Commonwealth Edison Company
1400 Opus Place
Downers Grove, IL 60515

ComEd

September 25, 1995

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attn: Document Control Desk

Subject: Quad Cities Nuclear Power Station Units 1 and 2,
Third Ten Year Interval Inspection Plan; Proposed Relief Requests
NRC Docket No. 50-254 and 50-265

References: (1) J.L. Schrage to T. Murley (USNRC) letter dated January 7, 1993

(2) C.P. Patel to D.L. Farrar letter dated May 12, 1994

(3) J.L. Schrage to USNRC letter dated October 26, 1994

In Reference (1), Commonwealth Edison (ComEd) submitted a proposed third ten-tear interval Inservice Inspection (ISI) Plan for Quad Cities Station Units 1 and 2. In Reference (2), the NRC Staff identified additional information which would be required in order to approve the proposed ISI Program. ComEd supplied the requested information in Reference (3).

Pursuant to 10 CFR 50.55a(a)(3), ComEd requests alternative testing requirements from the requirements of the 1989 Edition of ASME Section XI, subsubarticle IWA-5250(a)(2) for bolted connections. The purpose of this letter is to transmit two additional proposed Relief Requests (CR-16 and CR-17) to the ISI Plan which describe the alternative testing requirements. Attachment 1 to this letter provides a copy of each proposed Relief Request.

In addition to the proposed Relief Requests, ComEd is providing, as Attachment 2 to this letter, a copy of the NRC Staff approval [P.F. McKee (USNRC) to J.J. Barton (GPU Nuclear) letter and Safety Evaluation dated February 24, 1995] for a similar Relief Request for Oyster Creek Nuclear Generating Station (Relief Request R12, Revision 1).

ComEd will implement the two proposed Relief Requests during the upcoming Quad Cities Station Unit 1 refuel outage, Q1R14, currently scheduled to commence February 1996.

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To the best of my knowledge and belief, the analyses and evaluations contained in these documents are true and correct. In some respects these documents are not based on my personal knowledge, but on information furnished by other Commonwealth Edison employees, contractor employees, and/or consultants. Such information has been reviewed in accordance with company practice, and I believe it to be reliable.

Sincerely,

John L. Schrage
Nuclear Licensing Administrator

Attachment 1: Relief Request CR-16, Revision 0; Relief Request CR-17, Revision 0
Attachment 2: P.F. McKee (USNRC) to J.J. Barton (GPU Nuclear) letter and Safety Evaluation dated February 24, 1995

cc: H.J. Miller, Regional Administrator - RIII
R.M. Pulsifer, Project Manager - NRR
C.G. Miller, Senior Resident Inspector - Quad Cities
Office of Nuclear Facility Safety - IDNS

OFFICIAL SEAL
JACQUELINE T EVANS
NOTARY PUBLIC, STATE OF ILLINOIS
MY COMMISSION EXPIRES: 12/15/97

Jacqueline T. Evans 9/25/95

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RELIEF REQUEST NUMBER: CR-16

COMPONENT IDENTIFICATION

Code Class:	1
References:	IWA-5250(a)(2)
Examination Category:	N/A
Item Number:	N/A
Description:	Bolting Removal When Leakage is Detected at Bolted Connection for Control Rod Drive (CRD) Housing During System Pressure Test

CODE REQUIREMENT

IWA-5250(a)(2) requires that if leakage occurs at a bolted connection, the bolting shall be removed, VT-3 visually examined for corrosion, and evaluated in accordance with IWA-3100.

BASIS FOR RELIEF

Control Rod Drive (CRD) housing leakage has been primarily observed at Quad Cities Station when the primary system was pressurized prior to reaching normal operating temperature range during system pressure testing.

During every refueling outage since the units went on line in 1973 there have been scheduled drive exchanges. At the end of fuel cycle 13, 172 drives in Unit 1 and 163 drives in Unit 2 had been exchanged. There are a total of 177 drives in each Quad Cities unit. Current maintenance practice requires that bolts removed from the exchanged drives be subjected to a VT-1 examination, with supplemental surface examination when warranted. These examinations have not revealed significant degradation caused by inservice corrosion. However, a number of CRD bolts were rejected during the course of these examinations because of linear indications found in the head-to-shank transition region. Metallurgical analyses of some of these rejected bolts from other ComEd BWR units revealed shallow and innocuous defects caused by the manufacturing process at maximum depth of 0.036 inch with no sign of crack initiation or propagation. Quad Cities Station will continue to examine these bolts during scheduled drive exchanges using VT-1 and supplemental surface examination when necessary. This sampling of CRD bolts will identify degradation trends that may occur.

