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10 CFR 50.55a

TMI-10-079

August 10, 2010

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Three Mile Island Nuclear Station, Unit 1
Renewed Facility Operating License No. DPR-50
NRC Docket No. 50-289

Subject: Submittal of Relief Requests Associated with the Fourth Inservice Inspection (ISI) Interval

Attached for your review are relief requests associated with the Fourth Inservice Inspection (ISI) Interval for Three Mile Island Nuclear Station (TMI), Unit 1. The fourth interval of the TMI, Unit 1 ISI program complies with the 2004 Edition, No Addenda, of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code. The fourth ISI interval will begin on April 20, 2011. We request your approval by August 10, 2011.

There are no regulatory commitments in this letter.

If you have any questions concerning this letter, please contact Tom Loomis at (610) 765-5510.

Respectfully,

Pamela B. Cowan
Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Attachment: Relief Requests Associated with the Fourth Ten-Year Interval for Three Mile Island Nuclear Station, Unit 1

cc: Regional Administrator, Region I, USNRC
D. M. Kern, USNRC Senior Resident Inspector, TMI
P. Bamford, Project Manager [TMI] USNRC

A047
NRR

Attachment

Relief Requests Associated with the Fourth Ten-Year Interval for Three Mile Island Nuclear Station, Unit 1

I4R-01
I4R-02
I4R-03
I4R-04
I4R-05
I4R-06

Request for Relief for Expanded Applicability for use of ASME Code Case N-513-2, Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 and 3 Piping In Accordance with 10 CFR 50.55a(a)(3)(i)

1.0 ASME CODE COMPONENTS AFFECTED:

Code Class:	2 and 3
Reference:	IWA-2441(b) and ASME Code Case N-513-2
Examination Category:	NA
Item Number:	NA
Description:	Expanded Applicability for use of ASME Code Case N-513-2, Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 and 3 Piping
Component Number:	Moderate Energy Class 2 and 3 Piping

2.0 APPLICABLE CODE EDITION AND ADDENDA:

The Inservice Inspection (ISI) program is based on the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, 2004 Edition, No Addenda.

3.0 APPLICABLE CODE REQUIREMENT:

IWA-2441(b) requires Code Cases be applicable to the Edition and Addenda specified in the Inspection Plan.

ASME Code Case N-513-2, Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 and 3 Piping, provides requirements that may be used to accept flaws without performing a repair/replacement activity for a limited time period.

4.0 REASON FOR REQUEST:

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

On April 20, 2011 TMI, Unit 1 will start its fourth ten-year interval ISI program under the requirements of the 2004 Edition, No Addenda of ASME Section XI. When implementing this edition of ASME Section XI, Paragraph IWA-2441(b) requires code cases be applicable to the Edition and Addenda specified in the Inspection Plan.

ASME Code Case N-513-2 has an applicability limited up to the 2001 Edition with the 2003 Addenda, which is identified in Section 7.0 of the code case and in the latest applicability index for Section XI Code Cases. Since ASME Code Case N-513-2 only applies up to the 2001 Edition with the 2003 Addenda, Paragraph IWA-2441(b) does not allow the use of ASME Code Case N-513-2 for the TMI, Unit 1 fourth ten-year interval ISI program.

5.0 PROPOSED ALTERNATIVE AND BASIS FOR USE:

TMI requests the applicability of ASME Code Case N-513-2 be extended to the 2004 Edition, No Addenda for use in the plant's fourth interval ISI program. The USNRC has accepted the use of ASME Code Case N-513-2 as an acceptable method for evaluating the structural integrity of flaws identified in moderate energy piping in the latest revision of Regulatory Guide 1.147, Revision 15.

No technical changes to ASME Code Case N-513-2 are being proposed in this relief request. This relief request is being submitted to correct a timing situation, which has resulted from the application of the 2004 Edition, No Addenda of ASME Section XI for TMI, Unit 1. Since no technical change is proposed in this relief request, TMI, Unit 1 considers that this alternative provides an acceptable level of quality and safety, and is consistent with provisions of 10 CFR 50.55a(a)(3)(i).

6.0 DURATION OF PROPOSED ALTERNATIVE:

Relief is requested for the fourth ten-year ISI interval for TMI, Unit 1.

7.0 PRECEDENTS:

Similar relief requests have been requested for:

Letter from J. Price (Dominion Nuclear Connecticut, Inc.) to U.S. Nuclear Regulatory Commission, "Dominion Nuclear Connecticut, Inc., Millstone Power Station Unit 3 Alternative Request IR-3-12 for the Use of ASME Code Case N-513-2," dated May 28, 2009.

Letter from J. Price (Dominion Nuclear Connecticut, Inc.) to U.S. Nuclear Regulatory Commission, "Dominion Nuclear Connecticut, Inc., Millstone Power Station Unit 2 Relief Requests RR-04-02, Alternative VT-2 Pressure Testing Requirements for the Lower Portion of the Reactor Pressure Vessel, and RR-04-03, Alternative Evaluation Criteria for Code Case N-513-2, Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping," dated March 30, 2010.

Request for Relief for Alternate Risk-Informed Selection and Examination Criteria for Examination Category B-F, B-J, C-F-1, and C-F-2 Pressure Retaining Piping Welds In Accordance with 10 CFR 50.55a(a)(3)(i)

1.0 ASME CODE COMPONENTS AFFECTED:

Code Class:	1 and 2
Reference:	Table IWB-2500-1, Table IWC-2500-1
Examination Category:	B-F, B-J, C-F-1, and C-F-2
Item Number:	B5.10, B5.40, B5.50, B9.11, B9.21, B9.22, B9.31, B9.32, B9.40, C5.11, C5.21, C5.30, C5.41, C5.51, C5.70, and C5.81
Description:	Alternate Risk-Informed Selection and Examination Criteria for Examination Category B-F, B-J, C-F-1, and C-F-2 Pressure Retaining Piping Welds
Component Number:	Pressure Retaining Piping

2.0 APPLICABLE CODE EDITION AND ADDENDA:

The ISI program is based on the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, 2004 Edition, No Addenda.

3.0 APPLICABLE CODE REQUIREMENT:

Table IWB-2500-1, Examination Category B-F, requires volumetric and surface examinations on welds for Item Numbers B5.10 and B5.40, and surface examinations for welds for Item Number B5.50.

Table IWB-2500-1, Examination Category B-J, requires volumetric and surface examinations on a sample of welds for Item Numbers B9.11 and B9.31, volumetric examinations on a sample of welds for Item Number B9.22, and surface examinations on a sample of welds for Item Numbers B9.21, B9.32, and B9.40. The weld population selected for inspection includes the following:

1. All terminal ends in each pipe or branch run connected to vessels.

2. All terminal ends and joints in each pipe or branch run connected to other components where the stress levels exceed either of the following limits under loads associated with specific seismic events and operational conditions:

    a. primary plus secondary stress intensity range of $2.4S_m$ for ferritic steel and austenitic steel.

b. cumulative usage factor *U* of 0.4.

3. All dissimilar metal welds not covered under Examination Category B-F.

4. Additional piping welds so that the total number of circumferential butt welds, branch connections, or socket welds selected for examination equals 25% of the circumferential butt welds, branch connection, or socket welds in the reactor coolant piping system. This total does not include welds exempted by Paragraph IWB-1220 or welds in Item Number B9.22.

5. A 10% sample of PWR high pressure safety injection system circumferential welds in piping ≥ NPS 1½ and < NPS 4 shall be selected for examination. This sample shall be selected from locations determined by the Owner as most likely to be subject to thermal fatigue.

Table IWC-2500-1, Examination Categories C-F-1 and C-F-2 require volumetric and surface examinations on a sample of welds for Item Numbers C5.11, C5.21, and C5.51, and surface examinations on a sample of welds for Item Numbers C5.30, C5.41, C5.70, and C5.81. The weld population selected for inspection includes the following:

1. Welds selected for examination shall include 7.5%, but not less than 28 welds, of all dissimilar metal, austenitic stainless steel and high alloy welds (Examination Category C-F-1) or of all carbon and low alloy steel welds (Examination Category C-F-2) not exempted by Paragraph IWC-1220. (Some welds not exempted by Paragraph IWC-1220 are not required to be nondestructively examined per Examination Categories C-F-1 and C-F-2. These welds, however, shall be included in the total weld count to which the 7.5% sampling rate is applied.) The examinations shall be distributed as follows:

    a. the examinations shall be distributed among the ISI Class 2 systems prorated, to the degree practicable, on the number of nonexempt dissimilar metal, austenitic stainless steel and high alloy welds (Examination Category C-F-1) or carbon and low alloy welds (Examination Category C-F-2) in each system;

    b. within a system, the examinations shall be distributed among terminal ends, dissimilar metal welds, and structural discontinuities prorated, to the degree practicable, on the number of nonexempt terminal ends, dissimilar metal welds, and structural discontinuities in the system; and

    c. within each system, examinations shall be distributed between piping sizes prorated to the degree practicable.

4.0 REASON FOR REQUEST:

Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested on the basis that the proposed alternative utilizing Reference 1 along with two enhancements from Reference 4 will provide an acceptable level of quality and safety.

