L austenitic stainless steels, Type CF-3 cast stainless steel, Types CF-8 and CF-8M cast austenitic stainless steel with at least 5% ferrite, Type 308L stainless steel weld metal, and other austenitic stainless steel weld metal with at least 5% ferrite content. Unstabilized wrought austenitic stainless steel without controlled low carbon has not been so demonstrated except when the piping is in the solution-annealed condition. The use of such material (i.e., regular grades of Types 304 and 316 stainless steels) should be avoided. If such material is used, the as-installed piping including welds should be in the solution-annealed condition. Where regular grades of Types 304 and 316 are used and welding or heat treatment is required, special measures, such as those described in Part III.C, Processing of Materials, should be taken to ensure that IGSCC will not occur. Such measures may include (a) solution annealing subsequent to the welding or heat treatment, and (b) weld cladding of materials to be welded using procedures that have been demonstrated to reduce residual stresses and sensitization of surface materials.

1. The comments on III.A. also apply here.

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*These materials have controlled low carbon (0.02% max) and nitrogen (0.1% max) contents and meet all requirements, including mechanical property requirements, of ASME specification for regular grades of Type 304 or 316 stainless steel pipe.

III.A.2. Corrosion-Resistant Safe Ends and Thermal Sleeves

All unstabilized wrought austenitic stainless steel materials used for safe ends and thermal sleeves without controlled low carbon contents (L-grades and Nuclear Grade) should be in the solution-annealed condition. If as a consequence of fabrication, welds joining these materials are not solution annealed, they should be made between cast (or weld overlaid) austenitic stainless steel surfaces (5% minimum ferrite) or other materials having high resistance to oxygen-assisted stress corrosion. The joint design must be such that any high-stress areas in unstabilized wrought austenitic stainless steel without controlled low carbon content, which may become sensitized as a result of the welding process, is not exposed to the reactor coolant. Thermal sleeve attachments that are welded to the pressure boundary and form crevices where impurities may accumulate should not be exposed to a BWR coolant environment.

2. The comments on III.A. also apply here.

III.B. Testing of Materials

For new installation, tests should be made on all regular grade stainless steels to be used in the ASME Code Class 1, 2, and 3 piping systems to demonstrate that the material was properly annealed and is not susceptible to IGSCC. Tests that have been used to determine the susceptibility of IGSCC include Practices A* and E** of ASTM A-262, "Recommended Practices for Detecting Susceptibility to Intergranular Attack in Stainless Steels" and the electrochemical potentiokinetic reactivation (EPR) test. The EPR test is not yet accepted by the NRC. If the EPR test is used, the acceptance criteria applied must be evaluated and accepted by the NRC on a case-by-case basis.

B. The licensee has not furnished data on this paragraph in his responses to NRC Generic Letter 81-04.

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*Practice A--Oxalic acid etch test for classification of etch structures of stainless steels.

**Practice E--Copper-copper sulfate-sulfuric acid test for detecting susceptibility to intergranular attack in stainless steels.

III.C. Processing of Materials

Corrosion-resistant cladding with a duplex microstructure (5% minimum ferrite) may be applied to the ends of Type 304 or 316 stainless steel pipe for the purpose of avoiding IGSCC at weldments. Such cladding, which is intended to (a) minimize the HAZ on the pipe inner surface, (b) move the HAZ away from the highly stressed region next to the attachment weld, and (c) isolate the weldment from the environment, may be applied under the following conditions:

C. The licensee has not furnished data on this paragraph in his responses to NRC Generic Letter 81-04. See comments on Part II.C. above.

III.C.1. For initial construction, provided that all of the piping is solution annealed after cladding.

1. The comments on III.C. also apply here.

III.C.2. For repair welding and modification to in-place systems in operating plants and plants under construction. When the repair welding or modification requires replacement of pipe, the replacement pipe should be solution-annealed after cladding. Corrosion-resistant cladding applied in the "field" (i.e., without subsequent solution annealing of the pipe) is acceptable only on that portion of the pipe that has not been removed from the piping system. Other "field" applications of corrosion-resistant cladding are not acceptable.

Other processes that have been found by laboratory tests to minimize stresses and IGSCC in austenitic stainless steel weldments include induction heating stress improvement (IHSI) and heat sink welding (HSW). Although the use of these processes as an alternate to augmented inservice inspection is not yet accepted by the NRC, these processes may be permissible and will be considered on a case-by-case basis provided acceptable supportive data are submitted to the NRC.

2. The comments on III.C. also apply here.

IV. INSERVICE INSPECTION AND LEAK DETECTION REQUIREMENTS FOR BWRs WITH VARYING DEGREES OF CONFORMANCE TO MATERIAL SELECTION, TESTING, AND PROCESSING GUIDELINES

IV.A. For plants whose ASME Code Class 1, 2, and 3 pressure boundary piping meets the guidelines of Part III, no augmented inservice inspection or leak detection requirements beyond those specified in the 10 CFR 50.55a(g), "Inservice Inspection Requirements" and plant Technical Specifications for leakage detection are necessary.

A. The licensee has not furnished data on this paragraph in his responses to NRC Generic Letter 81-04.

IV.B. ASME Code Class 1 and 2 pressure boundary piping that does not meet guidelines of Part III is designated "Nonconforming" and must have additional inservice inspection and more stringent leak detection requirements. The degree of augmented inservice inspection of such piping depends on whether the specific "Nonconforming" piping runs are classified as "Service Sensitive." The "Service Sensitive" lines were and will be designated by the NRC and are defined as those that have experienced cracking of a generic nature, or that are considered to be particularly susceptible to cracking because of a combination of high local stress, material condition, and high oxygen content in the relatively stagnant, intermittent, or low-flow coolant. Currently, for the nonconforming ASME Code Class 3 piping, no additional inservice inspection beyond the Section XI visual examination is required.