There are eight (8) CRD bolts in each drive. In the unlikely event that a bolt might fail due to manufacturing defects, a drive would not separate from its housing. In accordance with an analysis performed by General Electric Co. for Commonwealth Edison Co. (ComEd) in 1991 (EBO-91-448, dated August 22, 1991) as few as three (3) uniformly distributed and unflawed bolts can support all imposed loads and maintain the applicable ASME Code stress limits. Alternatively, the applicable ASME Code stress limits can be maintained with eight (8) bolts having defects that are 0.157 inch deep and extend 360° around each bolt shank circumference.

RELIEF REQUEST NUMBER: CR-16
(Page 2 of 2)

BASIS FOR RELIEF (Con't)

Relief is requested from the requirements specified in IWA-5250(a)(2) of the 1989 ASME Section XI for the CRD bolts on the basis that examination of CRD bolts during scheduled drive exchanges will provide an acceptable level of quality and safety in that it will identify potential degradation trends.

PROPOSED ALTERNATE PROVISIONS

As an alternate examination, Quad Cities Station will perform a VT-1 visual examination in accordance with Table IWB-2500-1, Examination Category B-G-2, Item B7.80 on the CRD bolting when the CRDs are disassembled for maintenance. Supplemental surface examination will be performed when deemed necessary. CRD bolts will not be removed for a VT-3 examination when leakage is detected at the CRD housing flange connection during the conduct of the system pressure tests in accordance with IWB-5000.

APPLICABLE TIME PERIOD

Relief is requested for the third ten-year interval of the Inservice Inspection Program for Quad Cities Units 1 and 2, which concludes on February 18, 2003 and March 10, 2003, respectively.

RELIEF REQUEST NUMBER: CR-17
(Page 1 of 1)

COMPONENT IDENTIFICATION

Code Class:	1, 2 and 3
References:	IWA-5250(a)(2)
Examination Category:	N/A
Item Number:	N/A
Description:	Bolting Removal When Leakage is Detected at Bolted Connections During System Pressure Tests for All Class 1,2, and 3 Pressure Retaining Bolted Connections Except Control Rod Drive (CRD) Housing Connections.

CODE REQUIREMENT

IWA-5250(a)(2) requires that if leakage occurs at a bolted connection, the bolting shall be removed, VT-3 visually examined for corrosion, and evaluated in accordance with IWA-3100.

BASIS FOR RELIEF

The current requirement to remove all bolting associated with a leaking bolted connection results in unnecessary radiation exposure without a commensurate increase in safety. Rules provided in later editions of the Code (i.e., 1992 Edition with 1993 Addenda) state, "If leakage occurs at a bolted connection on other than a gaseous system, one of the bolts shall be removed, VT-3 examined, and evaluated in accordance with IWA-3100. The bolt selected shall be the one closest to the source of leakage. When the removed bolt has evidence of degradation, all remaining bolting in the connection shall be removed, VT-3 examined, and evaluated in accordance with IWA-3100." Removal and inspection of the bolt closest to the source of leakage will provide adequate assessment of the condition of the bolting and overall integrity of the bolted connection.

Relief is requested from the requirements specified in IWA-5250(a)(2) of the 1989 ASME Section XI for the removal of all bolts on the basis that the later Code requirements are a better approach with regard to bolting removal and inspection at leaking connections.

PROPOSED ALTERNATE PROVISIONS

As an alternate examination, Quad Cities Station will meet the requirements as specified in ASME Section XI, 1992 Edition with 1993 Addenda, Subsubarticle IWA-5250(a)(2) in it's entirety.

APPLICABLE TIME PERIOD

Relief is requested for the third ten-year interval of the Inservice Inspection Program for Quad Cities Units 1 and 2, which concludes on February 18, 2003 and March 10, 2003, respectively.

