September 25, 2002

Mr. John L. Skolds, President
and Chief Nuclear Officer
Exelon Nuclear
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: THREE MILE ISLAND NUCLEAR STATION, UNIT 1 (TMI-1), RE: THIRD 10-YEAR INTERVAL INSERVICE INSPECTION (ISI) RELIEF REQUESTS (TAC NO. MB2839)

Dear Mr. Skolds:

By letter dated August 2, 2001, you submitted proposed reliefs and alternatives RR-00-01 through RR-00-14 for the third 120-month ISI interval at TMI-1. You also submitted proposed alternative RR-8 related to containment inspections. Your letter of April 18, 2002, responded to the Nuclear Regulatory Commission (NRC) staff's February 25, 2002, request for additional information and withdrew RR-00-01. The NRC staff has completed its review of your requested reliefs and proposed alternatives.

Based on our review, the NRC staff concludes that certain inservice examinations cannot be performed to the extent required by the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (the Code) at TMI-1. For Relief Request Nos. RR-00-02, RR-00-03, and RR-00-06, the Code requirements are impractical to meet, and reasonable assurance of the structural integrity of the subject components have been provided. Therefore, relief is granted pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g)(6)(i). The NRC staff has determined that the granting of relief is authorized by law and will not endanger life or property, or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

The NRC staff also concludes that the proposed alternatives in RR-00-07, RR-00-08, RR-00-10, RR-00-11, RR-00-12, RR-00-13, and RR-8, provide an acceptable level of quality and safety. Therefore, the licensee's proposed alternatives are authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year ISI interval at TMI-1.

For the alternatives contained in Relief Request Nos. RR-00-04, RR-00-05, and RR-00-09, the NRC staff finds that imposition of the Code requirements would result in a hardship without a compensating increase in the level of quality and safety. The NRC staff concludes that the proposed alternative provides reasonable assurance of structural integrity of the subject components in the licensee's request for relief. Therefore, the licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) for the third 10-year ISI interval at TMI-1.

Details of the NRC staff's review are contained in the enclosed safety evaluation. If you have any questions, please contact me at 301-415-1402.

Sincerely,

/RA by PTam for/

Richard J. Laufer, Chief, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-289

Enclosure: Safety Evaluation

cc w/encl: See next page

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**see previous concurrence

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THIRD 10-YEAR INTERVAL INSERVICE INSPECTION (ISI) PROGRAM

THREE MILE ISLAND NUCLEAR STATION, UNIT 1 (TMI-1)

DOCKET NO. 50-289

1.0 INTRODUCTION

By letter dated August 2, 2001, AmerGen Energy Company, LLC (AmerGen, the licensee), submitted relief requests and alternatives associated with the third 10-year ISI interval program plan for TMI-1. The licensee provided additional information in a submittal dated April 18, 2002, and withdrew Relief Request No. RR-00-01. The Nuclear Regulatory Commission (NRC) staff has reviewed the information submitted by the licensee in support of Relief Request Nos. RR-00-02, RR-00-03, RR-00-04, RR-00-05, RR-00-06, RR-00-07, RR-00-08, RR-00-09, RR-00-10, RR-00-11, RR-00-12, RR-00-13 and RR-8. The NRC staff's basis for disposition is documented below.

2.0 BACKGROUND

ISI of the American Society of Mechanical Engineers (ASME) Code Class 1, 2 and 3 components is to be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code (ASME Code or the Code) and applicable addenda as required by Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). Pursuant to 10 CFR 50.55a(a)(3), alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the licensee demonstrates that (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code, Class 1, 2 and 3 components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The applicable edition of Section XI of the ASME Code for the third 10-year ISI interval at TMI-1 is the 1995 Edition through the 1996 Addenda.

3.0 RELIEF REQUESTS

3.1 RELIEF REQUEST RR-00-02

3.1.1 Code Requirements for which Relief is Requested

ASME Code, Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components, 1995 Edition with 1996 Addenda, Table IWB-2500-1, Examination Category B-K, Item B10.10, requires a surface examination of areas A-B and C-D on welded attachments similar to those shown on Figure IWB-2500-13. Relief is requested from the surface examination requirement of Table IWB-2500-1, Examination Category B-K, Item B10.10 for area C-D as shown on Figure IWB-2500-13. The specific components covered by this relief are welded attachments SG-0006 and SG-0013 on steam generators RC-H-1A and RC-H-1B.

3.1.2 Licensee's Basis for Alternative (as stated)

> Pursuant to 10 CFR 50.55a(g)(5)(iii), relief is requested on the basis that conformance with the Code requirements is impractical.
>
> Relief is requested from performing the Code required surface examination of area C-D of the referenced welded attachments since the steam generator is designed in such a manner that access to this area for a meaningful examination is impractical. Detail "X" of drawing 131117E shows final machining details for these welds. Substantial surface preparation would be required to perform a surface examination. Access restrictions reduces to a 1¾ inch radius at this area precluding sufficient access for surface examination or weld preparation equipment and personnel.

3.1.3 Licensee's Proposed Alternative Examination

As an alternative to the Code-required surface examination of areas shown on Figure IWB-2500-13, the following examinations will be performed:

(1) Code-required surface examination of area A-B as shown on Figure IWB-2500-13
(2) Visual examination of area C-D as shown on Figure IWB-2500-13

3.1.4 Evaluation

The Code requires a surface examination of areas A-B and C-D on welded attachments similar to those shown on Figure IWB-2500-13. Relief is requested from the surface examination requirement of Table IWB-2500-1, Examination Category B-K, Item B10.10 for area C-D as shown on Figure IWB-2500-13. The specific components covered by this relief are welded attachments SG-0006 and SG-0013 on steam generators RC-H-1A and RC-H-1B. The NRC staff has reviewed the licensee's documentation and drawing number 131117E. The NRC staff finds the steam generator is designed in such a manner that access to area C-D for a meaningful surface examination is impractical. Detail "X" of drawing 131117E shows final machining details for these welds. Substantial surface preparation would be required to perform a surface examination. Access restrictions reduces to a 1¾-inch radius at this area, precluding sufficient access for surface examination or weld preparation equipment and personnel.

Based on the access restriction, the NRC staff finds imposition of the Code requirement would require redesign and would be an excessive burden on the licensee. As an alternative to the Code-required surface examination of the areas shown on Figure IWB-2500-13, the following examinations will be performed. The Code-required surface examination of area A-B as shown on Figure IWB-2500-13, and visual examination of area C-D as shown on Figure IWB-2500-13.

The NRC staff finds that the combination of the Code-required surface examination on the outside surface of the subject welds in conjunction with a visual examination of the inside surface will provide reasonable assurance of continued structural integrity. Therefore, granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that would result if the requirements were
imposed on the facility. The requested relief is granted for the third 10-year ISI interval at TMI-1.

3.2 RELIEF REQUEST RR-00-03

3.2.1 Code Requirements for which Relief is Requested

ASME Code, Section XI, Table IWB-2500-1, Examination Category B-B, Item B2.70, requires volumetric examination of 1 foot of longitudinal welds intersecting the circumferential weld at each end of the heat exchanger primary side shell. The examination may be limited to 1 vessel among the group of vessels performing a similar function. Relief is requested from the volumetric examination requirements of Table IWB-2500-1, Examination Category B-B, Item B2.70 (examination of 1 foot of longitudinal welds intersecting the circumferential), for the following longitudinal welds on letdown coolers MU-C-1A and MU-C-1B: Welds MU-1019L, MU-1020L, MU-1021L, MU-1022L, MU-1034L, MU-1035L, MU-1036L, MU-1037L.