As stated in "Safety Evaluation Report Related to EPRI Risk-Informed Inservice Inspection Evaluation Procedure (EPRI TR-112657, Revision B, July 1999)" (Reference 2):

> "The staff concludes that the proposed RI-ISI Program as described in EPRI TR-112657, Revision B, is a sound technical approach and will provide an acceptable level of quality and safety pursuant to 10 CFR 50.55a for the proposed alternative to the piping ISI requirements with regard to the number of locations, locations of inspections, and methods of inspection."

The initial TMI, Unit 1 Risk-Informed Inservice Inspection (RISI) Program was submitted at the beginning of the second period of the third inspection interval. This initial RISI Program was developed in accordance with EPRI TR-112657, Revision B-A, as supplemented by ASME Code Case N-578-1. The program was approved for use by the USNRC via a Safety Evaluation as transmitted to Exelon (Reference 5).

The transition from the 1995 Edition, 1996 Addenda to the 2004 Edition, No Addenda of ASME Section XI for the TMI, Unit 1 fourth inspection interval does not impact the currently approved RISI evaluation methods and process used in the third inspection interval, and the requirements of the new Code Edition/Addenda will be implemented as detailed in the TMI ISI Program Plan. Therefore, with the exception of specific weld locations that may have changed due to maintenance or modification activities (e.g., steam generator replacement) and the addition of an Alloy 600 Augmented Examination Program, the proposed alternative RISI Program for the fourth inspection interval is the same program methodology as approved in Reference 5 for the third inspection interval.

Locations potentially susceptible to Primary Water Stress Corrosion Cracking (PWSCC), whether repaired, mitigated, or unmitigated, that fall within the TMI Alloy 600 Augmented Examination Program (MRP-139, ASME Code Case N-722, ASME Section XI Appendix Q, etc.) under which they are tracked, categorized, and subject to augmented examination selection criteria and requirements, are also evaluated under the RISI Program for appropriate degradation mechanism (DM) assignment. Where PWSCC is the only DM assigned, the locations are removed from the RISI scope and deferred to the Alloy 600 Augmented Examination Program for examinations. These PWSCC examination programs are based upon criteria that is generally more stringent than the RISI Program because they are generally based upon deterministic criteria that accounts for flaw growth rates and time to structural instability. For locations other than those which have full structural weld overlay applied where the degradation mechanism assessment identifies PWSCC and another DM under the RISI Program, the elements remain in the RISI Program and are subject to the normal RISI element selection process solely for the additional DMs assigned. Locations with full structural weld overlay will be removed from the RISI Program and treated under the Alloy 600 augmented examination program.

The Risk Impact Assessment completed as part of the original baseline RISI Program was an implementation/transition check on the initial impact of converting from a traditional ASME Section XI program to the new RISI methodology. For the fourth interval ISI update, there is no transition occurring between two different methodologies, but rather, the currently approved RISI methodology and evaluation will be maintained for the new interval. The original methodology of the evaluation has not changed, and the change in risk was simply re-assessed using the initial 1995 Edition, 1996 Addenda ASME Section XI program prior to RISI and the new element selection for the fourth interval RISI program. This same process has been maintained in each revision to the TMI, Unit 1 RISI assessment that has been performed to date.

The actual "evaluation and ranking" procedure including the Consequence Evaluation and Degradation Mechanism Assessment processes of the currently approved (Reference 5) RISI Program remain unchanged and are continually applied to maintain the Risk Categorization and Element Selection methods of EPRI TR-112657, Revision B-A. These portions of the RISI Program have been and will continue to be reevaluated and revised as major revisions of the site Probabilistic Risk Assessment (PRA) occur and modifications to plant configuration are made. The Consequence Evaluation, Degradation Mechanism Assessment, Risk Ranking, Element Selection, and Risk Impact Assessment steps encompass the complete living program process applied under the TMI, Unit 1 RISI Program.

5.0 PROPOSED ALTERNATIVE AND BASIS FOR USE:

The proposed alternative originally implemented in RISI inspection plan for TMI, Unit 1 (Reference 3), along with the two enhancements noted below, provide an acceptable level of quality and safety as required by 10 CFR 50.55a(a)(3)(i). This original program along with these same two enhancements is currently approved for the TMI, Unit 1 third inspection interval as documented in Reference 5.

The fourth interval RISI Program will be a continuation of the current application and will continue to be a living program as described in the "Reason For Request" section of this relief request. No changes to the evaluation methodology as currently implemented under EPRI TR-112657, Revision B-A, are required as part of this interval update. The following two enhancements will continue to be implemented.

a. In lieu of the evaluation and sample expansion requirements in Section 3.6.6.2, "RI-ISI Selected Examinations" of EPRI TR-112657, TMI will utilize the requirements of Paragraph -2430, "Additional Examinations" contained in ASME Code Case N-578-1 (Reference 4). The alternative criteria for additional examinations contained in ASME Code Case N-578-1 provide a more refined methodology for implementing necessary additional examinations. The reason for this selection is that the guidance discussed in EPRI TR-112657 includes requirements for additional examinations at a high level, based on service conditions, degradation mechanisms, and the performance of evaluations to determine the scope of additional examinations, whereas ASME Code Case N-578-1 provides more specific and clearer guidance regarding the requirements for additional examinations that is structured similar to the guidance provided in ASME Section XI, Paragraphs IWB-2430 and IWC-2430. Additionally, similar to the current requirements of ASME Section XI, TMI intends to perform additional examinations that are required due to the identification of flaws or relevant conditions exceeding the acceptance standards, during the outage the flaws are identified.

b. To supplement the requirements listed in Table 4-1, "Summary of Degradation-Specific Inspection Requirements and Examination Methods" of EPRI TR-112657, TMI, Unit 1 will utilize the provisions listed in Table 1, Examination Category R-A, "Risk-Informed Piping Examinations" contained in ASME Code Case N-578-1 (Reference 4). To implement Note 10 of this table, paragraphs and figures from the 2004 Edition, No Addenda of ASME Section XI (TMI, Unit 1 code of record for the fourth interval) will be utilized which parallel those referenced in the Code Case. Table 1 of ASME Code Case N-578-1 will be used as it provides a detailed breakdown for Examination Method and Categorization of Parts to be Examined. Based on these Methods and Categorization, the examination figures specified in Section 4 of EPRI TR-112657 will then be used to determine the examination volume/area based on the degradation mechanism and component configuration. For elements not subject to a degradation mechanism, Note 1 to Table 1 of ASME Code Case N-578-1 will be applied using the expanded volume. Also, as discussed in the "Reason For Request" section of this relief request, elements potentially subject to PWSCC and no other degradation mechanism will be removed from the RISI population considered during the RISI element selection process and will be treated under the TMI Alloy 600 Augmented Examination Program, and all elements with full structural weld overlay applied will be removed from the RISI Program completely and examined under the Alloy 600 augmented program.

Piping examinations under this augmented program are currently performed in accordance with the criteria below. This program is subject to change and will be maintained in accordance with the latest regulations relative to PWSCC and the

Alloy 600 Augmented Examination Program. For elements evaluated under RISI to only be subject to the PWSCC degradation mechanism and all elements with full structural weld overlay applied, the requirements incorporated in the augmented examination program are:

1. Bare metal visual examinations are currently performed in accordance with 10 CFR 50.55a(g)(6)(ii)(E).
2. Ultrasonic examinations are currently performed in accordance with MRP-139, Revision 1, "Material Reliability Program: Primary System Piping Butt Weld Inspection and Evaluation Guideline" (Reference 8).
3. Ultrasonic examination of completed weld overlay repaired welds are currently performed in accordance with ASME Section XI Non-Mandatory Appendix Q, Weld Overlay Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping Weldments, Paragraph Q-4300.

The TMI RISI Program, as developed in accordance with EPRI TR-112657, Rev. B-A (Reference 1), requires that 25% of the elements that are categorized as "High" risk (i.e., Risk Category 1, 2, and 3) and 10% of the elements that are categorized as "Medium" risk (i.e., Risk Categories 4 and 5) be selected for inspection. For this application, the guidance for the examination volume for a given degradation mechanism is provided by the EPRI TR-112657 while the guidance for the examination method and categorization of parts to be examined are provided by the EPRI TR-112657 as supplemented by ASME Code Case N-578-1.

For U.S. Nuclear Regulatory Commission staff consideration in the evaluation of this alternative Risk-Informed ISI Program, Appendix 1 to this relief request contains a summary of the Regulatory Guide 1.200, Revision 2 (Reference 6), evaluation performed on TMI-PRA-014, Quantification Notebook (Reference 7), and the impact of the identified gaps on the technical adequacy of the TMI PRA Model to support this RISI application.

In addition to this risk-informed evaluation, selection, and examination procedure, all ASME Section XI piping components, regardless of risk classification, will continue to receive Code-required pressure testing as part of the current ASME Section XI program. VT-2 visual examinations are scheduled in accordance with the TMI, Unit 1 pressure testing program, which remains unaffected by the RISI Program.

6.0 DURATION OF PROPOSED ALTERNATIVE:

Relief is requested for the fourth ten-year inspection interval for TMI, Unit 1.

7.0 PRECEDENTS:

Similar relief requests have been approved for:

The TMI, Unit 1 third ISI interval Relief Request RR-21 was authorized per U.S. Nuclear Regulatory Commission (USNRC) Safety Evaluation Report (SER) dated November 7, 2003. The fourth ISI interval Relief Request utilizes the RISI methodology as was previously approved.