ATTACHMENT 2

P.F. McKee (USNRC) to J.J. Barton (GPU Nuclear) letter and Safety Evaluation dated February 24, 1995

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

February 24, 1995

Mr. John J. Barton
Vice President and Director
GPU Nuclear Corporation
Oyster Creek Nuclear Generating Station
P.O. Box 388
Forked River, NJ 08731

SUBJECT: OYSTER CREEK NUCLEAR GENERATING STATION, THIRD 10-YEAR INTERVAL INSERVICE INSPECTION, REQUEST FOR RELIEF (TAC NO. M89912)

Dear Mr. Barton:

By letter dated July 8, 1994, GPU Nuclear Corporation (GPUN) requested approval to use an alternative to the American Society of Mechanical Engineers (ASME) Code Section XI pursuant to the provisions of 10 CFR 50.55a(a)(3). Specifically GPUN requests approval to use (1) Relief Request PT-R2 the provisions of Code Case N-416-1, "Alternative Pressure Test Requirements for Welded Repairs or Installation of Replacement Items of Welding, Class 1, 2, and 3, (2) Relief Request PT-R3 the provisions of Code Case N-498-1, "Alternative Rules for 10-year System Hydrostatic Testing for Class 1, 2, and 3 systems, Section XI, Division 1," and (3) Relief Request PT-R4 as an alternative to Code requirements. GPUN proposed using 10 CFR 50, Appendix J testing to satisfy the periodic pressure testing requirements for those Class 2 portions of piping at containment penetrations where the balance of the adjoining system is classified as non-class as described in Code Case N-522. In addition GPUN requested generic relief (Relief Request R-12) from performing Code-required removal of bolting on Class 1 (except control rod drive housing connections), 2, and 3 components at pressure-retaining bolted connections when evidence of leakage is found during system pressure testing.

The staff has reviewed the GPUN submittal regarding Relief Request PT-R2 requesting approval to use ASME Code Case N-416-1 in lieu of performing the Code required hydrostatic pressure test for welded repairs or installation of replacement items by welding. Use of Code Case N-416-1 is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) provided additional surface examinations are performed on the root pass layer of bolt and socket welds on the pressure-retaining boundary of Class 3 components where the surface examinations method is used in accordance with ASME Section III. Use of Code Case N-416-1, with the provisions noted above, is authorized until such time as the Code Case is endorsed in a future revision of Regulatory Guide 1.147. At that time, if GPUN intends to continue to implement this Code Case, GPUN is to follow all the provisions in Code Case N-416-1, with the limitations issued in Regulatory Guide 1.147, if any.

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The staff has also reviewed the GPUN submittal regarding Relief Request PT-R3 requesting approval to use the alternative rules of ASME Code Case N-498-1 for 10-year hydrostatic testing. Use of Code Case N-498-1 is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) as compliance with the specified requirements of Section XI would result in hardship and or unusual difficulty for the licensee without a compensating increase in the level of quality and safety.

GPUN has also requested Relief Request PT-R4 concerning generic relief from performing Code-required periodic system pressure testing on Class 2 portions of piping at containment penetrations where the balance of the adjoining system is classified as non-class. The staff has reviewed GPUN's submittal regarding this matter and concludes that compliance with Code-required hydrostatic test of Class 2 piping that penetrates containment, where the balance of the piping system is non-code class, would result in hardships of unusual difficulty without a compensatory increase in the level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), GPUN's proposal (PT-R4) to use Code Case N-522 is authorized until such time as Code Case N-522 is published in a future revision of Regulatory Guide 1.147. After publication, if GPUN intends to continue to implement Code Case N-522, GPUN is to follow all its provisions, with the limitations issued in Regulatory Guide 1.147, if any.

The NRC staff has reviewed GPUN's submittal requesting generic relief (Relief Request R12) from performing Code-required removal of Class 1 (except control rod drive housing connections), 2, and 3 components at pressure-retaining bolted connections, when evidence of leakage is found during system pressure testing. Based on our review, the staff has concluded that GPUN did not address all obvious causes for leakage at bolted connections nor did GPUN submit supporting data that leaking bolted connections would perform their designed functions. Therefore, the alternative examination for Relief Request R12, Revision 1 is denied.

The staff's evaluation and conclusions are presented in the enclosed safety evaluation.

Sincerely,

Phillip F. McKee, Director
Project Directorate I-4
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-219

Enclosure: Safety Evaluation

cc w/encl: See next page

cc:

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE RELIEF FROM CERTAIN HYDROSTATIC TESTS AND BOLT EXAMINATIONS

GPU NUCLEAR CORPORATION

OYSTER CREEK NUCLEAR GENERATING STATION

DOCKET NO. 50-219

1.0 INTRODUCTION

In a letter of July 8, 1994, GPU Nuclear Corporation (GPUN/licensee) submitted a request for relief from certain hydrostatic tests and bolt examinations at Oyster Creek Nuclear Generating Station. In place of the hydrostatic tests required by the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, the licensee proposed alternatives consisting of non-approved ASME Code cases. In addition, the licensee proposed an alternative to the Code requirements for leaking bolted connections. The NRC staff has evaluated the licensee's request to use the proposed alternatives to the requirements.