Examples of piping considered to be "Service Sensitive" include but are not limited to: core spray lines, recirculation riser lines,* recirculation bypass lines (or pipe extensions/stub tubes on plants where the bypass lines have been removed), control rod drive (CRD) hydraulic return lines, isolation condenser lines, recirculation inlet lines at safe ends where crevices are formed by the welded thermal sleeve attachments, and shutdown heat exchanger lines. If cracking should later be found in a particular piping run and considered to be generic, it will be designated by the NRC as "Service Sensitive."

*Since no IGSCC has been observed in the domestic plants and in view of the possible high radiation exposure to the inspection personnel, surveillance and monitoring means other than those specified in Section IV of this report for recirculation riser lines will be considered on a case-by-case basis.

Leakage detection and augmented inservice inspection requirements for "Nonconforming" lines and "Nonconforming, Service Sensitive" lines are specified below:

B. The licensee has not furnished data on this paragraph in his responses to NRC Generic Letter 81-04.

IV.B.1. "Nonconforming" Lines That Are Not "Service Sensitive"

1. The comments on IV.B. also apply here.

IV.B.1.a. Leak Detection: The reactor coolant leakage detection systems should be operated under the Technical Specification requirements to enhance the discovery of unidentified leakage that may include through-wall cracks developed in austenitic stainless steel piping.

a. The comments on IV.B. also apply here.

IV.B.1.a.(1) The leakage detection system provided should include sufficiently diverse leak detection methods with adequate sensitivity to detect and measure small leaks in a timely manner and to identify the leakage sources within the practical limits. Acceptable leakage detection and monitoring systems are described in Section C, Regulatory Position of Regulatory Guide 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems."

Particular attention should be given to upgrading and calibrating those leak detection systems that will provide prompt indication of an increase in leakage rate.

Other equivalent leakage detection and collection systems will be reviewed on a case-by-case basis.

(1) <u>SUMMARY</u>

NSP's description of Monticello's leak detection methods is not detailed enough to determine whether they meet Section C of Regulatory Guide 1.45.

<u>DIFFERENCES</u>

The nine subsections of Section C of Regulatory Guide 1.45 are discussed below.

C.1 NSP has stated that leakage to the primary reactor containment from identified sources is collected such that

a. the flow rates are monitored separately from unidentified leakage,[11] and

b. the total flow rate can be established and monitored.[11]

C.2 Unidentified leakage to the Monticello primary reactor containment can be collected and the flow rate monitored with an accuracy of 1 gpm or better (FSAR Section 4.10.3).[8]

C.3 NSP has the following leak detection systems in Monticello:

a. Equipment and floor drain sump pump timers. An alarm is sounded when sump filling time is less than a preset time.

b. Equipment and floor drain sump level transmitters. Sump level is displayed and recorded on the control board. The plant process computer computes sump level rate of change and a computer alarm is generated when the preset setpoint is exceeded. These computer points provide rapid response to changes in leak rates.

c. Equipment and floor drain sump flow totalizers and flow recorders

d. Drywell pressure (13-17 psia narrow range)

e. Drywell temperature (seven points on multipoint recorder)

f. Drywell particulate monitoring and sampling system. A moving particulate filter and a beta scintillation detector provide an extremely sensitive and rapid means of detecting reactor coolant leakage. Leakage at very small rates can be detected. This is generally the earliest indicator of leakage.[8]

In addition to that, NSP states that, "During the next operating cycle we will implement additional operating procedures related to coolant leak detection limits and operability of leak detection equipment. The requirements of Generic Letter 81-04, 'Implementation of NUREG-0313, Rev. 1, Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping (Generic Task A-42),' related to leakage detection measures will be implemented. Specifically:

a. An additional operational limit on reactor coolant system leakage of an increase in unidentified leakage of two gallons/minute or more within any 24-hour period. On exceeding this limit, or the existing limits of 5 gallons/minute unidentified leakage or 25 gallons/minute total leakage (averaged over a 24-hour period), the reactor will be placed in a cold shutdown condition within 36 hours for inspection.

b. Drywell leakage will be measured and recorded every four hours.

c. At least one of the leakage measurement instruments associated with each sump will be operable.

d. The drywell atmospheric particulate radioactivity monitoring system will be operable or a sample shall be taken and analyzed every four hours."[8]

Unless there is either a system for monitoring condensate flow rate from air coolers or a system for monitoring airborne gaseous radioactivity, the leak detection methods do not meet Regulatory Guide 1.45, Paragraph C.

C.4 It is not clear whether provisions have been made in the Monticello FSAR to monitor systems connected to the RCPB for signs of intersystem leakage.

C.5 It is not clear that the Monticello systems employed to detect and monitor unidentified leakage can detect leakage of 1 gpm in less than 1 h.

C.6 It is not clear whether the Monticello airborne particulate radioactivity monitoring system remains functional when subjected to the SSE.

C.7 Indicators and alarms for the required leakage detection system are provided in the main control room. Procedures for converting various indications to a common leakage equivalent are available to the operators.[8,11]

It is not known whether calibration of the indicators accounts for the needed independent variables.

C.8 It is not clear whether the Monticello leak detection systems enumerated in Reference 8 can be calibrated or tested during operation.

C.9 The Monticello Technical Specifications includes limiting conditions for identified and unidentified leakage.[8,10]

NSP has indicated that "at least one of the leakage measurement instruments with each sump will be operable".[8] However, it is not clear whether this will insure that leakage detection and measurement systems will be available at all times during operation.

It cannot be determined from the above whether Monticello meets all the requirements of Regulatory Guide 1.45, Section C.

ADDITIONAL DATA REQUIRED

1. Indicate whether provisions have been made in the Monticello FSAR to monitor systems connected to the RCPB for signs of intersystem leakage (Subsection C.4 of Regulatory Guide 1.45).