3.2.2 Licensee's Basis for Alternative (as stated)

> Pursuant to 10 CFR 50.55a(g)(5)(iii), relief is requested on the basis that conformance with the Code requirements is impractical.
>
> Relief is requested from the Code required examination because the design of the letdown coolers precludes accessibility to the subject area of interest required to be examined. The letdown coolers are of a helical coil design using a split manifold to allow for tube expansion and seal welding prior to completing manufacture of the manifold. The tube bundle and all but approximately 1¼ inch of the inlet and 2¾ inch of the outlet manifolds are then covered by the Class 3 (heat sink) side of the heat exchanger. Access is therefore limited to the short section of manifold outboard of the heat sink side of the vessel. In order to complete the volumetric examination to the extent required by the Code, the letdown coolers would require extensive modifications to obtain access.
>
> The accessible portions of the subject welds are the most highly stressed areas and will receive the Code-required volumetric examination.

3.2.3 Licensee's Proposed Alternative Examinations

As an alternative to the Code-required examination, AmerGen proposes to volumetrically examine the accessible length of all manifold welds on one cooler during the third 10-year interval.

3.2.4 Evaluation

ASME Code, Section XI, Table IWB-2500-1, Examination Category B-B, Item B2.70, requires volumetric examination of 1 foot of longitudinal welds intersecting the circumferential weld at each end of the heat exchanger primary side shell. Relief is requested for the following longitudinal welds on letdown coolers MU-C-1A and MU-C-1B: Welds MU-1019L, MU-1020L, MU-1021L, MU-1022L, MU-1034L, MU-1035L, MU-1036L, and MU-1037L. As an alternative to the Code required examination, AmerGen proposes to volumetrically examine the accessible length of all manifold welds on one cooler during the third 10-year interval. The NRC staff has reviewed the drawings and documentation submitted by the licensee and determined that the volumetric examination of 1 foot of longitudinal weld at each end of the shell welds is impractical to perform due to inaccessibility. To provide access for volumetric examination, design modifications or replacement would be required.

The accessible portions of the subject welds are the most highly stressed areas and will receive volumetric examination. The NRC staff finds the Code-required volumetric examination of the accessible portions of the welds will provide reasonable assurance of continued structural integrity. In addition, the letdown coolers receive a visual, VT-2, examination prior to plant startup following each reactor refueling outage in accordance with the requirements of ASME Code, Section XI, Examination Category B-P, Item No. B15.40. Therefore, granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. The requested relief is granted for the third 10-year ISI interval at
TMI-1.

3.3 RELIEF REQUEST RR-00-04

3.3.1 Code Requirements for which Relief is Requested

ASME Code, Section XI, Table IWC-2500-1, Examination Category C-B, Item C2.32, requires a volumetric examination of the inner 1/3 wall thickness of nozzle welds and the nozzle inner radii as shown in Figure IWC-2500-4(c) when the inside of the vessel is accessible.

3.3.2 Licensee's Basis for Alternative

An alternative is requested from performing the Code-required volumetric examinations. Examination from the inside surface would require the development of remote-operated scanners and data acquisition systems to minimize dispersion of sound and control of search unit skew angles in lieu of a manual examination. AmerGen does not consider this technology to be reasonably available for such a specific nozzle design and application with any certainty of the results. Significant lead-time would be required for technique development and personnel training. It is expected that there would be insufficient notification time, in the event that cooler maintenance were to become necessary.

Additionally, AmerGen estimates a dose rate of 500 mR/hr would be encountered at the cooler interior, which would also limit possible interior examination techniques. A manual examination, if attempted, would require approximately 2 hours of scanning inside the cooler.

3.3.3 Licensee's Proposed Alternative Examinations

As an alternative to the Code-required examination, AmerGen proposes to perform a liquid penetrant examination of the inside of the nozzles area G-I as shown by Figure IWC-2500-4(c) if the coolers are disassembled for maintenance. The relief covers nozzle-to-shell welds and nozzle inner radii on decay heat removal (DHR) coolers DH-C-1A and DH-C-IB. Specifically, the relief covers the following components: DH-0395B, DH-0397B, DH-0401B, and DH-403B.

AmerGen proposes that a liquid penetrant examination be performed on the inside surface of the nozzles when the coolers are disassembled for maintenance. The liquid penetrant examination of the area of interest would require about 10 minutes of time inside the cooler greatly minimizing the exposure of personnel as compared to the manual ultrasonic examination. In addition, the liquid penetrant examination would provide a more reliable and sensitive examination for inside diameter (ID)-initiated flaws than would the ultrasonic examination. Any ultrasonic examination indications in this area would likely require their confirmation by either liquid penetrant or eddy current examination. AmerGen believes that the overall level of plant safety will be increased by performing the proposed alternative examination in lieu of the Code-required ultrasonic examination.

3.3.4 Evaluation

The Code requires that the subject nozzle welds and associated inner radii receive a volumetric examination when the inside of the vessel is accessible. The licensee proposes to perform a surface examination (penetrant test or PT) of the inside surface of the nozzles if the cooler is disassembled for maintenance. The licensee discusses the difficulty of examining these welds using ultrasonic testing. In addition, the licensee also identified concerns with maintaining doses as low as reasonably achievable (ALARA) if the examination were imposed. The licensee estimates a dose rate of 500 mR/hr would be encountered at the cooler interior, which would also limit possible interior examination techniques. A manual UT examination, if attempted would require approximately 2 hours of scanning inside the cooler. The licensee's alternative to perform a surface examination of the area of interest would require about ten minutes of exposure time in the cooler. Based on the ALARA considerations associated with the examination of the nozzle welds and inner radii, the surface examination would minimize personnel exposure. In addition, the objective of the required examination is to detect service induced flaws initiating at the ID, a PT examination would provide reasonable assurance of the continued inservice structural integrity.

In order to perform the Code required examination, the licensee would have to develop an automated data acquisition and analysis system with a remote operated manipulator. This technology is not readily available for such a specific nozzle design. The NRC staff finds that complying with the Code requirement would result in hardship or unusual difficulty which is not compensated by an increase in safety above that provided by the proposed alternative. Therefore, the licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) for the third 10-year ISI interval at TMI-1.

3.4 RELIEF REQUEST RR-00-05

3.4.1 Code Requirements for which Relief is Requested

ASME Code, Section XI, Table IWC-2500-1, Examination Category C-A, Item C1.10, requires a 100% volumetric examination, as defined by Figure IWC-2500-1, of the heat exchanger shell welds at gross structural discontinuities.

3.4.2 Licensee's Basis for Relief

Pursuant to 10 CFR 50.55a(a)(3)(ii), an alternative is requested on the basis that compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Relief is requested from performing 100% of the Code required volumetric examination because of restricted access to the welds due to the cooler design which utilizes a removable primary head and tubesheet bundle in its design. The primary head (Class 2) is bolted to the tubesheet and heat exchanger shell (Class 3). Drawing B-25533-A shows that the head has a retaining ring (Item A3) to shell (Item A1) weld covered by a sliding flange (Item A4). This design makes examination of these welds impractical. The licensee submitted drawings that show there is no scan surface available for ultrasonic examination while the cooler is in the assembled condition. Even disassembled, insufficient outer diameter scan surface is available to perform UT examination.