2.0 BACKGROUND

By letter dated April 16, 1992, GPUN submitted the inservice inspection program for the third 10-year interval at Oyster Creek. The program implemented the requirements of the 1986 Edition with no addenda to Section XI of the ASME Code. By letter dated July 8, 1994, the licensee submitted a request to use Code Case N-416-1 for repair by welding and the attachment of replacements by welding (PT-R2), Code Case N-498-1 for the inspection interval hydrostatic test (PT-R3), and Code Case N-522 for periodic system pressure testing of Class 2 portions of piping at containment penetrations where the balance of the adjoining system is classified as non-class (PT-R4). These Code Cases have not been endorsed in US NRC Regulatory Guide 1.147. In place of the Code-required bolt examination of pressure-retaining bolted connections exhibiting evidence of leakage, the licensee proposed an in-place VT-1 examination with additional requirements for items showing corrosion. The licensee also included a revision (R12 Revision 1) of the original submittal dated April 16, 1992. In the revision, the licensee proposed an alternative to the Code requirements for leaking bolted connections found during a system pressure test.

Enclosure

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3.0 DESCRIPTION

3.1 PT-R2

3.1.1 Code Requirements

In accordance with IWA-4000 and IWA-5000, a hydrostatic pressure test shall be performed following repair or replacement of Class 1, 2, or 3 components by welding on the pressure retaining boundary.

3.1.2 Request for Relief

The licensee requested generic relief from performing the Code-required hydrostatic pressure test following repair or replacement by welding.

3.1.3 Basis for Relief

The licensee states that there exists numerous publications and ASME documentation regarding the lack of value of the hydrostatic pressure test at elevated pressure. This has led to the issuance of Code Case N-498, which eliminates the requirement to perform a hydrostatic test at elevated pressure for Class 1 and 2 systems as part of the periodic test requirement. This code case, which has been endorsed by Regulatory Guide 1.147, did not initially address Class 3 systems because pressure tests served as the only form of examination (except for integral attachments). Equally lacking in value is the requirement to perform a hydrostatic test at elevated pressures subsequent to repairs by welding and the attachment of replacements by welding. The ASME Committee has recognized this and consequently developed Code Case N-416-1 to provide an alternative. This Code Case has been approved by the ASME Committee during the first quarter of 1994 and will be issued by ASME in Supplement 8 to Section XI. The licensee believes that the requirements of the Code Case, as outlined below, provides a technically sound alternative to the current requirements.

3.1.4 Proposed Alternative Examination

As an alternative to Code requirements, the licensee proposed using Code Case N-416-1 for welded repairs and installation of replacement items by welding in Class 1, 2, and 3 piping.

3.1.5 Evaluation/Conclusions

Code Case N-416-1 requires a system leakage test at normal operating temperature and pressure in accordance with IWA-5000 and the 1992 Edition of Section XI in lieu of the hydrostatic test of the pressure-retaining boundary following Code nondestructive examination (NDE) of a repair. This Code Case also specifies that NDE of the welds be performed in accordance with the applicable subsections of the 1992 Edition of Section III. Hardships are generally encountered with hydrostatic tests performed in accordance with the Code. For example, since hydrostatic test pressure would be higher than nominal operating pressure, hydrostatic pressure testing frequently requires significant effort to set up and perform. The need to use special equipment, such as temporary attachment of test pumps and gages, and the need for individual valve lineups can cause the testing to be on a critical path.

Piping components are designed for a number of loadings postulated to occur under the various modes of plant operation. Hydrostatic tests only subject the piping components to a small increase in pressure over the design pressure. Accordingly, hydrostatic pressure testing is primarily regarded as a means to enhance leakage detection during the examination of components under pressure, rather than solely as a measure to determine the structural integrity of the components.

The industry indicates that experience has demonstrated that leaks are not being discovered as a result of hydrostatic test pressures propagating a preexisting flaw through wall. They indicate that leaks in most cases are being found when the system is at normal operating pressure. This is largely due to the fact that hydrostatic pressure testing is required only upon installation, while system leakage tests at nominal operating pressures are conducted a minimum of once each refueling outage for Class 1 systems and each 40-month inspection period for Class 2 and 3 systems. In addition, leaks may be identified during system walkdowns by plant operators, which may be conducted as often as once a shift.