The Braidwood Station, Units 1 and 2 third ISI interval Relief Request I3R-01 was authorized per USNRC SER dated November 5, 2009.

The Peach Bottom Atomic Power Station, Units 2 and 3 fourth ISI interval Relief Request I4R-44 was authorized per USNRC SER dated February 26, 2009.

8.0 REFERENCES:

1. Electric Power Research Institute (EPRI) Topical Report (TR) 112657 Rev. B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure," December 1999.

2. Letter from W. Bateman (USNRC) to G. Vine (EPRI), "Safety Evaluation Report Related to EPRI Risk-Informed Inservice Inspection Evaluation Procedure (EPRI TR-112657, Revision B, July 1999)," dated October 28, 1999.

3. Letter from M. Gallagher (AmerGen Energy Company, LLC) to U.S. Nuclear Regulatory Commission, "Third Ten-Year Interval Inservice Inspection (ISI) Program Risk-Informed Inservice Inspection Program Alternative to the ASME Boiler and Pressure Vessel Code Section XI Requirements for Class 1 and 2 Piping Welds," dated October 1, 2002.

4. American Society of Mechanical Engineers (ASME) Code Case N-578-1, "Risk-Informed Requirements for Class 1, 2, or 3 Piping, Method B, Section XI, Division 1."

5. Letter from R. Laufer (USNRC) to J. Skolds (AmerGen Energy Company, LLC), "Three Mile Island Nuclear Station, Unit 1, RE: Third 10-Year Interval Inservice Inspection (ISI) Program Requests for Relief (TAC NOS. MB6498 and MB6499)," dated November 7, 2003.

6. Regulatory Guide 1.200, Revision 2, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," dated March 2009.

7. TMI-PRA-014, Quantification Notebook, Revision 3, June 2009, Model 2009 (TM1080).

8. MRP-139, Revision 1, "Material Reliability Program: Primary System Piping Butt Weld Inspection and Evaluation Guideline."

PRA Technical Adequacy

Exelon Generation Company, LLC (EGC) employs a multi-faceted approach to establishing and maintaining the technical adequacy and plant fidelity of the PRA models for all operating EGC nuclear generation sites. This approach includes both a proceduralized PRA maintenance and update process, and the use of self-assessments and independent peer reviews. The following information describes this approach as it applies to the Three Mile Island (TMI) PRA.

1.0 PRA Maintenance and Update

The EGC risk management process ensures that the applicable PRA model remains an accurate reflection of the as-built and as-operated plants. This process is defined in the EGC Risk Management program, which consists of a governing procedure (ER-AA-600, "Risk Management") and subordinate implementation procedures. EGC procedure ER-AA-600-1015, "FPIE PRA Model Update" delineates the responsibilities and guidelines for updating the full power internal events PRA models at all operating EGC nuclear generation sites. The overall EGC Risk Management program, including ER-AA-600-1015, defines the process for implementing regularly scheduled and interim PRA model updates, for tracking issues identified as potentially affecting the PRA models (e.g., due to changes in the plant, errors or limitations identified in the model, industry operating experience), and for controlling the model and associated computer files. To ensure that the current PRA model remains an accurate reflection of the as-built, as-operated plants, the following activities are routinely performed:

- Design changes and procedure changes are reviewed for their impact on the PRA model.
- New engineering calculations and revisions to existing calculations are reviewed for their impact on the PRA model.
- Maintenance unavailabilities are captured, and their impact on CDF is trended.
- Plant specific initiating event frequencies, failure rates, and maintenance unavailabilities are updated approximately every four years.

In addition to these activities, EGC risk management procedures provide the guidance for particular risk management and PRA quality and maintenance activities. This guidance includes:

- Documentation of the PRA model, PRA products, and bases documents.
- The approach for controlling electronic storage of Risk Management (RM) products including PRA update information, PRA models, and PRA applications.

- Guidelines for updating the full power, internal events PRA models for EGC nuclear generation sites.

- Guidance for use of quantitative and qualitative risk models in support of the On-Line Work Control Process Program for risk evaluations for maintenance tasks (corrective maintenance, preventive maintenance, minor maintenance, surveillance tests and modifications) on systems, structures, and components (SSCs) within the scope of the Maintenance Rule (10 CFR 50.65 (a)(4)).

In accordance with this guidance, regularly scheduled PRA model updates nominally occur on an approximately 4-year cycle; longer intervals may be justified if it can be shown that the PRA continues to adequately represent the as-built, as-operated plant.

2.0 PRA Self Assessment and Peer Review

The TM1080 version of the TMI PRA model is the most recent evaluation of the risk profile at TMI for internal event challenges, including internal flooding. The TMI PRA modeling is highly detailed, including a wide variety of initiating events, modeled systems, operator actions, and common cause events. The PRA model quantification process used for the TMI PRA is based on the event tree / fault tree methodology, which is a well-known methodology in the industry.

2.1 Self Assessment and Peer Review Results

Several assessments of technical capability have been made for the TMI PRA model. These assessments are as follows and further discussed in the paragraphs below.

- An independent PRA peer review was conducted under the auspices of the B&W Owners Group in 2000, following the Industry PRA Peer Review process [3]. This peer review included an assessment of the PRA model maintenance and update process.

- A limited scope gap assessment was performed in 2005 to support the Mitigating Systems Performance Indicator (MSPI) implementation. Additionally, the TMI PRA model results were evaluated in the B&W Owners Group PRA cross-comparisons study performed in support of implementation of the MSPI process.

- A RG-1.200 Peer Review was conducted in October 2008 against the ASME PRA Standard, Addenda RA-Sb-2005 and RA-Sc-2007 [4]. The DA and IF elements (Data and Internal Flooding) were not reviewed at this time.

- A focused-scope RG-1.200 Peer Review was conducted in April 2010, for the Data (DA) element, against the ASME PRA Standard, Addenda RA-Sb-2005 and RA-Sc-2007.

A summary of the disposition of the PRA Peer Review facts and observations (F&Os) for the

TMI PRA model was documented as part of the statement of PRA capability for MSPI in the TMI MSPI Basis Document [5]. As noted in that document, the one significance level A F&O and all but one significance level B F&Os from that peer review have been addressed and closed out as of the TMI 2004 Revision 1 PRA model. The remaining issue was resolved in the TMI 2004 Revision 2 PRA model (TMI1080).

As indicated above, a PRA model update was completed in 2009, resulting in the TM1080 updated model. In updating the PRA, changes were made to the PRA model to address most of the identified gaps from the 2008 peer review, as well as to address other open Updating Requirement Evaluations (UREs). Open findings from the peer review are summarized in Table 2-1.

The 2008 peer review did not cover the DA or IF elements. For DA, a separate focused-scope peer review was performed in April 2010. The preliminary results from that review and the DA element self-assessment are provided in Table 2-2.

For Internal Flooding, all the B F&Os associated with the IF technical element from the 2000 peer review have been dispositioned. A self-assessment against the Standard was performed for IF; the results are provided in Table 2-3.

All remaining gaps will be reviewed for consideration for the next periodic PRA model update, but are judged to have low impact on the PRA model or its ability to support a full range of PRA applications. The remaining gaps are documented in the URE database so that they can be tracked and their potential impacts accounted for in applications where appropriate.

2.2 *Sensitivity Studies*

Three gaps were identified in Tables 2-1 and 2-3 (QU-C1-01, LE-D1b-01 and IFEV-A5-01) which warranted sensitivity studies. QU-C1-01 was evaluated separately. Gaps LE-D1b-01 and IFEV-A5-01 were evaluated simultaneously using one sensitivity study.

<u>QU-C1-01</u>

A review was performed of the CDF and LERF cutsets containing the recovery: REO - Operator Manually Actuates HPI Components if ESAS Fails. No cutsets contained any other failed operator actions, therefore HEP dependence is not an issue. As a bounding sensitivity, REO was set to 1.0. This resulted in no changes to any Risk-Informed Inservice Inspection (RISI) evaluations; the only calculations impacted were CCDP and CLERP for initiators %SBL, %TRIA, %TRIB, and %VSB, which are already ranked as High consequence.

<u>LE-D1b-01 and IFEV-A5-01</u>

Gaps LE-D1b-01 and IFEV-A5-01 were evaluated simultaneously in one sensitivity.

LE-D1b-01: The concern is that the mechanical and/or electrical penetrations have a lower strength than assumed in the LERF analysis. It was determined that if the strength of these penetrations were indeed lower, it would impact early containment failure due to overpressurization. One split fraction in the LERF model, NOAFTSTREN2 (Probability of Containment Failing Due to Combustible Gas Burn with Low Base Pressure), has a low value (1E-3) that was adjusted to 1E-2. This value is a factor of 10 higher and consistent with generic values provided in NUREG/CR-6595 [8].

IFEV-A5-01: It is expected that new pipe failure rates are lower than those used in the current TMI Internal Flood model and plant specific experience has been nominal. Human-induced flooding, on the other hand, would increase the flood initiating event frequencies. As a sensitivity, all flood initiating event frequencies were increased by a factor of 10.