If the cooler is required to be disassembled for maintenance, UT of the weld from the end surface or inside surface may be possible. AmerGen estimates the dose rates to be approximately 500 mR/hr at the inside surface of the cooler. If a liquid penetrant inspection of the weld was considered, AmerGen estimates that the examination of the inside surface would require only 10 to 15 minutes at the weld as compared with an estimated 2 to 3 hours of personnel time at the weld for UT. Liquid penetrant examination of the outside diameter (OD) surface would result in minimal personnel exposure compared to examinations on the inside end surfaces.

Disassembly and inspection of this cooler to accommodate required examinations would require approximately four man-weeks of labor and an estimated exposure of 2.5 Person-Rem. Disassembly of the cooler would require a decay heat removal system train be out of service for an extended length of time. It is difficult to obtain an ideal seal on the flanged connections which are prone to leakage.

Disassembly solely for the purpose of inspection would increase the probability of primary coolant leakage in the auxiliary building. Also, taking a train of decay heat removal out of service increases the likelihood of a loss of decay heat removal event as described in NRC Generic Letter 88-17.

The cooler is designed for the maximum allowable working pressure and temperature (505 psig at 250° F). The weld was 100% radiographed during fabrication. Therefore, unacceptable fabrication related flaws should not exist. The borated water storage tank (BWST) provides a constant 40 psig static head to the cooler while in the standby mode. Throughwall leakage, if not

detected during the scheduled VT-2 examinations, would be detected by an increase in activity along with an increase in auxiliary building sump level or a decrease in BWST level.

3.4.3 Licensee's Proposed Alternative Examination

As an alternative to the Code-required examination, AmerGen proposes to perform a liquid penetrant examination of the ID and OD surface of the weld on one cooler should one or both coolers require disassembly for maintenance or repair during the interval. In addition, a VT-2 examination of the weld area will be performed, once each period, on each cooler while the cooler is in service.

Inservice-induced flaws would originate from the inside or outside surface of the weld. Liquid penetrant examinations would provide a more reliable and sensitive examination for surface propagating flaws than would UT. If the cooler is disassembled, a liquid penetrant examination of the weld will be performed on both the inside and outside surfaces. A VT-2 examination, with emphasis on this area, will be performed each period whether the cooler is disassembled or not. Use of the alternative examination would not result in a decrease in the overall plant safety for the following reasons. Disassembly of the cooler only for inspection purposes would increase the likelihood of leakage from the bolted connections. Sufficient monitoring is in place to detect through-wall leakage if it were to occur. If the cooler is disassembled for maintenance, a liquid penetrant test would be performed and would provide adequate sensitivity to detect service-induced flaws.

3.4.4 Evaluation

The Code requires that one of the retaining ring to shell welds on the DHR coolers receive a volumetric examination each 10-year ISI interval. A volumetric examination of this weld would be a hardship because of the design and the high radiation levels inside the cooler. With the sliding flange design, the weld is inaccessible for ultrasonic examination in the assembled position, and essentially inaccessible when disassembled. When disassembled, the only access to this weld for ultrasonic examination would be from the inside surface. The estimated dose rate on the inside surface of the coolers is approximately 500mR/hour. A volumetric examination of this weld would require approximately 2 hours of personnel time at the weld. The licensee's proposed alternative is to perform a liquid penetrant (PT) examination of both the OD and ID surfaces of the weld if one of the coolers requires disassembly for maintenance or repair during the interval. Service induced defects would initiate from the surfaces of the weld, therefore the NRC staff finds the proposed alternative would provide reasonable assurance of the continued inservice structural integrity of the weld.

The licensee submitted drawings that show there is no scan surface available for ultrasonic examination while the cooler is in the assembled condition. Even disassembled, insufficient outer diameter scan surface is available to perform UT examination. The NRC staff finds that complying with the Code required volumetric examination would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Therefore, based on the difficulty of performing the Code required examination and the reasonable assurance provided, the licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) for the third 10-year ISI interval at TMI-1.

3.5 RELIEF REQUEST RR-00-06

3.5.1 Code Requirements for which Relief is Requested

ASME Code, Section XI, Table IWF-2500-1, Examination Category F-A, Item F1.40 requires a Visual VT-3 examination of the reactor pressure vessel (RPV) support skirt to the extent defined in IWF-1300 and IWF-2510 and as shown by Figure IWF-1300-1

3.5.2 Licensee's Basis for Relief (as stated)

> Pursuant to 10 CFR 50.55a(g)(5)(iii), relief is requested on the basis that conformance with the Code requirements is impractical.
>
> Relief is requested from performing the Code required examination because of restricted access to the reactor vessel support skirt caused by the design of the support skirt. The reactor vessel is supported by a support skirt bolted to the reactor building floor inside the primary shield wall.
>
> Access to the inside surface of the support skirt is obtained by entering a tunnel which leads to the reactor vessel lower head and incore instrument guide tubes. The entire lower head and approximately 50% of the support skirt are obstructed by mirror insulation when access is obtained from beneath the reactor vessel (reference drawing 500993001C). The inside anchor area and a portion of the support skirt are visible using remote hand held cameras for about 50% of the circumference. The remaining circumference, where the incore guide tubes exit the reactor vessel shield area, is inaccessible because of the guide tubes.
>
> Access to the outside surface of the skirt could only be obtained from the tip of the reactor vessel by lowering remote camera equipment between the reactor vessel and insulation and between the primary shield wall and insulation (reference drawing 500993001C). This approach requires removal of sand plugs and insulation to a lower level than would be required for access to the nozzle to pipe welds discussed in Relief Request RR-00-01. The cumulative exposure would be 87 Person-Rem. These visual examinations would increase that exposure. It would also be necessary to navigate between insulation supports using remote crawlers in order to view the anchor area.

3.5.3 Licensee's Proposed Alternative Examination

AmerGen proposes that based on the access restrictions, a VT-3 visual examination would be performed on the accessible areas of the RPV support skirt inside surface.

3.5.4 Evaluation

The Code requires a VT-3 visual examination of the reactor pressure vessel support skirt. Access to the internal surface of the RPV support skirt is limited due to mirror insulation and guide tubes. Access to the external surface of the support skirt can only be obtained by lowering remote camera equipment between the reactor vessel and insulation and between the primary shield wall and insulation. To access the external surface would require the removal of sand plugs and insulation which would involve significant radiation exposure. Due to difficulties in insulation removal and replacement in the confined area, obstruction from the guide tubes, and the radiation exposure involved, the licensee proposes to perform a limited remote VT-3 visual examination on the interior surface of the support skirt. The Code

requires a remote VT-3 visual examination to have a resolution capability at least equivalent to that obtainable by direct visual observation.

The NRC staff has reviewed the licensee's submittal including the drawing which shows the examination limitations. Based on the design of the RPV support skirt, the NRC staff concludes that visual examination to the extent required by the Code is impractical due to access restrictions with respect to the RPV support skirt.

The NRC staff feels that the licensee's proposed remote visual examination of approximately 50% of the interior support skirt will give reasonable assurance of continued structural integrity. Should maintenance activities be required, allowing access to the external area of the skirt or unexamined internal area, the NRC staff finds it prudent for the licensee to perform a visual examination at that time.

Therefore, granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Relief is granted for the third 10-year ISI interval at TMI-1.

3.6 RELIEF REQUEST RR-00-07

3.6.1 Code Requirements for which Alternative is Requested

ASME Code, Section XI, Subarticle IWA-2300 and Paragraph IWA-2312, require personnel performing nondestructive examinations not listed in SNT-TC-1A to be qualified and certified to a comparable level of qualification as defined in SNT-TC-1A and the employer's written practice.