Following the performance of welding, the Code requires volumetric examination for repairs or replacements in Class 1 and 2 piping components, but only requires a surface examination of the final weld pass in Class 3 piping components. There are no ongoing NDE requirements for Class 3 components except for pressure testing and visual examination for leakage.

Considering the NDE performed on Class 1 and 2 systems and since the hydrostatic test pressure is not substantially higher than the nominal operating pressure during the system leakage test, the staff believes that increased assurance of the integrity of welds in Class 1 and 2 systems is not commensurate with the burden of performing hydrostatic tests.

For Class 3 components, hydrostatic tests are generally performed at pressures substantially higher than normal operating pressure. In view of this difference and the NDE requirements for Class 3 components, the staff does not believe that a system pressure test is an acceptable alternative for the hydrostatic test unless additional surface examinations are performed on the root pass layer of butt and socket welds on the pressure-retaining boundary of Class 3 components when the surface examination method is used in accordance with ASME Section III.

With this provision applied to Class 3 components, the staff concludes that compliance with the Code hydrostatic test requirements for welded repairs or replacements would result in hardships without a compensating increase in the level of quality and safety. Accordingly, the licensee's proposal to use Code Case N-416-1 is authorized for Oyster Creek pursuant to 10 CFR 50.55a(a)(3)(ii) provided additional surface examinations are performed on the root pass layer of butt and socket welds on the pressure-retaining boundary of Class 3 components when the surface examination method is used in accordance with ASME Section III. Use of Code Case N-416-1, with the provision noted above, is authorized until such time as the Code Case is endorsed in a future revision of Regulatory Guide 1.147. At that time, if the licensee intends to continue to implement this Code Case, the licensee is to follow all the provisions in Code Case N-416-1, with the limitations issued in Regulatory Guide 1.147, if any.

3.2 PT-R3

3.2.1 Code Requirements

In accordance with Table IWD-2500-1, Categories D-A, D-B and D-C, a system hydrostatic test is required to be performed once each inspection interval.

3.2.2 Request for Relief

The licensee requested generic relief from performing the Code-required system hydrostatic test described in Table IWD-2500-1, Categories D-A, D-B, and D-C. In accordance with IWD-5000, the hydrostatic test is required to be performed at either 110 percent or 125 percent of the relief valve setting, or at design pressure.

3.2.3 Basis for Relief

The inspection interval hydrostatic test of Class 3 components at elevated pressures place a requirement on the utilities that provided little benefit. It has been shown that a hydrostatic test at elevated pressure only slightly increases the leakage rate from that of a leakage test run at normal operating pressure. Industry data and material and construction requirements pertaining to Class 3 systems support this position. Currently, the hydrostatic test at nominal or normal operating pressure, as applicable, is acceptable for Class 1 and 2 systems instead of the hydrostatic test at elevated pressure, in accordance with Code Case N-498, which the staff has endorsed in Regulatory Guide 1.147. Recognizing this concern, the ASME Committee has developed Code Case N-498-1 to extend these alternative rules to Class 3 components. Code Case N-498-1 was approved by the ASME Committee during the first quarter of 1994 and will be issued in Supplement 9 to ASME Section XI.

3.2.4 Proposed Alternative Examination

As an alternative to the Code requirements, the licensee proposed the following from Code Case N-498-1:

3.2.4.1 A system pressure test shall be conducted at or near the end of each inspection interval or during the same inspection period of each inspection interval of Inspection Program B.

3.2.4.2 The boundary subject to test pressurization during the system pressure test shall extend to all Class 3 components included in those portions of systems required to operate or support the safety system function up to and including the first normally closed valve (including a safety or relief valve) or valve capable of automatic closure when the safety function is required.

3.2.4.3 The systems shall be pressurized to normal operating pressure for at least 4 hours for insulated systems and 10 minutes for non-insulated systems. The system shall be maintained at normal operating pressure during the performance of the VT-2 visual examination.