The results of the sensitivity calculations showed that three runs changed risk rank (RI-D7, RI-D9 and RI-D13) and went from Medium to High consequence rank. However, most consequence determinations for a pipe break are composed of several possible scenarios, and the final set of consequence results is unaffected by these PRA changes. All 100 evaluations maintained the same risk rank as the base analysis.

3.0 General Conclusion Regarding PRA Capability

The TMI PRA maintenance and update processes and technical capability evaluations described above provide a robust basis for concluding that the PRA is suitable for use in risk-informed licensing actions. As specific risk-informed PRA applications are performed, remaining gaps to specific requirements in the PRA standard will be reviewed to determine which, if any, would merit application-specific sensitivity studies in the presentation of the application results.

4.0 Assessment of PRA Capability Needed for Risk Informed Inservice Inspection

In the RISI program at TMI, the EPRI Risk-Informed ISI methodology [1] is used to define alternative inservice inspection requirements. Plant-specific PRA-derived risk significance information is used during the RISI plan development to support the consequence assessment, risk ranking, element selection and risk impact steps.

The importance of PRA consequence results, and therefore the scope of PRA technical capability, is tempered by three fundamental components of the EPRI methodology.

First, PRA consequence results are binned into one of three conditional core damage probability (CCDP) and conditional large early release probability (CLERP) ranges before any welds are chosen for RISI inspection as illustrated below. Broad ranges are used to define these bins so that the impact of uncertainty is minimized and only substantial PRA changes would be expected to have an impact on the consequence ranking results.

Consequence Results Binning Groups		
Consequence Category	**CCDP Range**	**CLERP Range**
High	CCDP > 1E-4	CLERP > 1E-5
Medium	1E-6 < CCDP ≤ 1E-4	1E-7 < CLERP ≤ 1E-5
Low	CCDP ≤ 1E-6	CLERP ≤ 1E-7

The risk importance of a weld is therefore not tied directly to a specific PRA result. Instead, it depends only on the range in which the PRA result falls. As a consequence, any PRA modeling uncertainties would be mitigated by the wide binning provided in the methodology. Additionally, conservatism in the binning process (e.g., as would typically be introduced through PRA attributes meeting ASME PRA Standard Capability Category I versus II) will tend to result in a larger inspection population.

Secondly, the impacts of particular PRA consequence results are further dampened by the joint consideration of the weld failure potential via a non-PRA-dependent damage mechanism assessment. The results of the consequence assessment and the damage mechanism assessment are combined to determine the risk ranking of each pipe segment (and ultimately each element) according to the EPRI Risk Matrix. The Risk Matrix, which equally takes both assessments into consideration, is reproduced below.

POTENTIAL FOR PIPE RUPTURE PER DEGRADATION MECHANISM SCREENING CRITERIA	**CONSEQUENCES OF PIPE RUPTURE** IMPACTS ON CONDITIONAL CORE DAMAGE PROBABILITY AND LARGE EARLY RELEASE PROBABILITY			
	NONE	**LOW**	**MEDIUM**	**HIGH**
HIGH FLOW ACCELERATED CORROSION	**LOW** **Category 7**	**MEDIUM** **Category 5**	**HIGH** **Category 3**	**HIGH** **Category 1**
MEDIUM OTHER DEGRADATION MECHANISMS	**LOW** **Category 7**	**LOW** **Category 6**	**MEDIUM** **Category 5**	**HIGH** **Category 2**
LOW NO DEGRADATION MECHANISMS	**LOW** **Category 7**	**LOW** **Category 7**	**LOW** **Category 6**	**MEDIUM** **Category 4**

Thirdly, the EPRI RISI methodology uses an absolute risk ranking approach. As such, conservatism in either the consequence assessment or the failure potential assessment will result in a larger inspection population rather than masking other important components. That is, providing more realism into the PRA model (e.g., by meeting higher capability categories) most likely would result in a smaller inspection population.

These three facets of the methodology reduce the importance and influence of PRA on the final list of candidate welds.

The limited manner of PRA involvement in the RISI process is also reflected in the Risk-Informed license application guidance provided in Regulatory Guide 1.174 [7]. Section 2.2.6 of Regulatory Guide 1.174 provides the following insight into PRA capability requirements for this type of application:

There are, however, some applications that, because of the nature of the proposed change, have a limited impact on risk, and this is reflected in the impact on the elements of the risk model.

An example is risk-informed inservice inspection (RI-ISI). In this application, risk significance was used as one criterion for selecting pipe segments to be periodically examined for cracking. During the staff review it became clear that a high level of emphasis on PRA *technical acceptability was not necessary. Therefore, the staff review of plant-specific RI-ISI typically will include only a limited scope review of PRA technical acceptability.*

In addition to the above, it is noted that welds determined to be low risk significant are not eliminated from the ISI program on the basis of risk information. For example, the risk significance of a weld may fall from Medium Risk Ranking to Low Risk Ranking, resulting in it not being a candidate for inspection. However, it remains in the program, and if, in the future, the assessment of its ranking changes (either by damage mechanism or PRA consequence risk) then it may again become a candidate for inspection. If it is discovered during the RISI update process that a weld is now susceptible to flow-accelerated corrosion (FAC), intergranular stress corrosion cracking (IGSCC), or microbiological induced cracking (MIC) in the absence of any other damage mechanism, then it is addressed in an "augmented" program where it is monitored for those special damage mechanisms. That occurs no matter what the Risk Ranking of the weld is determined to be.

5.0 Conclusion Regarding PRA Capability for Risk-Informed ISI

The TMI PRA model continues to be suitable for use in the Risk-Informed Inservice Inspection application. This conclusion is based on:

- the PRA maintenance and update processes in place,
- the PRA technical capability evaluations that have been performed and are being planned, and
- the RISI process considerations, as noted above, that demonstrate the relatively limited sensitivity of the EPRI RISI process to PRA attribute capability beyond ASME PRA Standard Capability Category I.

In support of the PRA analyses for the TMI-1 Ten-Year Interval evaluations using the TM1080 PRA model, the remaining gaps to the PRA standard have been reviewed to determine which, if any, would merit RISI-specific sensitivity studies in the presentation of the application results. The result of this assessment concluded that 3 gaps required sensitivity studies, all of which showed no change in the conclusions of the RISI evaluation (see Section 2.2 above).

6.0 References

[1] *Revised Risk-Informed Inservice Inspection Evaluation Procedure,* EPRI TR-112657, Revision B-A, December 1999.

[2] Regulatory Guide 1.200, *An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk Informed Activities*, Revision 2, March 2009.

[3] Framatome Technologies, Inc., *PSA Peer Review Certification Process: PSA Self-Assessment Process,* 47-5005658-00, September 1999.

[4] American Society of Mechanical Engineers, *Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications*, (ASME RA-S-2002), Addenda RA-Sb-2005, and Addenda RA-Sc-2007, August 2007.

[5] TMI MSPI Basis Document, TMI-2006-004 Rev. 2, September 2009.

[6] ASME Committee on Nuclear Risk Management in collaboration with ANS Risk Informed Standards Committee, *Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications*, ASME/ANS RA-Sa-2009, March 2009.

[7] U.S. Nuclear Regulatory Commission, *An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis*, Regulatory Guide 1.174, Revision 1, November 2002.

[8] NUREG/CR-6595, An Approach for Estimating the Frequencies of Various Containment Failure Modes and Bypass Events, Revision 1, October 2004.

Table 2-1
Open Peer Review Findings

Title	Description of Gap	Applicable SRs [6]	Current Status	Comment
IE-A4-01	The list of systems examined seems to be generated from a high level PRA system significance standpoint and does not seem to provide a complete list of all plant systems.	IE-A5	Open	Table 5 in the Initiating Event Notebook (TMI-PRA-002, Rev.1) shows the results of a systematic review of all the systems in the PRA. The impact of failure of systems not modeled in the PRA that cause an IE are subsumed in other events (e.g., reactor trip, Loss of offsite power, LOCA, etc.). However, this is not explicitly documented in the IE Notebook. Therefore, this is considered a documentation issue not affecting the technical adequacy of the PRA model.
IE-A4a-01	For the systematic evaluation required in IE-A4, the examination of potential initiating events resulting from common cause failures is not documented.	IE-A6	Open	The potential for common cause failures (CCF), including CCFs from routine system alignments that could result from preventive and corrective maintenance, was included in the systematic evaluation for potential initiating events. This is a documentation issue not affecting the technical adequacy of the PRA model.
IE-A6-01	No documentation was found of interviews with plant personnel (e.g., operations, maintenance, engineering, safety analysis) to determine if potential initiating events have been overlooked.	IE-A8	Open	This is a documentation issue not affecting the technical adequacy of the PRA model.
IE-C10-01	No comparison of the initiating event fault tree results with generic data has been identified. Compare plant initiating event fault tree results to generic frequency sources (i.e., NUREG/CR-5750, NUREG/CR-6928, WOG PSA Database, etc.) and explain differences.	IE-C12	Open	The initiating event fault tree results were compared to generic industry frequencies and with the PWROG database. However, the results of the review are not documented; Therefore, this is a documentation issue not affecting the technical adequacy of the PRA model.