3.6.2 Licensee's Basis for Alternative (as stated)

> Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested on the basis that the proposed alternatives provide an acceptable level of quality and safety.
>
> Section XI currently requires personnel conduction VT-2 inspections to be qualified and certified to comparable levels of qualification as defined in SNT-TC-1A and the Employer's written practice. However, unlike the nondestructive testing methods addressed within SNT-TC-1A, or VT-1 and VT-3 examination methods, VT-2 examinations do not require any special knowledge of underlying technical principles to perform the examination. It is only a straightforward examination to look for evidence of leakage or structural distress. No special skills or technical training are required in order to observe water dripping from a component or bubbles forming on a wetted joint. As such, VT-2 personnel should not be subject to the same qualification and certification requirements that were established for nondestructive testing personnel. Code Case [(CC)] N-546 and DG-1091 provide more appropriate requirements for the qualification and certification of VT-2 examination personnel.
>
> [CC] N-546 and the additional requirements of DG-1091 require personnel performing VT-2 visual inspections meet the following requirements:
>
> (1) Personnel shall have at least forty (40) hours of plant walkdown experience;

(2) Personnel shall receive a minimum of four (4) hours of training on Section XI requirements and plant specific procedures;
(3) Examination personnel shall be qualified by test to demonstrate knowledge of Section XI and plant specific procedures for VT-2 visual examination;
(4) Examination personnel shall be re-qualified by examination every three years;
(5) Personnel shall pass the vision test requirements of IWA-2321, 1995 Edition;
(6) This Code Case is applicable only the performance of VT-2 examinations.

This alternative to the existing Code requirements reduces the administrative burden of maintaining a Section XI qualification and certification program for VT-2 examiners, and allows for the use of personnel most familiar with the walkdown of plant systems, such as licensed and non-licensed operators, local leak rate test personnel, system engineers and examination personnel. The quality of VT-2 visual examinations will be maintained by using the alternative qualification criteria of the Code Case.

3.6.3 Licensee's Proposed Alternative

TMI-1 will use the provision of Code Case N-546, with the additional requirements as listed above in items (1) through (6), as an alternative to the requirements of ASME Code, Section XI, IWA-2300 for qualifying VT-2 visual examiners.

3.6.4 Evaluation

The Code requires personnel performing VT-2 visual examinations be qualified and certified using a written, approved procedure prepared in accordance with SNT-TC-1A. The Code also requires examination personnel meet near and far distance acuity requirements. Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee proposed to use Code Case N-546 along with additional provisions as stated above. The NRC staff considers the qualification requirements in Code Case N-546 with the added provisions, to be comparable to those of the ASME Code, Section XI, paragraph IWA-2300, for VT-2 visual examination personnel. With regard to the selection of personnel to conduct the test, the Code Case states that licensed and non-licensed operators, local leak rate personnel, system engineers, and inspection and nondestructive examination personnel may be eligible if they possess certain plant walkdown experience. The NRC staff agrees that personnel fulfilling these responsibilities and positions typically have a sound working knowledge of plant systems and components, and of piping layouts, making them knowledgeable candidates for performing VT-2 visual examinations. The Code Case also requires a vision test for examination personnel that is in accordance with the 1995 Edition of the Code. The licensee included that VT-2 visual examination personnel be required to demonstrate knowledge of Section XI and plant-specific procedures for VT-2 visual examinations and to demonstrate continued proficiency through periodic re-qualification every 3 years. The NRC staff believes that periodic re-certification is necessary to demonstrate continued qualification, and finds that re-certification every 3 years is consistent with the frequency specified in IWA-2314 of the ASME Code, 1995 Edition with the 1996 Addenda. Therefore, for the purpose of performing VT-2 examinations, the NRC staff finds the licensee's proposed alternative provides an acceptable level of quality and safety. The proposed vision test alternative provides assurance that the person performing the examination will have acceptable vision.

Therefore, the NRC staff concludes that the use of the licensee's alternative to implement Code Case N-546, supplemented with the additional provisions pertaining to testing and re-certification of VT-2 examination personnel, for the performance of VT-2 examinations, is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year ISI interval at TMI-1 or until such time Code Case N-546 is referenced in a future revision of Regulatory Guide (RG) 1.147, "Inservice inspection Code Case Acceptability -- ASME Section XI, Division 1." At that time, if the licensee intends to continue to implement Code Case N-546, the licensee must follow all provisions in the subject Code Case with limitations or conditions, if any, specified in RG 1.147.

3.7 RELIEF REQUEST RR-00-08

3.7.1 Code Requirements for which Alternative is Requested

ASME Code, Section XI, Paragraph IWA-5242(a) states, "For systems borated for the purpose of controlling reactivity, insulation shall be removed from the pressure retaining bolted connections for VT-2 visual examination." The VT-2 visual examination is required to be performed coincident with the system leakage test at nominal operating pressure and temperature.

3.7.2 Licensee's Basis for Alternative (as stated)

Pursuant to 10 CFR 50.55a(a)(3)(i), an alternative is requested on the basis that the proposed alternative would provide an acceptable level of quality and safety.

An alternative is requested to the requirement to remove insulation from the subject bolted connections during the system leakage test at nominal pressure and temperature for the following reasons:

(1) Code Class 1 systems borated for the purpose of controlling reactivity are large extensive systems covering many areas and elevations. Scaffolding is required to access many of the bolted connections. In addition, many of the bolted connections are located in difficult to access areas and in medium to high radiation areas. Insulation removal combined with scaffolding requirements will increase refuel outage durations, personnel exposure, financial costs and generation of radwaste associated with the performance of VT-2 visual examinations.

(2) The VT-2 visual examination of Class 1 systems, primarily the Reactor Coolant System (RCS) piping and components which are located inside containment are performed at hot shutdown conditions. As required by IWB-5221, the RCS is at normal operating conditions. Removal/reinstallation of insulation for Class 1 systems pose significant radiological considerations. In addition, performance of the VT-2 visual examination, the removal/reinstallation of insulation, and the assembly/disassembly of scaffolding at bolted connections presents significant personnel safety considerations.

The following TMI Unit 1 bolting examination commitments in conjunction with the Proposed Alternative Provisions provide an acceptable level of safety and quality for bolted connections in systems borated for the purpose of controlling reactivity.

In response to NRC Generic Letter 88-05, TMI Unit 1 has established a program for engineering to examine all boric acid leaks discovered in the containment building and to evaluate the impact of those leaks on carbon steel or low alloy steel components. Any evidence of leakage, including dry boric acid crystals or residue, is examined and evaluated regardless of whether the leak was discovered at power or during an outage. Issues such as the following are considered in the examination and evaluation:

(1) Evidence of corrosion or metal degradation
(2) Effect the leakage may have on the pressure boundary
(3) Possibility of boric acid traveling along the inside of insulation on piping
(4) Possibility of dripping or spraying other components

Based on this Evaluation, TMI Engineering initiates appropriate corrective actions to preclude reoccurrence of the leakage and to repair or replace, if necessary, any degraded materials or components.