3.2.4.4 The VT-2 visual examination shall include all components within the boundary identified above.

3.2.4.5 Test instrumentation requirements (IWA-5260) are not applicable.

3.2.5 Evaluation

Information prepared in conjunction with ASME Code Case N-498-1 notes that the system hydrostatic test is not a test of the structural integrity of the system but rather an enhanced leakage test. That this was the original intent is indicated in a paper by S.H. Bush and R.R. Maccary, *"Development of In-Service Inspection Safety Philosophy for U.S.A. Nuclear Power Plants,"* ASME, 1971. Piping components are designed for a number of loadings that would be postulated to occur under the various modes of plant operation. Hydrostatic testing only subjects the piping components to a small increase in pressure over the design pressure and therefore does not present a significant challenge to pressure boundary integrity since piping dead weight, thermal expansion, and seismic loads, which may present far greater challenge to the structural integrity of a system than fluid pressure, are not part of the loading imposed during a hydrostatic test. Accordingly, hydrostatic pressure testing is primarily regarded as a means to enhance leakage detection during the examination of components under pressure, rather than as a measure to determine the structural integrity of the components.

The licensee has indicated that they are already using N-498, "Alternative Rules for 10-Year System Hydrostatic Testing for Class 1, and 2 Systems," which was previously approved by the NRC in Regulatory

Guide 1.147, Rev. 11. The rules for Code Class 1 and 2 in N-498-1 are unchanged from N-498. The staff found N-498 acceptable because the alternative provided adequate assurance and because compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, this evaluation applies to Class 3 systems.

Revision N-498-1 encompasses Class 3 components and specifies requirements for Class 3 that are identical to those for Class 2 components. In lieu of 10-year hydrostatic pressure testing at or near the end of the 10-year interval, Code Case N-498-1 requires a visual examination (VT-2) be performed in conjunction with system leakage testing in accordance with paragraph IWA-5000.

Currently, licensees incur considerable time, and radiation dose carrying out hydrostatic test requirements. A significant amount of effort may be necessary (depending on system, plant configuration, Code Class, etc.) to temporarily remove or disable Code safety and/or relief valves to meet test pressure requirements. The safety assurance provided by the enhanced leakage gained from a slight increase in system pressure during a hydrostatic test may by offset or negated by the following factors: having to gag or remove Code safety and/or relief valves, placing the system (and thus the plant) in an off-normal state, erecting temporary supports in steam lines, possible extension of refueling outages, and resource requirements to set up testing with special equipment and gages.

Class 3 systems do not normally receive the amount and/or type of Non-Destructive Examinations that Class 1 and 2 systems receive. While Class 1 and 2 system failures are relatively uncommon, Class 3 leaks occur more frequently and the failure mode typically differs. Based on a review of Class 3 system failures requiring repair for the last 5 years in Licensee Event Reports and the Nuclear Plant Reliability Data System databases, the most common causes of failures are erosion-corrosion (EC), microbiologically induced corrosion (MIC), and general corrosion. Licensees generally have programs in place for prevention, detection, and evaluation of EC and MIC. Leakage from general corrosion is readily apparent to inspectors when performing a VT-2 examination during system pressure tests. The industry indicates that experience has demonstrated that leaks are not being discovered as a result of hydrostatic test pressures propagating a preexisting flaw through wall. They indicate that leaks in most cases are being found when the system is at normal operating pressure.

Giving consideration to the minimal amount of increased assurance provided by the increased pressure associated with a hydrostatic test versus the pressure for the system leakage test and the hardship associated with performing the ASME Code required hydrostatic test, the staff finds that compliance with the Section XI hydrostatic testing requirements results in hardship and/or unusual difficulty for the licensees without a compensating increase in the level of quality and safety. Pursuant to 10 CFR 50.55a(a)(3)(ii), the licensee's proposal (PT-R3) to use Code Case N-498-1 is authorized until such time as the code case is published in a future revision of Regulatory Guide 1.147. At that time, if the licensee intends to continue to implement this Code Case, the licensee is to follow all provisions in Code Case N-498-1, with limitations issued in Regulatory Guide 1.147, if any.

3.3 PT-R4

3.3.1 Code Requirements

In accordance with Table IWC-2500-1, Category C-H, periodic system pressure testing is required to be performed on all Class 2 piping.

3.3.2 Request for Relief

The licensee requested generic relief from performing the Code-required periodic system pressure testing on Class 2 portions of piping at containment penetrations where the balance of the adjoining system is classified as non-class.