2. Indicate whether calibration of the indicators accounts for the needed independent variables (Subsection C.7 of Regulatory Guide 1.45).

3. Indicate whether the Monticello leak detection systems include either a system for monitoring condensate flow rate from the air coolers or a system for monitoring airborne gaseous system for monitoring airborne gaseous radioactivity as required by Subsection C.3 of Regulatory Guide 1.45.

4. Indicate whether a leakage detection and measurement system will be operable at all times during operation (Subsection C.9 of Regulatory Guide 1.45).

5. Indicate whether the leakage detection systems are capable of performing their functions following seismic events that do not require plant shutdown. Also, indicate whether the airborne particulate radioactivity monitoring system is functional after SSE (Subsection C.6 of Regulatory Guide 1.45).

6. Indicate whether the Monticello systems used to detect and monitor unidentified leakage can detect a 1-gpm leak in 1 h (Subsection C.5 of Regulatory Guide 1.45).

7. Indicate whether the Monticello leak detection systems identified in Reference 8 can be calibrated or tested during operation (Subsection C.8 of Regulatory Guide 1.45).

IV.B.1.a.(2) Plant shutdown should be initiated for inspection and corrective action when any leakage detection system indicates, within a period of 24 hours or less, an increase in rate of unidentified leakage in excess of 2 gallons per minute or its equivalent, or when the total unidentified leakage attains a rate of 5 gallons per minute or its equivalent, whichever occurs first. For sump level monitoring systems with fixed-measurement interval method, the level should be monitored at 4-hour intervals or less.

(2) SUMMARY

NSP has changed Monticello's Technical Specifications to include the provision for shutdown for a 2-gpm increase in unidentified leakage in 24 h. Drywell leakage will be monitored every 4 h. NSP meets NUREG-0313, Rev. 1 in this matter.

DIFFERENCES

NUREG-0313, Rev. 1 requires that reactor shutdown be initiated when there is a 2-gpm increase in unidentified leakage in 24 h. For sump level monitoring systems with the fixed-measurement interval method, the level should be monitored every 4 h or less.

NSP has changed Monticello's Technical Specifications to include the provision for shutdown for a 2-gpm increase in unidentified leakage in 24 h.[9]

NSP will measure and record the leakage in the Monticello drywell every 4 h.[8]

ADDITIONAL DATA REQUIRED

None.

IV.B.1.a.(3) Unidentified leakage should include all leakage other than:

(3) NSP's definition of unidentified leakage for Monticello meets NUREG-0313, Rev. 1 (Monticello Technical Specifications).

IV.B.1.a.(3)(a) Leakage into closed systems, such as pump seal or valve packing leaks that are captured, flow metered, and conducted to a sump or collecting tank, or

(a) The comments on IV.B.1.a.(3) also apply here.

IV.B.1.a.(3)(b) Leakage into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operations of unidentified leakage monitoring systems or not to be from a through-wall crack in the piping within the reactor coolant pressure boundary.

(b) The comments on IV.B.1.a.(3) also apply here.

IV.B.1.b. Augmented Inservice Inspection: Inservice inspection of the "Nonconforming, Nonservice Sensitive" lines should be conducted in accordance with the following program:*

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*This program is largely taken from the requirements of ASME Boiler and Pressure Vessel Code, Section XI, referenced in the paragraph (b) of 10 CFR 50.55a, "Codes and Standards."

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b. SUMMARY

NSP will not use the methods outlined in NUREG-0313, Rev. 1 to choose which ASME Code Class 1 "nonservice sensitive" pipes should be subjected to augmented ISI.

NSP has provided an alternative to NUREG-0313, Rev. 1. However, more data are needed to determine whether NSP's alternate proposal meets NUREG-0313, Rev. 1.

DIFFERENCES

NUREG-0313, Rev. 1 requires that all nonconforming "service sensitive" piping be subjected to an augmented ISI program.

NSP plans to use the material properties and fabrication data, the SRI, and the IGSCC history of specific joints and systems to select welds to be inspected.

NSP also plans to take credit for augmented ISI examinations performed in the past, and plans to inspect the nonconforming "nonservice sensitive" pipes on a schedule that differs from that in NUREG-0313, Rev. 1.[7]

NSP described the augmented ISI procedures which led to the discovery of the IGSCC in Monticello in 1982. NSP inspected "all welds classified as nonconforming welds (as defined by NUREG-0313, Rev. 1) within the reactor recirculation system and the attached piping systems."[8]

ADDITIONAL DATA REQUIRED

In addition to answering questions 5a-5f in the November 8, 1982 letter from D. B. Vassallo requesting more information on "Augmented ISI of Nonconforming Service Sensitive Pipe", please list the specific "nonservice sensitive" piping systems inspected during the 1982 ISI.

The answers to this question may be provided upon submission of the answers to questions 5a-5f.

IV.B.1.b.(1) For ASME Code Class 1 components and piping, each pressure-retaining dissimilar metal weld subject to inservice inspection requirements of Section XI should be examined at least once in no more than 80 months (two-thirds of the time prescribed in the ASME Boiler and Pressure Vessel Code Section XI). Such examination should include all internal attachment welds that are not through-wall welds but are welded to or form part of the pressure boundary.

(1) The comments on IV.B.1.b. also apply here.

IV.B.1.b.(2) The following ASME Code Class 1 pipe welds subject to inservice inspection requirements of Section XI should be examined at least once in no more than 80 months:

(2) The comments on IV.B.1.b. also apply here.

IV.B.1.b.(2)(a) All welds at terminal ends* of pipe at vessel nozzles;

(a) The comments on IV.B.1.b. also apply here.

IV.B.1.b.(2)(b) All welds having a design combined primary plus secondary stress range of $2.4S_m$ or more;

(b) The comments on IV.B.1.b. also apply here.

IV.B.1.b.(2)(c) All welds having a design cumulative fatigue usage factor of 0.4 or more; and

(c) The comments on IV.B.1.b. also apply here.