Table 2-1
Open Peer Review Findings

Title	Description of Gap	Applicable SRs [6]	Current Status	Comment
IE-D1-01	The initiating event analysis has not been documented in a manner that facilitates PRA applications, upgrades, and peer review. The IE analysis is very difficult to trace and relies heavily on the ABS 2003 documentation, without proper reference in the IE notebook.	IE-D1	Open	The IE notebook was updated, although several documentation-related IE F&Os remain open. Therefore, this F&O remains open, but it is a documentation issue not affecting the technical adequacy of the PRA model.
AS-C1-01	Much of the AS-related documentation is located in the ABS 2003 report, with updates identified in the Event Tree notebook. In many cases, bases could not be verified without support of the TMI PRA personnel to aid in tracking down the documentation. To facilitate reviews, upgrades, etc., it is necessary to either include all the documentation in the event tree notebook or to reference the material in other documents.	AS-C1	Open	The Event Tree Notebook was updated, although several documentation-related AS F&Os remain open. Therefore, this F&O remains open, but it is a documentation issue not affecting the technical adequacy of the PRA model.
AS-C2-01	The process used to develop the accident sequences is not provided. Incorporation of plant specific information is therefore not demonstrated. Provide the process description and include the discussion of use of procedures, etc.	AS-C2, AS-A4, AS-A5	Open	The process for developing accident sequences used plant-specific information such as procedures. This is a documentation issue not affecting the technical adequacy of the PRA model.

Table 2-1
Open Peer Review Findings

Title	Description of Gap	Applicable SRs [6]	Current Status	Comment
SC-B2-01	Tables 3-1 through 3-8 of TMI PRA-003 include several instances of use of "Judgment" as the basis for success criteria. These applications of judgment do not use section 4.3 of the ASME std. to attain CCII and are not discussed in the report as required by SC-C2 to attain CCI. Do not use judgment as basis for success criteria or apply para. 4.3 of the ASME standards when implementing expert judgment.	SC-B2	Open	Expert judgment was NOT used in determining the success criteria. Therefore, this is a documentation issue not affecting the technical adequacy of the PRA model.
SC-B4-01	Many of the T/H success criteria were developed using the MAAP computer code, including large break LOCAs greater than 10" diameter (see Table 3-3 of Success Criteria notebook). However, FAI has identified a limitation/precaution using MAAP for the large break LOCA analyses. "...the results of the code should not be used for a definitive determination of the primary system pressure response, mass and energy releases, and peak cladding temperatures during this time frame." Do not use MAAP to develop large LOCA success criteria due to limitations associated with the code.	SC-B4	Open	The documentation is misleading. MAAP was not used to develop the success criteria for Large LOCAs. Therefore, this is a documentation issue not affecting the technical adequacy of the PRA model.
SC-B5-01	No documentation of a check for the reasonableness and acceptability of the results (i.e., comparison with results of the same analyses performed for similar plants, accounting for differences in unique plant features). Compare TMI results with results of the same analyses performed for similar plants, accounting for differences in unique plant features	SC-B5	Open	Reasonableness and acceptability of the results were checked; this is a documentation issue not affecting the technical adequacy of the PRA model.

Table 2-1
Open Peer Review Findings

Title	Description of Gap	Applicable SRs [6]	Current Status	Comment
SC-C1-01	Documentation does not facilitate PRA application, upgrades, or peer review. Though it appears the information exists, one must piece together information in multiple notebooks and calculations with no correlation reference to understand how success criteria were evaluated or developed in the model. In application and model upgrade one could easily make an error due to the disconnected nature of the documentation.	SC-C1	Open	This is a documentation issue not affecting the technical adequacy of the PRA model.

Table 2-1
Open Peer Review Findings

Title	Description of Gap	Applicable SRs [6]	Current Status	Comment
SC-C2-01	There is an implied process in the latest Success Criteria Notebook, but not a clear process for evaluating and documenting success criteria, this can be easily related to the other SC-C criteria not being met. Documentation of core damage could be clarified. Though calculations and other references are used to develop success criteria they are not easily found in the documentation. Computer codes are identified in some cases, however there is no description of limitations or potential conservatisms. The use of expert judgment is used without rational or basis. There is in many cases no basis for the time given for human actions such as operator interviews or simulator runs or MAAP analysis. There is no summery of success criteria for mitigating systems and HEP's used,	SC-C2	Open	The HRA and its notebook were revised to include documented bases for times available to perform operator actions and times needed to perform the actions. Expert judgment was NOT used in the development of success criteria. Although not incorporated in the Success Criteria NB, the following applies to computer codes used for success criteria: *For success criteria that were developed for the PRA, instead of using design basis success criteria, MAAP 4 is used. The overall conclusion from the EPRI MAAP Thermal-Hydraulic Qualification Studies was that MAAP had a wide range of applicability; however, a few limitations were identified. The current position on MAAP code limitations can be found on the MAAP4 web site. The significant limitation of MAAP for PWRs is Large LOCA behavior prior to reflood. The TMI PRA uses design basis criteria for Large LOCAs, so this limitation of MAAP 4 has been addressed.* The Success Criteria NB still requires updating, so this F&O remains open. This is a documentation issue not affecting the technical adequacy of the PRA model.

Table 2-1
Open Peer Review Findings

Title	Description of Gap	Applicable SRs [6]	Current Status	Comment
SC-C3-01	Documentation of sources of uncertainty has not been accomplished. This is a recognized/acknowledged gap for the TMI PRA.	SC-C3	Open	To be determined once the new USNRC/EPRI guidance is implemented. However, the EPRI RISI process is defined such that model uncertainties will not unduly influence results, and, further, the current approach provides appropriate insights into important modeling assumptions that may be pertinent to applications.
SY-A20-01	In general, the system notebooks do not discuss room cooling. The EFW system considered the impact of a steam line break and the diesel generators are assumed to require the room fan for success. However, other notebooks (e.g., HPI, DHRW/CCW, LPI/DHR) do not mention room cooling. HVAC systems are discussed in Appendix D to the 2003 TMI update, which presents the TMI responses to the 2000 peer review. In that document, the response to F&O DE-2 presents a review of various HVAC systems. Some PRA component areas are excluded with a good basis (e.g., NSCCW pump areas reference results from loss of ventilation tests). However, it is difficult to evaluate each area's HVAC requirements by reading the responses to the F&Os.	SY-A22, SY-B6, SY-B7, AS-B7	Open	This is a documentation issue not affecting the technical adequacy of the PRA model.
SY-C1-01	This SR is not met due to SY-C2 and SY-C3 not being met. In general the system notebooks did not supply sufficient information to evaluate SY effectively. Continue developing system documentation as a stand-alone document representing the current model. It is recommended that system notebooks like the Electrical Systems be broken up to discuss specific systems in more detail, for example the Diesel Generators, 4.160Kv, 480VAC, DC etc.	SY-C1, SY-C2, SY-C3, SY-A2	Open	This is a documentation issue not affecting the technical adequacy of the PRA model.

Table 2-1
Open Peer Review Findings

Title	Description of Gap	Applicable SRs [6]	Current Status	Comment
SY-C2-01	Documentation of the systems analysis was not sufficient reasonably assess the associated supporting requirements.	SY-C2	Open	This is a documentation issue not affecting the technical adequacy of the PRA model.
QU-B5-01	Logic loops have been broken, as none appear in the TMI1042 model. However, no record can be found of how the logic loops were broken. Document how logic loops were identified and broken.	QU-B5	Open	This is a documentation issue not affecting the technical adequacy of the PRA model.
QU-C1-01	Multiple HFE identification only considers HFE in the quantified model fault tree. Recovery event applied post quantification by the recovery tree were not addressed. Include recovery tree event for dependency identification.	QU-C1, HR-H3	Open	Only three recoveries are used in the TMI PRA. Dependency with other HFEs is considered for two of them, but not the third (REO). A sensitivity analysis was performed as described in Section 2.2. There was no impact on the RISI rankings based on this sensitivity. Therefore, there is no impact on the RISI assessment from this gap.
QU-D3-01	Comparison of the results of the model with other similar plants was not documented. Perform the comparison.	QU-D4	Open	A comparison of the model results with other plants was performed at a high level for other B&W plants and at a more detailed level for ANO-2. This review is not documented. Therefore, this is a documentation issue not affecting the technical adequacy of the PRA model nor this application.

Table 2-1
Open Peer Review Findings

Title	Description of Gap	Applicable SRs [6]	Current Status	Comment
QU-D5-01	Contribution to CDF of SSCs/operator actions are not provided in a manner to distinguish between initiating events vs. event mitigation. Expand the results discussion to include additional discussion of contributors at lower level of resolution and provide the contributions for IEs and for mitigation.	QU-D6	Open	Some SSCs that are significant contributors to initiating events, but not to mitigation, are not explicitly identified in the documentation of significant contributors. Significant contributors to initiating events were identified through a review of support system initiating event cutsets, but the individual contributors and cutsets were omitted from the quantification notebook. It should be noted that initiating event fault trees are re-quantified for any application affecting the components or configurations represented by these fault trees. However, this is a documentation issue not affecting the technical adequacy of the PRA model nor this application.
QU-E4-01	There is no evidence that an evaluation was performed of the sensitivity of the results to key model uncertainties and key assumptions.	QU-E4	Open	To be determined once the new USNRC/EPRI guidance is implemented. However, the EPRI RISI process is defined such that model uncertainties will not unduly influence results, and, further, the current approach provides appropriate insights into important modeling assumptions that may be pertinent to applications.