3.3.3 Basis for Relief

The safety function of the lines penetrating containment is to become part of the containment isolation system during periods when containment isolation is required. Therefore, the pressure testing requirements should be based on the containment system design, not the associated process system design requirements. These lines are tested in accordance with 10 CFR 50, Appendix J, "Reactor Containment Leakage Testing for Water Cooled Power Reactors," commensurate with the safety function the line performs and in accordance with technical specification surveillance requirements. Recognizing this situation, the ASME Committee has approved Code Case N-522, which allows use of the leakage testing requirements of 10 CFR 50, Appendix J, to satisfy the periodic pressure testing requirements of ASME Code, Section XI, Subsection IWC, for these isolated portions of Class 2 piping which are classified only for the purpose of containment integrity.

3.3.4 Proposed Alternative Examination

As an alternative to Code requirements, the licensee proposed using 10 CFR 50, Appendix J testing to satisfy the periodic pressure testing requirements for those Class 2 portions of piping at containment penetrations where the balance of the adjoining system is classified as non-class as described in Code Case N-522.

3.3.5 Evaluation/Conclusion

The hydrostatic pressure test required in Table IWC-2500-1, Category C-H provides periodic verification of the leak-tight integrity of Class 2 piping systems or segments at least once during every 10-year ISI interval. The Appendix J pressure testing provides periodic verification (at least three times in every 10-year ISI interval) of the leak-tight integrity of the primary reactor containment, and systems and components that penetrate containment. The Appendix J test frequency provides assurances that the containment pressure boundary is being maintained at an acceptable level while monitoring for deterioration of seals, valves, and piping.

In situations where the Appendix J test pressure is equal to or greater than the hydrostatic test pressure, the hydrostatic test would be redundant. If an event occurred in containment with pressures higher than the pressures in a pipe with a through-wall flaw, the isolation valves located on both sides of the containment wall would prevent any release outside containment. Multiple through-wall flaws appearing simultaneously inside and outside of containment between the isolation valves in a low pressure pipe segment is unlikely. However, the Appendix J test frequency would provide additional surveillance for leakage through pipe segments.

In situations where the Appendix J test pressure is less than the hydrostatic test pressure, the hydrostatic test would be overly conservative. If a through-wall opening occurred, leakage from the pipe in containment with pressures greater than containment pressures would protect containment pressure boundary integrity. The material in the pipe system is not safety-related as evident by the non-Code classification assigned to the pipe on the non-penetration side of the isolation valves. Therefore, the only concern is containment material entering the pipe and bypassing the containment boundary, which does not occur as long as the pressure in the pipe exceeds the pressure in containment or the isolation valves are closed.

Based on the above analysis and information submitted, the staff concludes that compliance with the Code-required hydrostatic test of Class 2 piping that penetrates containment, where the balance of the piping system is non-Code class, would result in hardships or unusual difficulty without a compensating increase in the level of quality and safety. Pursuant to 10 CFR 50.55a(a)(3)(ii), the licensee's proposal (PT-R4) to use Code Case N-522 is authorized until such time as the Code Case N-522 is published in a future revision of Regulatory Guide 1.147. After publication, if the licensee intends to continue to implement Code Case N-522, the licensee is to follow all its provisions, with the limitations issued in Regulatory Guide 1.147, if any.

3.4 R12 Revision 1

3.4.1 Code Requirements

In accordance with ASME Code, Section XI, 1986 Edition, Paragraph IWA-5250(a)(2), "if leakage occurs at a bolted connection, the bolting shall be removed, VT-3 examined for corrosion, and evaluated in accordance with IWA-3100."

3.4.2 Request for Relief

The licensee requested generic relief from performing Code-required removal of bolting on Class 1 (except control rod drive housing connections), 2, and 3 components at pressure-retaining bolted connections, when evidence of leakage is found during system pressure testing.

3.4.3 Basis for Relief

Regulatory authorities have already determined that a more relaxed approach regarding removal of bolts at leaking connections provide an acceptable alternative to the current requirements. This is evident by the rules provided in later editions of the Code (i.e., 1992 Edition with 1993 Addenda). This later requirement states, "If leakage occurs at a bolted connection on other than a gaseous system, one of the bolts shall be removed, VT-3 examined, and evaluated in accordance with IWA-3100. The bolt selected shall be the one closest to the source of the leakage. When the removed bolt has evidence of degradation, all remaining bolting in the connection shall be removed, VT-3 examined, and evaluated in accordance with IWA-3100." The licensee believes that the later Code requirements are a better approach with regard to bolting removal at leaking connections; however, the licensee also believes that some other considerations should be addressed, as follows:

3.4.3.1 If the bolted connection is leaking during system start-up and it is documented that the leakage stops at normal operating temperature, no further action shall be required, since the leakage is not continuous and, therefore, would not result in degradation of the bolting.