*Terminal ends are the extremities of piping runs that connect to structures, components (such as vessels, pumps, valves) or pipe anchors, each of which acts as rigid restraints or provides at least two degrees of restraint to piping thermal expansion.

IV.B.1.b.(2)(d) Sufficient additional welds with high potential for cracking to make the total equal to 25% of the welds in each piping system.

(d) The comments on IV.B.1.b. also apply here.

IV.B.1.b.(3) The following ASME Code Class 2 pipe welds, subject to inservice inspection requirements of Section XI, in residual heat removal systems, emergency core cooling systems, and containment heat removal systems should be examined at least once in no more than 80 months:

(3) SUMMARY

NSP has not identified those nonconforming "nonservice sensitive" pipes which are to be inspected per Part IV.B.1.b.(3) of NUREG-0313, Rev. 1. Data are needed to determine which "nonservice sensitive" ASME Code Class 2 pipes will be inspected and what inspection procedures will be used.

DIFFERENCES

NUREG-0313, Rev. 1 requires that nonconforming ASME Code Class 1 and Class 2 piping be subjected to an augmented ISI program. The augmented ISI program for ASME Code Class 1 piping differs from that required on Class 2 piping. Also, augmented ISI requirements differ for ASME Code Class 2 pipes to be inspected per Parts IV.B.1.b.(3) and IV.B.1.b.(4) of NUREG-0313, Rev. 1.

NSP has submitted the augmented ISI program for nonconforming "nonservice sensitive" piping, but has not distinguished between the ASME Code Class 1 and Class 2 piping, and between the ASME Code Class 2 pipes which are to be inspected per Parts IV.B.1.b.(3) and IV.B.1.b.(4) of NUREG-0313, Rev. 1. Therefore, NSP's program for ASME Code Class 2 piping cannot be evaluated.[7]

ADDITIONAL DATA REQUIRED

Identify which ASME Code Class 2 pipe will be inspected per Part IV.B.1.b.(3) and which inspection procedures will be used.

IV.B.1.b.(3)(a) All welds of the terminal ends of pipe at vessel nozzles, and

(a) The comments on IV.B.1.b.(3) also apply here.

IV.B.1.b.(3)(b) At least 10% of the welds selected proportionately from the following categories:

(b) The comments on IV.B.1.b.(3) also apply here.

IV.B.1.b.(3)(b)(i) Circumferential welds at locations where the stresses under the loadings resulting from <u>any</u> plant conditions as calculated by the sum of Equations (9) and (10) in NC-3652 exceed $0.8\ (1.2S_h + S_A)$;

(i) The comments on IV.B.1.b.(3) also apply here.

IV.B.1.b.(3)(b)(ii)	Welds at terminal ends of piping, including branch runs;	(ii) The comments on IV.B.1.b.(3) also apply here.
IV.B.1.b.(3)(b)(iii)	Dissimilar metal welds;	(iii)The comments on IV.B.1.b.(3) also apply here.
IV.B.1.b.(3)(b)(iv)	Welds at structural discontinuities; and	(iv) The comments on IV.B.1.b.(3) also apply here.
IV.B.1.b.(3)(b)(v)	Welds that cannot be pressure tested in accordance with IWC-5000.	(v) The comments on IV.B.1.b.(3) also apply here.

The welds to be examined shall be distributed approximately equally among runs (or portions of runs) that are essentially similar in design, size, system function, and service conditions.

IV.B.1.b.(4) The following ASME Code Class 2 pipe welds in systems other than residual heat removal systems, emergency core cooling systems, and containment heat removal systems, which are subject to inservice inspection requirements of Section XI, should be inspected at least once in no more than 80 months:

(4) SUMMARY

NSP has not identified those nonconforming "nonservice sensitive" pipes which are to be inspected per Part IV.B.1.b.(4) of NUREG-0313, Rev. 1. Data are needed to determine which "nonservice sensitive" ASME Code Class 2 pipes will be inspected and what inspection procedures will be used.

DIFFERENCES

NUREG-0313, Rev. 1 requires that nonconforming ASME Code Class 1 and Class 2 piping be subjected to an augmented ISI program. The augmented ISI program for ASME Code Class 1 piping differs from that required on Class 2 piping. Also, augmented ISI requirements differ for ASME Code Class 2 pipes to be inspected per Parts IV.B.1.b.(3) and IV.B.1.b.(4) of NUREG-0313, Rev. 1.

NSP has submitted the augmented ISI program for nonconforming "nonservice sensitive" piping, but has not distinguished between the ASME Code Class 1 and Class 2 piping, and between the ASME Code Class 2 pipes which are to be inspected per Parts IV.B.1.b.(3) and IV.B.1.b.(4) of NUREG-0313, Rev. 1. Therefore, NSP's program for ASME Code Class 2 piping cannot be evaluated.[7]

ADDITIONAL DATA REQUIRED

Identify which ASME Code Class 2 pipe will be inspected per Part IV.B.1.b.(4) and which inspection procedures will be used.

IV.B.1.b.(4)(a)	All welds at locations where the stresses under the loadings resulting from "Normal" and "Upset" plant conditions including the operating basis earthquake (OBE) as calculated by the sum of Equations (9) and (10) in NC-3652 exceed 0.8 $(1.2S_h + S_A)$;	(a) The comments on IV.B.1.b.(4) also apply here.
IV.B.1.b.(4)(b)	All welds at terminal ends of piping, including branch runs;	(b) The comments on IV.B.1.b.(4) also apply here.
IV.B.1.b.(4)(c)	All dissimilar metal welds;	(c) The comments on IV.B.1.b.(4) also apply here.
IV.B.1.b.(4)(d)	Additional welds with high potential for cracking at structural discontinuities* such that the total number of welds selected for examination equal to 25% of the circumferential welds in each piping system.	(d) The comments on IV.B.1.b.(4) also apply here.