3.7.3 Licensee's Proposed Alternative Provisions

As an alternative to the Code required examination, AmerGen proposes the following:

For Class 1 systems borated for the purpose of controlling reactivity, a system leakage test shall be performed in accordance with the frequency required by Table IWB-2500, Category B-P without the removal of insulation at bolted connections. A minimum 4-hour hold time at normal system operating pressure prior to the VT-2 visual examination to allow for leakage propagation from the insulation shall be required. Additionally, the insulation shall be removed from Class 1 bolted connections and a VT-2 visual examination shall be conducted with the system depressurized. The frequency for these depressurized VT-2 visual examinations shall be in accordance with the system examination frequencies specified in Table IWB-2500, Category B-P, each refueling outage. The proposed alternative is consistent with the requirements of Code Case N-533. These examinations shall be implemented through application of the TMI-1 surveillance program to assure they are performed within the prescribed time periods.

3.7.4 Evaluation

Paragraph IWA-5242(a) requires the removal of all insulation from pressure-retaining bolted connections in systems borated for the purpose of controlling reactivity when performing VT-2 visual examinations during system pressure tests. However, requiring the licensee to remove insulation during the Class 1 pressure test would create a safety hazard due to elevated system temperatures that are present during this test, and would also result in excessive radiation exposure to plant personnel.

The licensee proposes, for Class 1 systems borated for the purpose of controlling reactivity, that a system leakage test shall be performed in accordance with the frequency required by Table IWB-2500,

Category B-P without the removal of insulation at bolted connections. A minimum 4-hour hold time at normal system operating pressure prior to the VT-2 visual examination to allow for leakage propagation from the insulation shall be required. Additionally, the insulation shall be removed from Class 1 bolted connections and a VT-2 visual examination shall be conducted with the system depressurized. The frequency for these depressurized VT-2 visual examinations shall be in accordance with the system examination frequencies specified in Table IWB-2500, Category B-P, each refueling outage. The proposed alternative is the same as the requirements of Code Case N-533 with the additional provision of a 4-hour hold time prior to the VT-2 visual examination.

The NRC staff finds that use of Code Case N-533 with the provision of a 4-hour hold time provides an acceptable approach to ensuring leak-tight integrity of systems borated for the purpose of controlling reactivity. The licensee's approach includes a system pressure test with a 4-hour hold time prior to a VT-2 visual examination each outage for Class 1 systems. The 4-hour hold time will allow any leakage to penetrate the insulation, thus, providing a means of detecting any significant leakage with the insulations in place. By removing the insulation each outage for Class 1 systems, the licensee will be able to detect minor leakage indicated by the presence of boric acid crystals or residue. The NRC staff finds this two-step approach will

provide an acceptable level of quality and safety for bolted connections in borated Class 1 systems.

Therefore, use of the proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year ISI interval at TMI-1 or until such time Code Case N-533 is referenced in a future revision of RG 1.147, "Inservice inspection Code Case Acceptability -- ASME Section XI, Division 1." At that time, if the licensee intends to continue to implement Code Case N-533, the licensee must follow all provisions in the subject Code Case with limitations or conditions, if any, specified in RG 1.147.

3.8 RELIEF REQUEST RR-00-09

3.8.1 Code Requirements for which Alternative is Requested

ASME Code, Section XI, Table IWB-2500-1, Examination Category B-P, Item B15.20, pressure retaining bolting on the pressurizer heaters, requires a system leakage test each refueling outage in accordance with IWB-5000 and IWA-5000. IWA-5242(a) further states that "for systems borated for the purpose of controlling reactivity, insulation shall be removed from the pressure retaining bolted connections for VT-2 visual examination."

The licensee proposes an alternative to the Code requirements of IWA-5242(a) which requires the insulation to be removed from pressure retaining bolted connections when performing a VT-2 visual examination on systems borated for the purpose of controlling reactivity.

3.8.2 Licensee's Basis for Alternative (as stated)

> Pursuant to 10 CFR 50.55a(a)(3)(ii), an alternative is requested on the basis that compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Removing insulation surrounding the pressurizer heater connections is a hardship due to [a] concern about damage to the heaters associated with the insulation removal and with the personnel radiation exposure associated with that operation. Wear and tear of the heater cable jackets has been noted to result in the past from activities such as removal and replacement of insulation. AmerGen has performed the VT-2 examination in the past and has never found evidence of leakage. The closure in question is different than the typical bolted connection partly because some of the joints are seal welded and that if the seal welds leaked, the leakage would be apparent without the removal of insulation. The benefit to be derived from the removal of the insulation in the area of the pressurizer heater connections does not justify actions that could potentially cause significant damage to the pressurizer heater connections.

3.8.3 Licensee's Proposed Alternative Examinations

AmerGen proposes to conduct the VT-2 visual examination of the areas of bolted connections around the pressurizer heater electrical connections each refueling outage with the plant at hot shutdown conditions, but with the insulation around the heater connections installed. A minimum of 4 hours at nominal operating pressure before the VT-2 visual examination shall be required.

3.8.4 Evaluation

The Code requires a system leakage test each refueling outage in accordance with IWB-5000 and IWA-5000 for pressure retaining bolting on the pressurizer heaters. IWA-5242(a) further states that "for systems borated for the purpose of controlling reactivity, insulation shall be removed from the pressure retaining bolted connections for VT-2 visual examination."

The licensee proposes an alternative to the Code requirements of IWA-5242(a) which requires the insulation to be removed from pressure retaining bolted connections when performing a VT-2 visual examination on systems borated for the purpose of controlling reactivity. The licensee proposes to conduct the VT-2 visual examination of the areas of bolted connections around the pressurizer heater electrical connections each refueling outage with the plant at hot shutdown conditions, but with the insulation around the heater connections installed. A minimum of 4 hours at nominal operating pressure before the VT-2 visual examination shall be required.

The NRC staff finds that removing insulation surrounding the pressurizer heater connections is a hardship due to a concern about damage to the heaters associated with the insulation removal and with the personnel radiation exposure associated with that operation. Wear and tear of the heater cable jackets has been noted to result in the past from activities such as removal and replacement of insulation. The licensee has performed the VT-2 examination in the past and has never found evidence of leakage. The closure in question is different than the typical bolted connection partly because some of the joints are seal welded and that if the seal welds leaked, the leakage would be apparent without the removal of insulation. Based on the above, the NRC staff finds the specified requirement would result in a hardship without a compensating increase in the level of quality and safety.

Therefore, use of the proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) for the third 10-year ISI interval at TMI-1.

3.9 RELIEF REQUEST RR-00-10

3.9.1 Code Requirements for which Alternative is Requested

ASME Code, Section XI, Table IWC-2500-1, Examination Category C-H, Item C7.30, requires a system leakage test with a VT-2 visual examination each inspection period. IWC-5221 states that the nominal operating pressure during system operation shall be acceptable as the test pressure for the system leakage test.

The licensee is requesting an alternative from performing the system leakage test required by the Code for the emergency feedwater (EFW) system piping from the EF-V30 control valves to the EF-V12 check valves.