3.4.3.2 If the bolting in the connection was examined or replaced during the current outage, no further action shall be required.

3.4.3.3 If bolt removal becomes necessary, a VT-1 examination should be performed in lieu of the required VT-3 examination since this method is consistent with Section XI bolting examination requirements, and is better suitable for evaluation of corrosion.

3.4.3.4 Over the past 10-years preventive and/or corrective maintenance activities were performed on approximately 80 inservice inspection valves. The valve maintenance histories have shown that where leakage has occurred and the bolts were located in the path of the leakage flow stream, no corrosion was found in the threaded areas. Based on these observations, GPUN believes the immediate removal of the single bolt because of leakage is not warranted. If the exposed surface of the bolt/stud, nuts, or flange exhibits any evidence of degradation, the bolt should be removed for examination immediately. If no evidence of corrosion exists, the removal of a bolt at the next system out-of-service or scheduled refueling outage is sufficient to ensure continued serviceability.

3.4.4 Proposed Alternative Examination

If leakage occurs at a bolted connection on other than a gaseous system, and continues to leak once operation temperature has been obtained and the bolted connection was not replaced or examined during the current outage, an in-place VT-1 examination shall immediately be performed on the entire bolted connection. If evidence of corrosion is detected on any part of the bolted connection or flange surface, then the bolt closest to the source of the leakage shall be removed, VT-1 examined, and evaluated in accordance with IWA-3100. When the removed bolt has evidence of degradation, all remaining bolting in the connection shall be removed, VT-1 examined, and evaluated in accordance with IWA-3100.

If no evidence of corrosion exists on any part of the bolted connection or flange surface, the removal of the bolt closest to the source of leakage shall be deferred to the next system out-of-service or scheduled refueling outage. The removed bolt shall be VT-1 examined, and evaluated in accordance with IWA-3100. When the removed bolt has evidence of degradation, all remaining bolting in the connection shall be removed, VT-1 examined, and evaluated in accordance with IWA-3100.

3.4.5 Evaluation/Conclusions

As part of the basis for this request, the licensee referenced the 1992 Edition with 1993 Addenda of Section XI of the ASME Code, Paragraph IWA-5250(a)(2), which requires "if leakage occurs at a bolted connection on other than a gaseous system, one of the bolts shall be removed, VT-3 examined, and evaluated in accordance with IWA-3100. The bolt selected shall be the one closest to the source of leakage. When the removed bolt has evidence of degradation, all remaining bolting in the connection shall be removed, VT-3 examined, and evaluated in accordance with IWA-3100." The staff has selectively authorized Paragraph IWA-5250(a)(2).

The licensee's alternative for generic applications contains the Paragraph IWA-5250(a)(2) stated above with special considerations for four specific conditions. Some obvious assumptions associated with these four specific conditions are the following: (1) The condition in 3.4.3.1 makes the assumption that thermal effects on the bolted connections are the root cause of leaks; (2) The condition in 3.4.3.2 makes the assumption that a bolt that was looked at and found acceptable just prior to startup has not been exposed to a corrosive atmosphere long enough to deteriorate. If the leakage continues to the next outage, the licensee assumes that the bolts exposed to the leakage will not deteriorate to an unsafe condition. Prolonged leaking indicates an unexplainable condition, such as excessive corrosion, unanticipated fatigue cracks, wrong material selection, joint dislocation, or errant joint assembly; (3) The condition in 3.4.3.3 makes the assumption that all bolts are less than 2-inches in diameter with no obvious leakage during the inservice inspection interval, and assumes that deteriorated bolts are the only cause of leaking joints. The licensee's use of a VT-1 examination instead of the Code-required VT-3 examination does not take into account the general mechanical and structural condition of the components and their supports; and (4) The condition in 3.4.3.4 makes the assumption that bolt failure can only occur from corrosion in the threaded area. Bolts can fail in areas other than the threaded area and by mechanisms other than corrosion.

The four specific conditions did not address all obvious causes for leakage at bolted connections nor did the licensee submit supporting data that leaking bolted connections would perform their designed functions. On the basis of the above discussion, the alternative examination for R12 Revision 1 is denied.

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Date: February 24, 1995