*Structural discontinuities include pipe weld joints to vessel nozzles, valve bodies, pump casings, pipe fittings (such as elbows, tees, reducers, flanges, etc., conforming to ANSI Standard B 16.9) and pipe branch connections and fittings.

IV.B.1.b.(5)	If examination of (1), (2), (3), and (4) above conducted during the first 80 months reveal no incidence of stress corrosion cracking, the examination frequency thereafter can revert to 120 months as prescribed in Section XI of the ASME Boiler and Pressure Vessel Code.	(5) The licensee has not furnished data on this paragraph in his responses to NRC Generic Letter 81-04.
IV.B.1.b.(6)	Sampling plans other than those described in (2), (3), and (4) above will be reviewed on a case-by-case basis.	(6) The licensee has not furnished data on this paragraph in his responses to NRC Generic Letter 81-04.

IV.B.2. <u>"Nonconforming" Lines That are "Service Sensitive"</u>

IV.B.2.a.	Leak Detection: The leakage detection requirements, described in IV.B.1.a. above, should be implemented.	a. The comments made in Parts IV.B.1.a.(1) and IV.B.1.a.(2) apply here.

IV.B.2.b. Augmented Inservice Inspection:

b. SUMMARY

NSP will not use the methods outlined in NUREG-0313, Rev. 1 to choose which ASME Code Class 1 "nonservice sensitive" pipes should be subjected to augmented ISI.

NSP has submitted an alternative plan to NUREG-0313, Rev. 1.

DIFFERENCES

NUREG-0313, Rev. 1 requires that all nonconforming "service sensitive" piping be subjected to an augmented ISI program as described in Part IV.B.2.b.

NSP plans to use the material properties and fabrication data, the SRI, and the IGSCC history of specific joints and systems to select welds to be inspected.

NSP also plans to take credit for augmented ISI examinations performed in the past, and plans to inspect the nonconforming "service sensitive" pipes on a schedule that differs from that in NUREG-0313, Rev. 1.

NSP described the augmented ISI procedures which led to the discovery of the IGSCC in Monticello in 1982. NSP has inspected "all welds classified as nonconforming welds (as defined by NUREG-0313, Rev. 1) within the reactor recirculation system and the attached piping systems."

ADDITIONAL DATA REQUIRED

In addition to answering questions 4a-4f in the November 8, 1982 letter from D. B. Vassallo requesting more information on "Augmented ISI of Nonconforming Service Sensitive Pipe", please list the specific "service sensitive" piping systems inspected during the 1982 ISI.

The answer to this question may be provided upon submission of the answers to questions 4a-4f.

IV.B.2.b.(1) The welds and adjoining areas of bypass piping of the discharge valves in the main recirculation loops, and of the austenitic stainless steel reactor core spray piping up to and including the second isolation valve, should be examined at each reactor refueling outage or at other scheduled plant outages. Successive examination need not be closer than 6 months, if outages occur more frequently than 6 months. This requirement applies to all welds in all bypass lines whether the 4-inch valve is kept open or closed during operation.

(1) The comments on IV.B.2.b. also apply here.

In the event these examinations find the piping free of unacceptable indications for three successive inspections, the examination may be extended to each 36-month period (plus or minus by as much as 12 months) coincident with a refueling outage. In these cases, the successive examination may be limited to all welds in one bypass pipe run and one reactor core spray piping run. If unacceptable flaw indications are detected, the remaining piping runs in each group should be examined.

In the event these 36-month period examinations reveal no unacceptable indications for three successive inspections, the welds and adjoining areas of these piping runs should be examined as described in IV.B.1.b(1) for dissimilar metal welds and in IV.B.1.b(2) for other welds.

IV.B.2.b.(2) The dissimilar metal welds and adjoining areas of other ASME Code Class 1 "Service Sensitive" piping should be examined at each reactor refueling outage or at other scheduled plant outages. Successive examinations need not be closer than 6 months, if outages occur more frequently than 6 months. Such examination should include all internal attachments that are not through-wall welds but are welded to or form part of the pressure boundary.

(2) The comments on IV.B.2.b. also apply here.

IV.B.2.b.(3) The welds and adjoining areas of other ASME Code Class 1 "Service Sensitive" piping should be examined using the sampling plan described in IV.B.1.b(2) except that the frequency of such examinations should be at each reactor refueling outage or at other scheduled plant outages. Successive examinations need not be closer than 6 months, if outages occur more frequently than 6 months.

(3) The comments on IV.B.2.b. also apply here.

IV.B.2.b.(4) The adjoining areas of internal attachment welds in recirculation inlet lines at safe ends where crevices are formed by the welded thermal sleeve attachment should be examined at each reactor refueling outage or at other scheduled plant outages. Successive examinations need not be closer than 6 months, if outages occur more frequently than 6 months.

(4) The comments on IV.B.2.b. also apply here.

IV.B.2.b.(5) In the event the examinations described in (2), (3) and (4) above find the piping free of unacceptable indications for three successive inspections, the examination may be extended to each 36-month period (plus or minus by as much as 12 months) coinciding with a refueling outage.

In the event these 36-month period examinations reveal no unacceptable indications for three successive inspections, the frequency of examination may revert to 80-month periods (two-thirds the time prescribed in the ASME Code Section XI).

(5) The comments on IV.B.2.b. also apply here.

IV.B.2.b.(6) The area, extent, and frequency of examination of the augmented inservice inspection for ASME Code Class 2 "Service Sensitive" lines will be determined on a case-by-case basis.

(6) <u>SUMMARY</u>

NSP has submitted the augmented ISI program for nonconforming "service sensitive" piping, but has not distinguished between the ASME Code Class 1 and Class 2 piping. Therefore, NSP's program for ASME Code Class 2 piping cannot be evaluated without more data.