3.9.2 Licensee's Basis for Alternative (as stated)

> Pursuant to 10 CFR 50.55a(a)(3)(i), an alternative is requested on the basis that the proposed alternatives provide an acceptable level of quality and safety.
>
> The EFW system is a standby system used for emergency addition of feedwater to the Once Through Steam Generators (OTSGs). The only other time the EFW pumps are operated is for testing in accordance with the Technical Specifications and the Inservice Testing Program. Testing this section of piping at nominal EFW pressure requires operating one or more EFW pumps and injecting room temperature condensate onto the hot tubes in the upper region of the OTSGs. This thermal shock increases the likelihood of initiating or propagating OTSG tube cracks. The water in the condensate storage tank is also highly oxygenated, causing increased corrosion in the OTSGs.
>
> The leakage test for welds in this piping would be performed using the corresponding OTSG as the pressure source if there is sufficient back-leakage past check valves EF-V12A/B. If there is not sufficient back-leakage, a hydrostatic test pump would be the source of pressure and the piping will be pressurized to slightly less than OTSG pressure (to avoid unseating the check valves and potentially creating back-leakage).
>
> AmerGen has evaluated alternatives that would allow this section of piping to be tested at nominal EFW pressure without injecting cold oxygenated water in to the OTSGs. One option would involve throttling the EFW pump discharge control valves EF-V30/A/B/C/D to minimize the amount of condensate injected into the OTSGs. However, the pressure drop across the throttled valve would still result in a pressure less than nominal EFW pressure in the piping covered by this relief request. Another option considered was to replace the tilting disc check valves with stop check valves so that the valves could be used to isolate that section of piping for testing. AmerGen concluded that the cost of this modification would be too high considering that the only benefit gained would be a slight increase in pressure during the leakage test.
>
> The section of piping included in this alternative is within the scope of the Inservice Inspection Program and requires both volumetric and surface examination on a periodic basis. Three of the eleven welds in this section of the EFW system are between valves EF-V-30 and EF-V-12. All welds are similar in types and welding techniques and experience similar service conditions.

> These factors combined give assurance that, if degradation of the welds should occur, it would be detected by the nondestructive examinations before leaks develop.
>
> Therefore, AmerGen concludes that the benefit to be gained by conducting the test at higher test pressures does not justify the cost and risk of the actions that would be required to meet the Code requirement.

3.9.3 Licensee's Proposed Alternative Provisions

The licensee proposes to perform the leakage test at the nominal operating pressure for the OTSGs (approximately 900 psig).

3.9.4 Evaluation

The Code requires a system leakage test with a VT-2 visual examination each inspection period. IWC-5221 states that the nominal operating pressure during system operation shall be acceptable as the test pressure for the system leakage test. The nominal operating pressure for EFW system piping from the EF-V30 control valves to the EF-V12 check valves is approximately 1050 psig. As an alternative, the licensee proposes to perform the VT-2 leakage test at nominal operating pressure for the OTSGs, which is approximately 900 psig. Testing the system at 900 psig is sufficient pressure such that any through-wall cracking or damage would be detected. To require the licensee to perform the test at the slightly higher test pressure of 1050 psig could potentially cause damage to the OTSG tubes. The NRC staff has evaluated the licensee's submittal and finds that testing the subject system at the proposed test pressure of 900 psig will provide adequate assurance of structural integrity.

In addition, this section of piping is within the scope of the ISI Program and requires both volumetric and surface examination on a periodic basis. Three of the 11 welds in this section of the EFW system are between valves EF-V-30 and EF-V-12. The NRC staff finds that the pressure test at the lower pressure (900 psig in lieu of 1050 psig), in conjunction with the periodic volumetric and surface examinations, provide an acceptable level of quality and safety. Therefore, use of the proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year ISI interval at TMI-1.

3.10 RELIEF REQUEST RR-00-11

3.10.1 Code Requirements for which Alternative is Requested

ASME Code Section XI, Subsection IWA-5250(a)(2), requires that 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.

3.10.2 Licensee's Basis for Relief (as stated)

> Pursuant to 10 CFR 50.55a(a)(3)(i), an alternative is requested on the basis that the proposed alternative provide[s] an acceptable level of quality and safety.

Removal of pressure retaining bolting at mechanical connections for VT-3 visual examination and subsequent evaluation, in locations where leakage has been identified, is not always the most discerning course of action to determine acceptability of the bolting. The Code requirement to remove, examine, and evaluate bolting in this situation does not allow the owner to consider other factors which may indicate the acceptability of the mechanical joint bolting.

Other factors which should be considered when evaluating bolting acceptability when leakage has been identified at a mechanical joint include, but are not limited to: joint bolting material, service age of joint bolting material, location of leakage, history of leakage at the joint, evidence of corrosion with the joint assembled, and corrosiveness of the process fluid.

Performance of the pressure test while the system is in service may identify leakage at a bolted connection that, upon evaluation may conclude that the integrity and pressure retaining ability of the joint is not challenged. It would not be prudent to negatively impact the availability of a safety system to perform its safety function.

A situation frequently encountered at AmerGen nuclear facilities is the complete replacement of bolting materials (studs, bolts, nuts, washers, etc.) at mechanical joints during plant outages. When the associated system piping is pressurized during plant startup, leakage may be identified at those joints. The root cause of this leakage is most often due to thermal expansion of the piping and bolting materials at the joint and subsequent fluid seepage at the joint gasket. Proper re-torquing of the joint bolting, in most cases, stops the leakage. Removal of the joint bolting to evaluate for corrosion would be unwarranted in this situation due to the new condition of the bolting material.

3.10.3 Licensee's Proposed Alternative Provisions

As an alternative to the bolt removal requirements of Subsection IWA-5250(a)(2), the licensee proposes the following requirements from ASME Code, Section XI, Code Case N-566-1, be implemented in response to detection of leakage at a pressure-retaining bolted connection during a VT-2 visual examination:

(a) Stop the leak and evaluate the bolting and the component material for joint integrity as described in (c) below.

(b) If the leakage is not stopped, evaluate the joint for joint integrity in accordance with IWB-3142.4. This evaluation shall include the considerations listed in (c) below.

(c) The evaluation in (a) and (b) is to determine the susceptibility of the bolting to corrosion and failure. The evaluation shall include the following:
- The number and service age of bolts;
- Bolt and component material;
- Corrosiveness of process fluid;
- Leakage location and system function;
- Leakage history at the connection or other system components; and
- Visual evidence of corrosion at the assembled connection.

When the pressure test is performed on a system that is in service or that Technical Specifications (TSs) require to be operable, and the bolting is susceptible to corrosion, the evaluation shall address the connection's structural integrity until the next component/system outage of sufficient duration. If the evaluations conclude the system can perform its safety-related function, removal of the bolt closest to the source of the leakage and a VT-3 visual examination (the acceptance criteria for the VT-1 visual examination will be used to assess the acceptability of the bolting) of the bolt will be performed when the system or component is taken out of service for sufficient duration (to accomplish other system maintenance activities).
For bolting that is susceptible to corrosion, and when the initial evaluation indicates that the connection cannot conclusively perform its safety function until the next component/system outage of sufficient duration, the bolt closest to the source of the leakage will be removed, and a VT-3 visual examination will be performed and results evaluated in accordance with IWA-3100(a).

3.10.4 Evaluation

The Code requires that 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. In lieu of this requirement, the licensee has proposed to perform an evaluation of the bolting and its susceptibility to corrosion. Based on the items included in the evaluation process and the visual examination of any removed bolting, the evaluation proposed by the licensee provides a sound engineering approach. This approach will result in removal of bolting when necessary to assure the integrity of the joint, rather than all cases regardless of the merits of bolt removal. If the engineering evaluation indicates the need for examination of the bolting, the bolt closest to the source of leakage will be removed, visually examined and evaluated for further corrective action. The NRC staff concludes that the licensee's proposed alternative to use Code Case
N-566-1 provides an acceptable level of quality and safety.

Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the licensee's proposed alternative is authorized for the third 10-year ISI interval at TMI-1 or until such time as Code Case N-566-1 is published in RG 1.147. At that time, if the licensee intends to continue to implement Code Case N-566-1, the licensee must follow all provisions in the subject Code Case with limitations or conditions, if any, specified in RG 1.147.