Table 2-1
Open Peer Review Findings

Title	Description of Gap	Applicable SRs [6]	Current Status	Comment
QU-F1-01	The documentation of the quantification included only minimal information. Many of the requirements of the stated in the SRs are not included. (Examples: Reviews are not documented. Contributors are very minimally documented.) The documentation does not meet the minimum requirements of the ASME standard and thus does not facilitate applications/upgrades/reviews. The documentation does not describe the approach for identification and breaking of logic loops in the model. Revise the quantification documentation to include the requirements of the SRs.	QU-F1	Open	The Quantification Notebook has been updated and significantly improved. However, several documentation-related QU F&Os remain open. Therefore, this F&O remains open, but it is a documentation issue not affecting the technical adequacy of the PRA model.
QU-F2-01	The documentation of the quantification is missing significant sections such as reviews, sequence discussions, lower level results, uncertainty analyses. Update the results documentation to include all needed information. Use the SR to provide guidance regarding needed and suggested content.	QU-F2	Open	Many of the sections listed in the F&O have been added to the Quantification Notebook, but not all items in QU-F2 have been documented and this F&O remains open. However, it is a documentation issue not affecting the technical adequacy of the PRA model.
QU-F5-01	In the quantification notebook, other than the LERF truncation limitation, no evaluations of limitations were presented. Explicitly consider limitations of the model as they may apply to applications.	QU-F5, LE-G5	Open	LERF truncation is the only identified limitation to the TMI PRA model for applications. This is a documentation issue not affecting the technical adequacy of the PRA model.

Table 2-1
Open Peer Review Findings

Title	Description of Gap	Applicable SRs [6]	Current Status	Comment
LE-B1-01	The LERF contributors from Table 4.5.9-3 of the ASME Standard are considered in the TMI Containment Event Tree. Of the items applicable for Large, Dry Containments such as TMI, containment isolation is addressed in CET heading B, ISLOCA, SGTR, and induced SGTR in heading A, and HPME/core debris impingement in heading E. The item "In-vessel recovery" is considered in preventing late containment failures (per TMI-PRA-015.2, page 5-109), but no credit is given (failure event set to 1.0). It is conservative to take no credit for in-vessel recovery; the conservative modeling in the late analysis does not impact LERF, but failure to consider in the early analysis could potentially overstate impact of early containment failure after vessel breach.	LE-B1	Open	LE-B1 does not meet Capability Category II, but is considered adequate for this application. As this addresses a model issue resulting in conservative LERF results, the result of this gap is to bias CLERP results higher, which is conservative. Therefore, this gap is considered acceptable for the RISI evaluation.
LE-C2-01	This F&O applies to several LE SRs that involve reviewing significant LERF sequences for potential credit for equipment repair, additional recovery actions, engineering evaluations, etc. There is no formal record of a review of the LERF results for such items. Document reviews of the significant accident progression sequences that result in a large, early release to determine if repair, additional recoveries, additional engineering evaluations, etc. can be credited. If any credit is given, provide justification for the credit.	LE-C3, LE-C10, LE-C11	Open	LE-C3, LE-C10 and LE-C11 do not meet Capability Category II, but they are treated conservatively. As these address model issues resulting in conservative LERF results, the result of this gap is to bias CLERP results higher, which is conservative. Therefore, this gap is considered acceptable for the RISI evaluation.

Table 2-1
Open Peer Review Findings

Title	Description of Gap	Applicable SRs [6]	Current Status	Comment
LE-C7-01	System level operator actions are described in the Level 1 System Analysis notebooks. Offsite power recovery data is consistent with the Level 1 analysis. Other human actions in the TMI CET were estimated using qualitative judgment in Table 5-1 of the CET notebook. This qualitative evaluation is acceptable for some uncertain phenomenological issues, but more detailed HRA analyses are needed for actions that can be quantified, as per the requirements of the ASME Standard paragraph 4.5.5. Identify operator actions in the Level 2 for which a more detailed HRA is possible. One example would be comparing the time at which PORVs can be opened to reduce RCS pressure to the time at which an induced SGTR might occur. Consider sensitivity analyses on uncertain parameters.	LE-C7	Open	Conservative screening values are used for the CET HEPs. Therefore, the impact of these HEPs is to bias CLERP results higher, which is conservative. Therefore, this gap is considered acceptable for the RISI evaluation.
LE-C8a-01	Equipment survivability is considered for the containment fans in Section 5 of the CET notebook. For before, soon after, and long after vessel failure containment conditions, the fans are assumed to have a 0% chance of failure due to the accident environment. As a basis, the analysis states that the Oconee fans are expected to remain functional throughout an accident. The Oconee reference is from 1990, and may have been updated since that time. As the fans are important in controlling containment pressure and temperature, which impacts the EARLY evaluation, more detailed justification should be examined to credit their survivability.	LE-C9	Open	The Reactor Building Emergency Cooling System has no impact on CCDP or CLERP for RISI (CCDP and CLERP = 0.0 for RI-D23 in Table 3-3). Therefore, correcting this gap would have no impact on the PRA case runs. Therefore, this gap is considered acceptable for the RISI evaluation.

Table 2-1
Open Peer Review Findings

Title	Description of Gap	Applicable SRs [6]	Current Status	Comment
LE-D1b-01	The TMI containment comparison to the Oconee containment evaluation (Appendix B of TMI-PRA-015.2, Rev. 0) provided a good basis for utilizing the Oconee analyses of the personnel airlocks and purge penetrations. However, the report identified that additional analyses were necessary for evaluation of the equipment hatch, mechanical penetrations and electrical penetrations. A discussion of a qualitative evaluation of these is provided in the latter portion of Appendix C of TMI-PRA-015.2, Rev. 0. A detailed evaluation of the TMI equipment hatch, personnel airlock and containment purge valves are performed, providing good plant-specific basis for their evaluation. However, the evaluation of the electrical and mechanical penetrations is very subjective, stating simply that it is assumed that their failure pressures will be higher than the containment structure. While these assumptions are likely true, some additional basis should be provided.	LE-D2	Open	A sensitivity was performed to determine the impact of assuming a substantially lower failure pressure for the electrical and mechanical penetrations. See Section 2.2 for details of the assessment. This sensitivity resulted in no changes to the rankings for the RISI. Therefore, this gap is considered acceptable for the RISI evaluation.
LE-D4-01	The secondary side isolation is evaluated in the Level 1 analysis. However, the SG relief valve was evaluated only for the pre-core damage failures to isolate. Should core damage occur, the relief valve would experience many additional challenges (either passing steam or water depending on whether or not there is FW flow to the SG). The Level 2 analysis does not account for this elevated potential for a stuck open relief valve.	LE-D5	Open	All accident progression sequences involving SGTR (either as an initiator or induced following core damage) are assumed to be LERF. No credit is taken for SG isolation for any SGTR accident progression sequence. Therefore, SGTR is treated conservatively. The result of this gap is to bias CLERP results higher, which is conservative. Therefore, this gap is considered acceptable for the RISI evaluation.

Table 2-1
Open Peer Review Findings

Title	Description of Gap	Applicable SRs [6]	Current Status	Comment
LE-D5-01	Induced SGTR is considered in CET top event node Bypass, but it does not appear that a specific ISGTR methodology was utilized. The most significant issue with the ISGTR model is the assumption that operators would start the RCPs with dry SGs. The CET notebook states that operators are directed to do so with no caution about SG status. Clearing the loop seal results in significant convective heat transfer to the SG tubes, yielding the assumed 0.9 conditional probability of ISGTR. However, the current TMI SAMG guidance (ER-TM-TSC-0010, Rev. 1) directs operators to turn on the RCPs as a SAMG action but has a caution on the step 3.3 that turning on the RCPs when the SGs are dry can result in an induced SGTR. The caution states that if the SG cannot be adequately protected, then don't turn on the RCPs.	LE-D6	Open	The operator action to clear seals was determined to be considerably less likely than previously assumed, based on a review of the latest TMI SAMG guidance. Changing the operator action to reflect the SAMG guidance reduced ISGTR contribution to LERF. This F&O is still open, although the excessive conservatism relating to ISGTR has been removed. The representation of ISGTR is still considered to be conservative (but to a lesser extent), which bias the CLERP results higher, which is conservative. Therefore, this gap is considered acceptable for the RISI evaluation.
LE-E2-01	The TMI CET parameter estimates are conservative in general. The probabilities of early containment failure from DCH, rapid steam generation, and combustible gas burns are conservative and are all based on references from 1992 and earlier. Studies since that time (e.g., NUREG/CR-6075, NUREG/CR-6109 and NUREG/CR-6338) have recommended greatly reduced probabilities or even eliminated early containment HPME failures from large, dry containments.	LE-E2	Open	The TMI CET parameter estimates are conservative, resulting in conservative LERF results. The result of this gap is to bias CLERP results higher, which is conservative. Therefore, this gap is considered acceptable for the RISI evaluation.