<u>DIFFERENCES</u>

NUREG-0313, Rev. 1 requires that nonconforming ASME Code Class 1 and Class 2 piping be subjected to an augmented ISI program. The augmented ISI program for ASME Code Class 1 piping differs from that required on Class 2 piping.

NSP has not identified those nonconforming "service sensitive" pipes which are to be inspected per Part IV.B.2.b.(6) of NUREG-0313, Rev. 1.

Data are needed to determine which "service sensitive" ASME Code Class 2 pipes will be inspected and what inspection procedures will be used.

ADDITIONAL DATA REQUIRED

1. Identify which ASME Code Class 2 pipe will be inspected per Part IV.B.2.b.(6).

2. Identify the inspection procedures for "service sensitive" ASME Code Class 2 pipe.

IV.B.3. Nondestructive Examination (NDE) Requirements

The method of examination and volume of material to be examined, the allowable indication standards, and examination procedures should comply with the requirements set forth in the applicable Edition and Addenda of the ASME Code, Section XI, specified in Paragraph (g), "Inservice Inspection Requirements," of 10 CFR 50.55a, "Codes and Standards."

In some cases, the code examination procedures may not be effective for detecting or evaluating IGSCC and other ultrasonic (UT) procedures or advanced nondestructive examination techniques may be required to detect and evaluate stress corrosion cracking in austenitic stainless steel piping. Improved UT procedures have been developed by certain organizations. These improved UT detection and evaluation procedures that have been or can be demonstrated to the NRC to be effective in detecting IGSCC should be used in the inservice inspection. Recommendations for the development and eventual implementation of these improved techniques are included in Part V.

3. The licensee has not furnished data on this paragraph in his responses to NRC Generic Letter 81-04.

V. GENERAL RECOMMENDATIONS

The measures outlined in Part III of this document provide for positive actions that are consistent with current technology. The implementation of these actions should markedly reduce the susceptibility of stainless steel piping to stress corrosion cracking in BWRs. It is recognized that additional means could be used to limit the extent of stress corrosion cracking of BWR pressure boundary piping materials and to improve the overall system integrity. These include plant design and operational procedure considerations to reduce system exposure to potentially aggressive environment, improved material selection, special fabrication and welding techniques, and provisions for volumetric inspection capability in the design of weld joints. The use of such means to limit IGSCC or to improve plant system integrity will be reviewed on a case-by-case basis.

V. The licensee has not furnished data on this paragraph in his responses to NRC Generic Letter 81-04.

TABLE 2

SUMMARIES OF EVALUATION
OF LICENSEE'S RESPONSES

II.C Material Selection, Testing, and Processing Guidelines for BWRs with an Operating License

Northern States Power Company (NSP) presently has no firm plans to replace "service sensitive" lines.

NSP does not meet NUREG-0313, Rev. 1 in this matter.

IV.B.1.a.(1) Leak Detection and Monitoring Systems

NSP's description of Monticello's leak detection methods is not detailed enough to determine whether they meet Section C of Regulatory Guide 1.45.

IV.B.1.a.(2) Leak Detection Requirements

NSP has changed Monticello's Technical Specifications to include the provision for shutdown for a 2-gpm increase in unidentified leakage in 24 h. Drywell leakage will be monitored every 4 h. NSP meets NUREG-0313, Rev. 1 in this matter.

IV.B.1.b. Augmented ISI of Nonconforming "Nonservice Sensitive" Pipe

NSP will not use the methods outlined in NUREG-0313, Rev. 1 to choose which ASME Code Class 1 "nonservice sensitive" pipes should be subjected to augmented ISI.

NSP has provided an alternative to NUREG-0313, Rev. 1. However, more data are needed to determine whether NSP's alternate proposal meets NUREG-0313, Rev. 1.

IV.B.1.b.(3) Augmented ISI of Nonconforming "Nonservice Sensitive" ASME Code Class 2 Pipe

NSP has not identified those nonconforming "nonservice sensitive" pipes which are to be inspected per Part IV.B.1.b.(3) of NUREG-0313, Rev. 1. Data are needed to determine which "nonservice sensitive" ASME Code Class 2 pipes will be inspected and what inspection procedures will be used.

IV.B.1.b.(4) Augmented ISI of Nonconforming "Nonservice Sensitive" ASME Code Class 2 Pipe

NSP has not identified those nonconforming "nonservice sensitive" pipes which are to be inspected per Part IV.B.1.b.(4) of NUREG-0313, Rev. 1. Data are needed to determine which "nonservice sensitive" ASME Code Class 2 pipes will be inspected and what inspection procedures will be used.

IV.B.2.b. Augmented ISI of Nonconforming "Service Sensitive" Pipe

NSP will not use the methods outlined in NUREG-0313, Rev. 1 to choose which ASME Code Class 1 "nonservice sensitive" pipes should be subjected to augmented ISI.

NSP has submitted an alternative plan to NUREG-0313, Rev. 1.

IV.B.2.b.(6) Augmented ISI of Nonconforming "Service Sensitive" ASME Code Class 2 Pipe

NSP has submitted the augmented ISI program for nonconforming "service sensitive" piping, but has not distinguished between the ASME Code Class 1 and Class 2 piping. Therefore, NSP's program for ASME Code Class 2 piping cannot be evaluated without more data.

TABLE 3

DIFFERENCES BETWEEN NUREG-0313, REV. 1
AND LICENSEE'S RESPONSES

II.C Material Selection, Testing, and Processing Guidelines for BWRs with an Operating License

NUREG-0313, Rev. 1 requires that all NRC-designated "service sensitive" lines be replaced with corrosion-resistant materials. Also, lines that experience cracking should be replaced with corrosion-resistant materials.

NSP has no firm plans to replace "service sensitive" piping. Replacement materials have been obtained for the core spray and recirculation bypass branch connections as pipe replacement appears to be a practical and cost effective means of eliminating the potential for IGSCC.[7]

IV.B.1.a.(1) Leak Detection and Monitoring Systems

The nine subsections of Section C of Regulatory Guide 1.45 are discussed below.