3.11 RELIEF REQUEST RR-00-12

3.11.1 Code Requirements for which Alternative is Requested

The ASME Code, Section XI, Table IWD-2500-1, Examination Category D-B, Item D2.20, requires a system hydrostatic test, VT-2 visual examination, each inspection period per the requirements of IWD-5222.

3.11.2 Licensee's Basis for Relief

Pursuant to 10 CFR 50.55a(a)(3)(i), an alternative is requested on the basis that the proposed alternative provides an acceptable level of quality and safety.

The ASME Code, Section XI, committees and working groups have over recent years reviewed the requirements for hydrostatic testing. Code committee consensus acknowledged that the small increase in system pressure and limited challenge to pressure boundary integrity associated with a hydrostatic test versus the pressure for the system leakage test did not offset the hardship imposed by the performance of the hydrostatic test. As a result, Code Case N-498-1 was published and endorsed by the NRC in RG 1.147, Revision 12. The 1995 Edition and 1996 Addenda incorporated the requirements of Code Case N-498-1 (system leakage tests in place of hydrostatic tests) into Tables IWB-2500, Category B-P and IWC-2500, Category C-H. Code Case N-498-1 was subsequently annulled. However, the pressure test requirements for Class 3 stated in N-498-1 and endorsed by the NRC were erroneously omitted in the Code revision as shown by Table IWD-2500, Category D-B, which still requires a system hydrostatic test. The working group recognized this omission and unanimously approved File ISI 00-11 (WG 98-0-4: S G99-12). The issue was considered through the Main Committee under BPV LB 00-06.

The ASME Code committee has subsequently approved Code Case N-498-4 for use regarding pressure testing of Class 1, Class 2, and Class 3 systems. Code Case N-498-4 allows the alternative use of a system leakage test in lieu of hydrostatic testing for Class 3 systems. However, the Code Case does not require any hold time prior to the performance of the VT-2 examination. Contrary to the Code Case, TMI-1 would impose the following hold times:

> For insulated systems, a 4-hour hold time would be required at system operating pressure and temperature.
>
> For non-insulated systems a hold time of 10 minutes would be required at system operating pressure and temperature.

3.11.3 Licensee's Proposed Alternative Provisions

As an alternative to the Code requirements for Class 3 systems of Table IWD-2500-1, Examination Category D-B, Item D2.20, the licensee proposes to perform a system leakage test each inspection period in lieu of hydrostatic testing per Code Case N-498-4.

The following hold times for the system pressure test would be imposed in addition to the requirements of Code Case N-498-4.

> For insulated systems, a 4-hour hold time would be required at system operating pressure and temperature.
>
> For non-insulated systems a hold time of 10 minutes would be required at system operating pressure and temperature.

3.11.4 Evaluation

The Code requires a system hydrostatic test be performed once per interval to include all Class 3 pressure retaining components and piping at a test pressure greater than the normal operating pressure. In lieu of performing the system hydrostatic test at a pressure greater than the system's

normal operating pressure, the licensee proposes to perform the test at a reduced test pressure equal to the system's normal operating pressure for Class 3 components.

NRC RG 1.147, Revision 12, lists Code Case N-498-1, "Alternative Rules for 10-Year System Hydrostatic Test for Class 1, 2, and 3 Systems," as an acceptable Code Case for licensees to use without the need to request relief. The Code Case describes an alternative to the 10-year system hydrostatic test performed at a test pressure greater than normal operating pressure. The alternative allows a system pressure test which is performed at a test pressure equal to the system's normal operating pressure for all ASME Code, Class 1, 2, and 3 systems. However, the 1995 Edition with the 1996 Addenda of the ASME Code, Section XI, eliminated the system hydrostatic test requirement for Class 1 and Class 2 components, while keeping the system hydrostatic test requirement for Class 3 components. The system hydrostatic testing at a higher test pressure increases the use of resources for the licensee resulting from use of auxiliary equipment, special valve line-ups, increased testing time, and possible radiation exposure. The minimal increase in assurance of structural integrity provided by a slightly higher test pressure is not considered commensurate with the increase in burden. The NRC staff finds that the licensee's proposed alternative is equivalent to Code Case N-498-1, which has been approved for use. Therefore, the NRC staff finds the licensee's proposed alternative will provide an acceptable level of quality and safety.

Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the licensee's proposed alternative is authorized for the third 10-year ISI interval at TMI-1 for Examination Category D-B, Item D2.20 components.

3.12 RELIEF REQUEST RR-00-13

3.12.1 Code Requirements for which Alternative is Requested

ASME Code, Section XI, Tables IWB-2412-1, IWC-2412-1, IWD-2412-1, and IWF-2410-2 list the required percentages that must be performed per inspection period in accordance with Inspection Program B. An alternative is requested from the Code requirements for examination percentage completion identified in Tables IWB-2412-1, IWC-2412-1, IWD-2412-1, and IWF-2410-2.

3.12.2 Licensee's Basis for Alternative

Pursuant to 10 CFR 50.55a(a)(3)(i), an alternative is requested on the basis that the proposed alternative would provide an acceptable level of quality and safety.

The inspection program percentage tables of ASME Code, Section XI, were originally established such that approximately one-third of the non-deferred component examinations would be performed each period. The emergence of longer plant operating fuel cycles coincident with efforts to reduce the length of refueling outages have limited the amount of time available to perform examinations. These factors make it difficult to plan and complete the Code required percentages of examinations in allotted critical path time.

The alternative provision was developed to address these issues. Expansion of the range for examination completion percentages shown in Table 1 allows component examinations to be more evenly distributed between outages. In addition, this expansion minimizes the need to schedule excessive numbers of examinations during a specific outage, and allows for a more uniform distribution

between outages that is more conducive to performing quality examinations. Repetitive costs associated with inspections, such as the erecting and disassembly of scaffolding, and labor costs associated with acquiring inspectors each outage, can be minimized through balancing the inspection percentages.

3.12.3 Licensee's Proposed Alternative Provisions

As an alternative to the Code requirements for the determination of examination percentage completion identified in Section XI, Tables IWB-2412-1, IWC-2412-1, IWD-2412-1, and IWF-2412-2, the licensee proposes the use of the examination percentages derived from Code Case N-598 and identified in Table 1 below.

TABLE 1

Inspection Interval	Inspection Period, Calendar Years of Plant Service Within the Interval	Minimum Examinations Completed, %	Maximum Examinations Credited, %
3rd	3	16	50
	7	50[1]	75
	10	100	100

NOTE:
(1) If the first period completion percentages for any examination category exceeds 34%, at least 16% of the required examinations shall be performed in the second period.

3.12.4 Evaluation

The Code requires that the sequence of component examinations established during the initial ISI interval be repeated during each successive inspection interval to the extent practical. In addition, Tables IWB-2412-1, IWC-2412-1, IWD-2412-1, and IWF-2410-2 require a distribution of examinations each inspection period. The licensee proposes to use the examination percentages of Code Case N-598.

The Code scheduling philosophy requires periodic examination of selected areas to assure continued system operability and integrity. Modifying the schedule of examination areas for the licensee's third 10-year ISI interval provides the licensee with a means to enhance the overall efficiency of the ISI Program. Code Case N-598 and Section XI of the Code both require the same minimum percentage of examinations be completed each inspection period, but the Code Case allows a greater maximum percentage of examinations to be performed early in the interval.