Table 2-1
Open Peer Review Findings

Title	Description of Gap	Applicable SRs [6]	Current Status	Comment
LE-F2-01	The CET document notes some MAAP sensitivity analyses that were performed to aid in determining the split fractions in the CET. The sensitivity analyses were not specifically referenced, but were performed to address some of the MAAP uncertainties. No sensitivities on the other phenomenological Level 2 uncertainties (e.g., induced SGTR assumptions and probabilities) have been performed. No uncertainty calculation was documented in the Level 2 notebooks. Perform LERF uncertainty and sensitivity calculations. Characterize LERF uncertainties consistent with the applicable requirements of ASME Standard tables 4.5.8-2(d) and 4.5.8-2(e).	LE-F3	Open	To be determined once the new USNRC/EPRI guidance is implemented. However, the EPRI RISI process is defined such that model uncertainties will not unduly influence results, and, further, the current approach provides appropriate insights into important modeling assumptions that may be pertinent to applications.

Table 2-2
Gaps to Capability Category II
For the DA Technical Element

Title	Description of Gap	Applicable SRs [6]	Current Status	Comment
DA-B1-01	Although components are grouped according to type and characteristic, there is no difference in failure rates for most groups of the same type, unless the group was updated with plant specific data.	DA-B1	Open	This SR is Met Capability Category I, since the components are grouped by type. The most recent generic data (NUREG/CR-6928) does not support more specific groups, since most component failure rates are based on type (e.g., there is only one category of MOVs). However, there is gradation between standby and normally operating components. For the important systems (MU, DH, EF, DC, DH, DR, NR, NC, DG), plant specific data is used to determine the failure rates by system and component type. The component type codes that were updated with plant specific data were not changed much from the generic data. Therefore, it is not expected that more complete grouping of components by characteristic in order to meet Capability Category II would have much impact on PRA and the results of the RISI evaluation. Therefore, this gap is considered acceptable for the RISI evaluation.
DA-B2-01	Although the component failure rates are grouped by system and component type, that does not guarantee that outliers are not included in a group.	DA-B2	Open	There is no indication of outliers due to testing or operational characteristics (except for potentially manual valves, which are not risk significant), nor due to poor performance of certain components or systems. Therefore, this gap is considered acceptable for the RISI evaluation.

Table 2-2
Gaps to Capability Category II
For the DA Technical Element

Title	Description of Gap	Applicable SRs [6]	Current Status	Comment
DA-C2-01	Plant specific data is collected for component failures and success for all components in the scope of MSPI. Although this is a smaller set of component types and failure modes than all the significant basic events (e.g, F-V >.005 or RAW >2), it is considered an acceptable scope of data for a model update. Unavailability data is collected for all MR equipment for which unavailability data is maintained.	DA-C2	Open	The impact of updating with plant specific data on failure rates was minor (e.g., changes by several percent). There is no indication of particularly poor performers in any risk significant system. Therefore, there would be no significant impact expected on the PRA or RISI if plant specific data was used for all risk significant component types. Therefore, this gap is considered acceptable for the RISI evaluation.
DA-C4-01	The MSPI rules are used for data collection of failures, as described in the Data Notebook. The failure definitions are generally consistent with the PRA failure definitions. However, that is currently an assumption, since there is no documented basis.	DA-C4	Open	This is considered a documentation issue not affecting the technical adequacy of the PRA model.
DA-C7-01	The number of Surveillance Tests are estimated based on plant requirements. Data is obtained from the MSPI Derivation Reports as described in Section 2.4 of the Data Notebook.	DA-C7	Open	This SR meets Capability Category I. Although the number of Surveillance Tests are estimated, the estimation is expected to be very close to the actual value. If actual numbers of tests were used, the final failure rates should not be significantly different from the failure rates calculated with estimated demands. Therefore, this gap is considered acceptable for the RISI evaluation.

Table 2-2
Gaps to Capability Category II
For the DA Technical Element

Title	Description of Gap	Applicable SRs [6]	Current Status	Comment
DA-C8-01	Time that the component is in standby is estimated based on plant requirements (e.g., nominal time between surveillance tests). Documentation of standby mission times is lacking in the current data notebook.	DA-C8	Open	This SR meets Capability Category I. Although the standby time of components is estimated, the estimation is expected to be very close to the actual value. If actual standby times were used, the final failure probabilities should not be significantly different from the failure probabilities calculated with estimated times. Therefore, this gap is considered acceptable for the RISI evaluation.
DA-C10-01	Surveillance tests were reviewed to determine demands and operational time. Successes were estimated based on surveillance schedules.	DA-C10	Open	This SR meets Capability Category I. Although the demands and operational time for components is estimated, the estimation is conservative and expected to be reasonably close to the actual value. If actual operation times and successes were used, the final failure rates should be lower but not significantly different from the failure rates calculated with estimated times. Therefore, this gap is considered acceptable for the RISI evaluation.
DA-C12-01	A review of support system unavailability to ensure that double counting did not occur was performed. However, the documentation is lacking in the Data Notebook.	DA-C12	Open	This is a documentation issue not affecting the technical adequacy of the PRA model.
DA-C14-01	A review of coincident unavailability was performed. However, the documentation is lacking in the notebook.	DA-C14	Open	This is a documentation issue not affecting the technical adequacy of the PRA model.

Table 2-2
Gaps to Capability Category II
For the DA Technical Element

Title	Description of Gap	Applicable SRs [6]	Current Status	Comment
DA-D1-01	The decision was made to only update MSPI components with plant-specific data. However, this does not meet the requirements to update all Significant BEs, since there are significant BEs that are not within the scope of MSPI. For the BEs within the scope of MSPI, CC II is Met. However, the full scope of significant BEs does not use both generic and plant-specific data in a Bayes process.	DA-D1	Open	This SR meets Capability Category I. The impact of updating with plant specific data on failure rates was minor (e.g., changes by several percent). There is no indication of particularly poor performers in any risk significant system. Therefore, there would be no significant impact expected on the PRA or RISI if plant specific data was used for all risk significant component types. Therefore, this gap is considered acceptable for the RISI evaluation.
DA-D4-01	Although a Bayesian Approach is used, there is no evidence that a check of the posterior distribution was made as required by this SR. On review, it can be seen that the type codes which were updated with plant specific information have reasonable values, but there is no documentation of the check.	DA-D4	Open	This is a documentation issue not affecting the technical adequacy of the PRA model.
DA-E3-01	This SR is not met. Parametric uncertainty values are provided, but sources of model uncertainty and related assumptions are not.	DA-E3	Open	To be determined once the new USNRC/EPRI guidance is implemented. However, the EPRI RISI process is defined such that model uncertainties will not unduly influence results, and, further, the current approach provides appropriate insights into important modeling assumptions that may be pertinent to applications.

Table 2-3
Identified Gaps to Capability Category II
For the IF Technical Element

IFPP-A2-01	Documentation is lacking in details for several parts of the flood analysis, such as flood area determination and screening criteria and results.	IFPP-A2, IFSO-B2, IFSN-B2 IFQU-B2	Open	This is a documentation issue not affecting the technical adequacy of the PRA model.
IFPP-B3-01	Documentation and evaluation of sources of uncertainty has not been accomplished. This is a recognized/acknowledged gap for the TMI PRA.	IFPP-B3, IFSO-B3 IFSN-B3 IFEV-B3	Open	To be determined once the new USNRC/EPRI guidance is implemented. However, the EPRI RISI process is defined such that model uncertainties will not unduly influence results, and, further, the current approach provides appropriate insights into important modeling assumptions that may be pertinent to applications.
IFEV-A5-01	Several requirements in establishing flood initiating event frequencies are not met. 1) Recent pipe data is not used 2) Effect of plant specific features and experience are not factored into the initiating event frequencies 3) Human-induced flooding does not appear to be evaluated.	IFEV-A5, IFEV-A6, IFEV-A7	Open	The importance of flood initiating events are affected by this gap. The only impact on the RISI calculations associated with flood initiating events are the CCDP and CLERP calculations for demand impacts. A sensitivity was performed for these calculations based on assuming all flood initiators were an order of magnitude higher. See Section 2.2 for details of the assessment. This sensitivity resulted in no changes to the rankings for the RISI. Therefore, this gap is considered acceptable for the RISI evaluation.

Request for Relief for Inservice Inspection Impracticality of Pressure Testing the Reactor Pressure Vessel Head Flange Connection Lines In Accordance with 10 CFR 50.55a(g)(5)(iii)

1.0 ASME CODE COMPONENTS AFFECTED:

Code Class:	2
Reference:	Table IWC-2500-1, IWC-5200
Examination Category:	C-H
Item Number:	C7.10
Description:	Pressure Testing the Reactor Pressure Vessel Head Flange Connection Lines
Component Number:	Reactor Pressure Vessel Head Flange Connection Lines
Drawing Number:	Figure I4R-03.1

2.0 APPLICABLE CODE EDITION AND ADDENDA:

The ISI program is based on the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, 2004 Edition, No Addenda.

3.0 APPLICABLE CODE REQUIREMENT:

Table IWC-2500-1, Examination Category C-H, Item Number C7.10, requires ISI Class 2 pressure retaining components be subject to a system leakage test with a VT-2 visual examination in accordance with Paragraph IWC-5220. This pressure test is to be conducted once each inspection period.