C.1 NSP has stated that leakage to the primary reactor containment from identified sources is collected such that

a. the flow rates are monitored separately from unidentified leakage,[11] and

b. the total flow rate can be established and monitored.[11]

C.2 Unidentified leakage to the Monticello primary reactor containment can be collected and the flow rate monitored with an accuracy of 1 gpm or better (FSAR Section 4.10.3).[8]

C.3 NSP has the following leak detection systems in Monticello:

a. Equipment and floor drain sump pump timers. An alarm is sounded when sump filling time is less than a preset time.

b. Equipment and floor drain sump level transmitters. Sump level is displayed and recorded on the control board. The plant process computer computes sump level rate of change and a computer alarm is generated when the preset setpoint is exceeded. These computer points provide rapid response to changes in leak rates.

c. Equipment and floor drain sump flow totalizers and flow recorders

d. Drywell pressure (13-17 psia narrow range)

e. Drywell temperature (seven points on multipoint recorder)

f. Drywell particulate monitoring and sampling system. A moving particulate filter and a beta scintillation detector provide an extremely sensitive and rapid means of detecting reactor coolant leakage. Leakage at very small rates can be detected. This is generally the earliest indicator of leakage.[8]

In addition to that, NSP states that, "During the next operating cycle we will implement additional operating procedures related to coolant leak detection limits and operability of leak detection equipment. The requirements of Generic Letter 81-04, 'Implementation of NUREG-0313, Rev. 1, <u>Technical Report on Material Selection and</u>

Processing Guidelines for BWR Coolant Pressure Boundary Piping (Generic Task A-42),' related to leakage detection measures will be implemented. Specifically:

a. An additional operational limit on reactor coolant system leakage of an increase in unidentified leakage of 2 gallons/minute or more within any 24-hour period. On exceeding this limit, or the existing limits of 5 gallons/minute unidentified leakage or 25 gallons/minute total leakage (averaged over a 24-hour period), the reactor will be placed in a cold shutdown condition within 36 hours for inspection.

b. Drywell leakage will be measured and recorded every four hours.

c. At least one of the leakage measurement instruments associated with each sump will be operable.

d. The drywell atmospheric particulate radioactivity monitoring system will be operable or a sample shall be taken and analyzed every four hours."[8]

Unless there is either a system for monitoring condensate flow rate from air coolers or a system for monitoring airborne gaseous radioactivity, the leak detection methods do not meet Regulatory Guide 1.45, Paragraph C.

C.4 It is not clear whether provisions have been made in the Monticello FSAR to monitor systems connected to the RCPB for signs of intersystem leakage.

C.5 It is not clear that the Monticello systems employed to detect and monitor unidentified leakage can detect leakage of 1 gpm in less than 1 h.

C.6 It is not clear whether the Monticello airborne particulate radioactivity monitoring system remains functional when subjected to the SSE.

C.7 Indicators and alarms for the required leakage detection system are provided in the main control room. Procedures for converting various indications to a common leakage equivalent are available to the operators.[8,11]

It is not known whether calibration of the indicators accounts for the needed independent variables.

C.8 It is not clear whether the Monticello leak detection systems enumerated in Reference 8 can be calibrated or tested during operation.

C.9 The Monticello Technical Specifications includes limiting conditions for identified and unidentified leakage.[8,10]

NSP has indicated that "at least one of the leakage measurement instruments with each sump will be operable".[8] However, it is not clear whether this will ensure that leakage detection and measurement systems will be available at all times during operation.

It cannot be determined from the above whether Monticello meets all the requirements of Regulatory Guide 1.45, Section C.

IV.B.1.a.(2) Leak Detection Requirements

NUREG-0313, Rev. 1 requires that reactor shutdown be initiated when there is a 2-gpm increase in unidentified leakage in 24 h. For sump level monitoring systems with the fixed-measurement interval method, the level should be monitored every 4 h or less.

NSP has changed Monticello's Technical Specifications to include the provision for shutdown for a 2-gpm increase in unidentified leakage in 24 h.[9]

NSP will measure and record the leakage in the Monticello drywell every 4 h.[8]

IV.B.1.b. Augmented ISI of Nonconforming "Nonservice Sensitive" Pipe

NUREG-0313, Rev. 1 requires that all nonconforming "service sensitive" piping be subjected to an augmented ISI program.

NSP plans to use the material properties and fabrication data, the SRI, and the IGSCC history of specific joints and systems to select welds to be inspected.

NSP also plans to take credit for augmented ISI examinations performed in the past, and plans to inspect the nonconforming "nonservice sensitive" pipes on a schedule that differs from that in NUREG-0313, Rev. 1.[7]

NSP described the augmented ISI procedures which led to the discovery of the IGSCC in Monticello in 1982. NSP inspected "all welds classified as nonconforming welds (as defined by NUREG-0313, Rev. 1) within the reactor recirculation system and the attached piping systems."[8]

IV.B.1.b.(3) Augmented ISI of Nonconforming "Nonservice Sensitive" ASME Code Class 2 Pipe

NUREG-0313, Rev. 1 requires that nonconforming ASME Code Class 1 and Class 2 piping be subjected to an augmented ISI program. The augmented ISI program for ASME Code Class 1 piping differs from that required on Class 2 piping. Also, augmented ISI requirements differ for ASME Code Class 2 pipes to be inspected per Parts IV.B.1.b.(3) and IV.B.1.b.(4) of NUREG-0313, Rev. 1.