The use of Code Case N-598 will establish a new sequence of component examinations. Since Code Case N-598 allows the licensee to perform examinations earlier in the interval, 10 years should not be exceeded between component examinations. Consequently, the use of Code Case N-598 will provide an acceptable level of quality and safety.

Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the licensee's proposed alternative is authorized for the third 10-year ISI interval at TMI-1 or until such time as Code Case N-598 is published in RG 1.147. At that time, if the licensee intends to continue to implement Code Case N-598, the licensee must follow all provisions in the subject Code Case with limitations or conditions, if any, specified in RG 1.147.

3.13 RELIEF REQUEST RR-8

3.13.1 Code Requirements From Which Relief is Requested

ASME Code, Section XI, 1992 Edition with 1992 Addenda, Subsection IWE, Table IWE-2500-1, Examination Category E-G, Pressure Retaining Bolting, Item E8.10, requires that Class MC bolted connections be subject to a VT-1 visual examination. Relief is requested from the ASME Code, Section XI, required VT-1 examinations specified in Table IWE-2500-1, Examination Category E-G, Pressure Retaining Bolting, Item E8.10. Deferral of inspection to the end of the interval is permissible.

3.13.2 Licensee's Basis For Relief

Pursuant to 10 CFR 50.55a(a)(3)(ii), relief is requested for TMI-1 on the basis that compliance with the specified Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Section 50.55a of Title 10 was amended in the *Federal Register* (61 FR 41303) to require the use of the 1992 Edition with 1992 Addenda, Section XI, when performing containment inspections. Section XI requires a VT-1 visual examination of the bolted connections, which was reevaluated during subsequent rewrites of Subsection IWE. During the review of Examination Category E-G examination criteria, the following factors were considered:

(3) Containment surfaces, including bolted connections, are already subject to visual examination in accordance with Table IWE-2500-1, Examination Category E-A.
(4) Bolted connections in containment are subject to the performance of 10 CFR Part 50, Appendix J, testing.
(5) Containment bolting is not subjected to any known degradation mechanism. These bolts are not within a corrosive environment, and therefore, problems with containment bolting have not been identified as a problem through out the industry.
(6) More specifically, AmerGen performed the required IWE expedited examinations during the 1R13 Outage (September - October 1999). Thirteen (13) penetrations were identified that contained pressure retaining bolting meeting the requirements of Examination Category E-G, Item E8.10. Of these 13 penetrations, 11 were VT-1 inspected and the remaining two were VT-3 examined due to inaccessibility. Only one out of the population of 13 penetrations had a recordable condition and that was for questionable full thread engagement attribute, resulting from an installation discrepancy and not an inservice degraded condition. This finding was disposition as use-as-is by engineering.

During review of the 1998 Edition of the Code, the conclusion reached by ASME Code, Section XI, was that Examination Category E-G examinations on bolted connections were not warranted. In the Commentary which accompanied the Subsection IWE rewrite, the following was written:

"Pressure retaining bolting as a separate category has been deleted, and the examination requirements for pressure retaining bolting have been consolidated into Category E-A. Examination of pressure retaining bolting does not require removal or disassembly, and only those exposed surfaces of the bolting materials need be examined." As a result, Examination Category E-G was eliminated from Table IWE-2500-1 of the 1998 Edition of ASME Code, Section XI.

The performance of VT-1 visual examinations on bolted connections in accordance with the 1992 Edition with 1992 Addenda represents a hardship with no compensating increase in the level of quality and safety. The reexamination of bolted connections that are already examined as part of Examination Category E-A, and tested in accordance with 10 CFR Part 50,
Appendix J, unnecessarily increase the number of inservice examinations and associated radiation exposure to personnel.

3.13.3 Licensee's Proposed Alternative

The following examinations required by Subsection IWE assure the structural integrity and the leak-tightness of Class MC pressure retaining bolting, and therefore, no additional alternative examinations are proposed.

(1) Exposed surfaces of bolted connections shall be visually examined in accordance with the requirements of Table IWE-2500-1, Examination Category E-A, Containment Surface, using VT-3 certified inspectors. These examinations shall be evaluated in accordance with the requirements of IWE-3510. Deficiencies shall be evaluated by certified VT-1 examiners and dispositioned by engineering under a formal program.

(2) Bolted connections shall meet the pressure test requirements of 10 CFR Part 50, Appendix J.

This relief is requested for the first inspection interval IWE containment inspections required by ASME Code, Section XI, 1992 Edition with 1992 Addenda.

3.13.4 Evaluation

In lieu of performing the VT-1 visual examination of the pressure retaining bolting in accordance with Table IWE-2500-1, Examination Category E-G, Item E8.10, the licensee proposed to perform VT-3 visual examinations on the exposed surfaces of bolted connections in accordance with the requirements of Table IWE-2500-1, Examination Category E-A, Containment Surface. The licensee also committed that these examinations shall be evaluated in accordance with the requirements of IWE-3510. Any deficiencies to be identified shall be evaluated by certified
VT-1 examiners. In addition, bolted connections shall meet the pressure test requirements of 10 CFR Part 50, Appendix J. The basis for the licensee's proposal is that the performance of VT-1 visual examinations on bolted connections represents a hardship with no compensating increase in the level of quality and safety. The reexamination of bolted connections that are already examined as part of Examination Category E-A, and tested in accordance with 10 CFR Part 50, Appendix J, unnecessarily increase the number of inservice examinations and associated radiation exposure to personnel.

The NRC staff finds that the performance of VT-3 visual examinations (with the commitment of performing VT-1 examinations on the deficiencies) on the bolted connections together with the Appendix

J test will ensure the leak-tight integrity of the containment structure with bolted connections. Therefore, the NRC staff concludes that the alternative proposed by the licensee is authorized on the basis that it provides an acceptable level of quality and safety pursuant to 10 CFR 50.55a(a)(3)(i).

4.0 SUMMARY

The TMI-1 licensee submitted relief requests and alternatives associated with the third 10-year ISI interval. The licensee's Relief Request Nos. RR-00-02, RR-00-03, RR-00-04, RR-00-05, RR-00-06, RR-00-07, RR-00-08, RR-00-09, RR-00-10, RR-00-11, RR-00-12, and RR-00-13 have been reviewed. The licensee's proposed alternative, RR-8, related to containment inspections has also been reviewed.

The NRC staff evaluated the licensee's submittal and concluded that certain inservice examinations cannot be performed to the extent required by the Code at TMI-1. For Relief Request Nos. RR-00-02, RR-00-03, and RR-00-06, the Code requirements are impractical to meet, and reasonable assurance of the structural integrity of the subject components have been provided. Therefore, relief is granted pursuant to 10 CFR 50.55a(g)(6)(i). The NRC staff has determined that the granting of relief is authorized by law and will not endanger life or property, or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

The NRC staff concludes that the proposed alternatives in RR-00-07, RR-00-08, RR-00-10, RR-00-11, RR-00-12, RR-00-13, and RR-8, provide an acceptable level of quality and safety. Therefore, the licensee's proposed alternatives are authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year ISI interval at TMI-1.

For the alternatives contained in Relief Request Nos. RR-00-04, RR-00-05, and RR-00-09, the NRC staff finds that imposition of the Code requirements would result in a hardship without a compensating increase in the level of quality and safety. The NRC staff concludes that the proposed alternatives provide reasonable assurance of structural integrity of the subject components in the licensee's requests for relief. Therefore, the licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) for the third 10-year ISI interval at TMI-1.

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