NSP has submitted the augmented ISI program for nonconforming "nonservice sensitive" piping, but has not distinguished between the ASME Code Class 1 and Class 2 piping, and between the ASME Code Class 2 pipes which are to be inspected per Parts IV.B.1.b.(3) and IV.B.1.b.(4) of NUREG-0313, Rev. 1. Therefore, NSP's program for ASME Code Class 2 piping cannot be evaluated.[7]

IV.B.1.b.(4) Augmented ISI for ASME Code Class 1 Pipe Welds with High Potential for Cracking

NUREG-0313, Rev. 1 requires that nonconforming ASME Code Class 1 and Class 2 piping be subjected to an augmented ISI program. The augmented ISI program for ASME Code Class 1 piping differs from that required on Class 2 piping. Also, augmented ISI requirements differ for ASME Code Class 2 pipes to be inspected per Parts IV.B.1.b.(3) and IV.B.1.b.(4) of NUREG-0313, Rev. 1.

NSP has submitted the augmented ISI program for nonconforming "nonservice sensitive" piping, but has not distinguished between the ASME Code Class 1 and Class 2 piping, and between the ASME Code Class 2 pipes which are to be inspected per Parts IV.B.1.b.(3) and IV.B.1.b.(4) of NUREG-0313, Rev. 1. Therefore, NSP's program for ASME Code Class 2 piping cannot be evaluated.[7]

IV.B.2.b. Augmented ISI of Nonconforming "Service Sensitive" Pipe

NUREG-0313, Rev. 1 requires that all nonconforming "service sensitive" piping be subjected to an augmented ISI program as described in Part IV.B.2.b.

NSP plans to use the material properties and fabrication data, the SRI, and the IGSCC history of specific joints and systems to select welds to be inspected.

NSP also plans to take credit for augmented ISI examinations performed in the past, and plans to inspect the nonconforming "service sensitive" pipes on a schedule that differs from that in NUREG-0313, Rev. 1.[7]

NSP described the augmented ISI procedures which led to the discovery of the IGSCC in Monticello in 1982. NSP has inspected "all welds classified as nonconforming welds (as defined by NUREG-0313, Rev. 1) within the reactor recirculation system and the attached piping systems."

IV.B.2.b.(6) Augmented ISI of Nonconforming "Service Sensitive" ASME Code Class 2 Pipe

NUREG-0313, Rev. 1 requires that nonconforming ASME Code Class 1 and Class 2 piping be subjected to an augmented ISI program. The augmented ISI program for ASME Code Class 1 piping differs from that required on Class 2 piping.

NSP has not identified those nonconforming "service sensitive" pipes which are to be inspected per Part IV.B.2.b.(6) of NUREG-0313, Rev. 1.

Data are needed to determine which "service sensitive" ASME Code Class 2 pipes will be inspected and what inspection procedures will be used.

TABLE 4

ADDITIONAL DATA REQUIRED
OF LICENSEE

II.C Material Selection, Testing, and Processing Guidelines for BWRs with an Operating License

None.

IV.B.1.a.(1) Leak Detection and Monitoring Systems

1. Indicate whether provisions have been made in the Monticello FSAR to monitor systems connected to the RCPB for signs of intersystem leakage (Subsection C.4 of Regulatory Guide 1.45).

2. Indicate whether calibration of the indicators accounts for the needed independent variables (Subsection C.7 of Regulatory Guide 1.45).

3. Indicate whether the Monticello leak detection systems include either a system for monitoring condensate flow rate from the air coolers or a system for monitoring airborne gaseous system for monitoring airborne gaseous radioactivity as required by Subsection C.3 of Regulatory Guide 1.45.

4. Indicate whether a leakage detection and measurement system will be operable at all times during operation (Subsection C.9 of Regulatory Guide 1.45).

5. Indicate whether the leakage detection systems are capable of performing their functions following seismic events that do not require plant shutdown. Also, indicate whether the

airborne particulate radioactivity monitoring system is functional after SSE (Subsection C.6 of Regulatory Guide 1.45).

6. Indicate whether the Monticello systems used to detect and monitor unidentified leakage can detect a 1-gpm leak in 1 h (Subsection C.5 of Regulatory Guide 1.45).

7. Indicate whether the Monticello leak detection systems identified in Reference 8 can be calibrated or tested during operation (Subsection C.8 of Regulatory Guide 1.45).

IV.B.1.a.(2) Leak Detection Requirements

None.

IV.B.1.b. Augmented ISI of Nonconforming "Nonservice Sensitive" Pipe

In addition to answering questions 5a-5f in the November 8, 1982 letter from D. B. Vassallo requesting more information on "Augmented ISI of Nonconforming Service Sensitive Pipe", please list the specific "nonservice sensitive" piping systems inspected during the 1982 ISI.

The answers to this question may be provided upon submission of the answers to questions 5a-5f.

IV.B.1.b.(3) Augmented ISI for ASME Code Class 1 Pipe Welds Having a Design Cumulative Fatigue Usage Factor of 0.4 or More

Identify which ASME Code Class 2 pipe will be inspected per Part IV.B.1.b.(3) and which inspection procedures will be used.

IV.B.1.b.(4) Augmented ISI of Nonconforming "Nonservice Sensitive" ASME Code Class 2 Pipe

Identify which ASME Code Class 2 pipe will be inspected per Part IV.B.1.b.(4) and which inspection procedures will be used.

IV.B.2.b. Augmented ISI of Nonconforming "Service Sensitive" Pipe

In addition to answering questions 4a-4f in the November 8, 1982 letter from D. B. Vassallo requesting more information on "Augmented ISI of Nonconforming Service Sensitive Pipe", please list the specific "service sensitive" piping systems inspected during the 1982 ISI.

The answer to this question may be provided upon submission of the answers to questions 4a-4f.

IV.B.2.b.(6) Augmented ISI of Nonconforming "Service Sensitive" ASME Code Class 2 Pipe

1. Identify which ASME Code Class 2 pipe will be inspected per Part IV.B.2.b.(6).

2. Identify the inspection procedures for "service sensitive" ASME Code Class 2 pipe.

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