4.0 IMPRACTICALITY OF COMPLIANCE:

Pursuant to 10 CFR 50.55a(g)(5)(iii), relief is requested on the basis that pressure testing the Reactor Pressure Vessel Head Flange Connection Line is deemed impractical.

The two Reactor Pressure Vessel Head Flange Connection Lines are separated from the reactor pressure boundary by one passive membrane, an O-ring located on the reactor pressure vessel closure head flange. A second O-ring is located on the opposite side of the tap in the vessel flange (see Figure I4R-03.1). This line runs from the flange to a normally closed 1" isolation valve and is not pressurized during normal operation.

The configuration of this system precludes manual testing while the vessel head is removed. The configuration of the vessel tap, combined with the small size of the tap and the high test pressure requirement (approximately 2155 psig), prevents the tap from being temporarily plugged. Also, when the reactor pressure vessel closure head is installed, an adequate pressure test cannot be performed due to the fact that the inner O-ring is designed to withstand pressure in one direction only. Due to the groove that the O-ring sits in and the clip assembly (See Figure I4R-03.1), pressurization in the opposite direction into the recessed cavity and retainer clips would likely damage the O-ring.

5.0 BURDEN CAUSED BY COMPLIANCE:

Pressure testing of this line during the System Leakage Test is precluded because the line will only be pressurized in the event of a failure of the inner O-ring. Purposely failing the inner O-ring to perform the ASME Section XI required test would require purchasing a new set of O-rings, additional time and radiation exposure to detension the reactor pressure vessel head, installation of the new O-rings, and then reset and retension the reactor pressure vessel head. This is considered to impose an undue burden.

Based on the above, TMI requests relief from the ASME Section XI requirements for system leakage testing of the Reactor Pressure Vessel Head Flange Connection Lines.

6.0 PROPOSED ALTERNATIVE AND BASIS FOR USE:

A VT-2 visual examination on the ISI Class 2 portion of the Reactor Pressure Vessel Head Flange Connection Lines will be performed once each inspection period when the reactor pressure vessel head is off and the fuel transfer canal is filled above the vessel flange. The static head developed with the connection lines filled with water will allow for the detection of any gross leakage in the lines. This examination will be performed on the accessible, exposed portion of the lines out to the closed isolation Class 2 boundary valves once each inspection period as per the frequency specified by Table IWC-2500-1.

7.0 DURATION OF PROPOSED ALTERNATIVE:

Relief is requested for the fourth ten-year ISI interval for TMI, Unit 1.

8.0 PRECEDENTS:

Similar relief requests have been approved for:

Peach Bottom Atomic Power Station, Units 2 and 3, fourth ISI interval Relief Request I4R-25 was granted per U.S. Nuclear Regulatory Commission (USNRC) Safety Evaluation Report (SER) dated February 26, 2009.

Limerick Generating Station, Units 1 and 2, third ISI interval Relief Request I3R-08 was granted per USNRC SER dated March 11, 2008.

LaSalle County Station, Units 1 and 2, third interval Relief Request I3R-08 was granted per USNRC SER dated January 30, 2008.

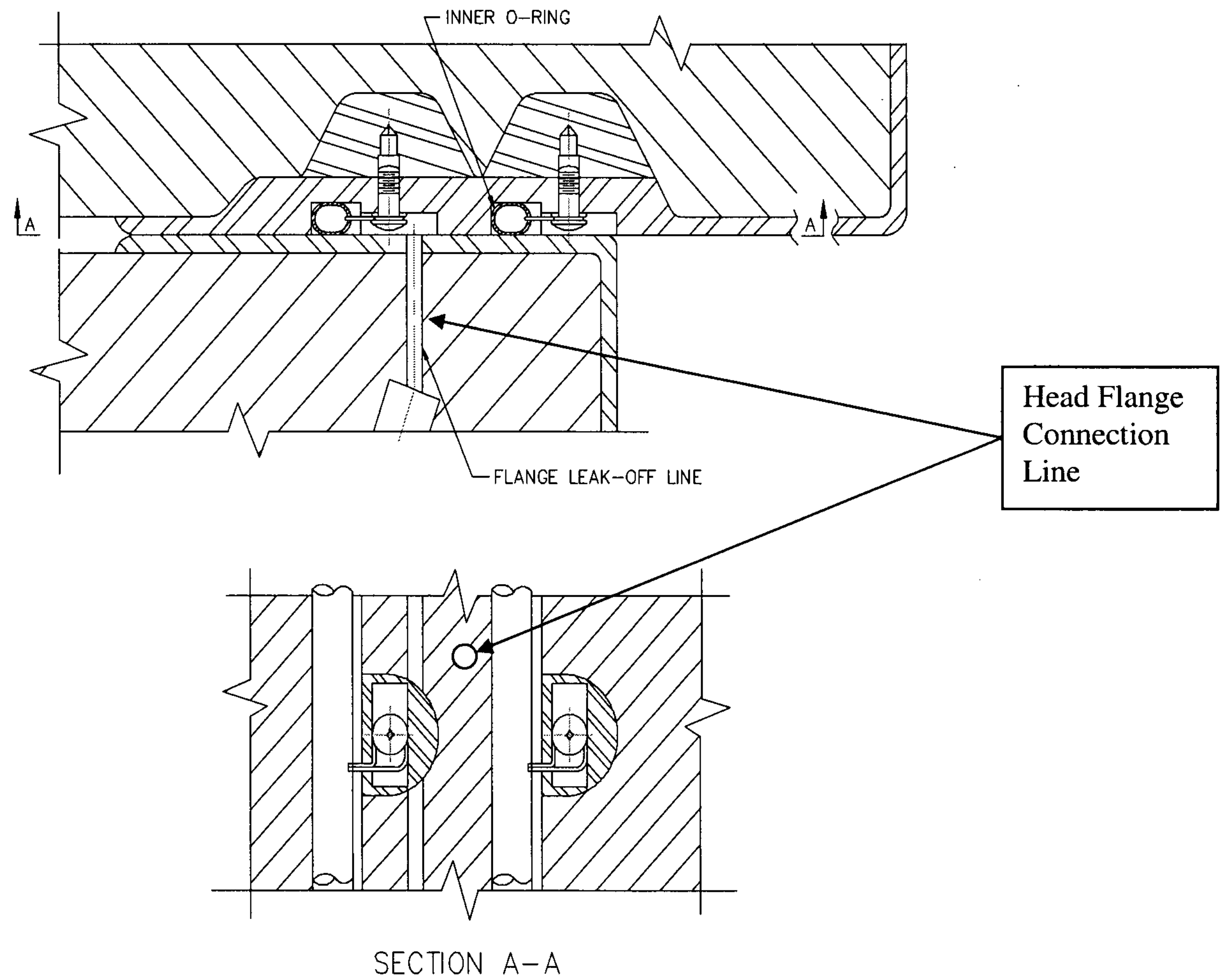

FIGURE I4R-03.1
O-RING CONFIGURATION

Request for Relief for ISI Snubbers Included in the Technical Specifications Snubber Visual Examination and Functional Testing Program In Accordance with 10 CFR 50.55a(a)(3)(i)

1.0 ASME CODE COMPONENTS AFFECTED:

Code Class:	1, 2, and 3
Reference:	IWF-5200(a) and IWF-5300(a) IWF-5200(b) and IWF-5300(b)
Examination Category:	NA
Item Number:	NA
Description:	ISI Snubbers Included in the Technical Specifications Snubber Visual Examination and Functional Testing Program
Component Number:	Various Safety Related Snubbers

2.0 APPLICABLE CODE EDITION AND ADDENDA:

The ISI program is based on the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, 2004 Edition, No Addenda. Table IWA-1600-1 of the ASME Section XI specifically references the 1987 Edition with OMa-1988 Addenda of the ASME/ANSI OM Code (Part 4).

3.0 APPLICABLE CODE REQUIREMENT:

Paragraphs IWF-5200(a) and IWF-5300(a) require Preservice and Inservice examinations to be performed in accordance with ASME/ANSI OM, Part 4, using the VT-3 visual examination method described in Paragraph IWA-2213.

Paragraphs IWF-5200(b) and IWF-5300(b) require Preservice and Inservice tests to be performed in accordance with ASME/ANSI OM, Part 4.

4.0 REASON FOR REQUEST:

Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested on the basis that the proposed alternative, utilizing TMI Technical Specifications, Section 4.17, will provide an acceptable level of quality and safety.

ASME/ANSI OM (Part 4) specifies three functional test plans. This Code was completely revised in the 1988 Addenda to incorporate three snubber functional testing sampling plans, identified as the 10% testing sample plan, the 37 testing sample plan, and the 55 testing sample plan.

The TMI Technical Specifications provide similar requirements for visual examination, scheduling, re-examinations, and functional testing requirements.

> "To provide assurance of snubber functional reliability, one of the two sampling and acceptance criteria methods are used:
>
> 1. Functionally test 10% of a type of snubber with an additional 10% tested for each functional testing failure, or
>
> 2. Functionally test a sample size and determine sample acceptance or rejection using Figure 4.17-1"

The TMI, Unit 1 Technical Specifications 10% testing sample plan differs from the ASME OM 10% plan in that the Technical Specifications require an additional 10% of that type of snubber be tested for each functional test failure. The ASME OM 10% testing plan requires additional snubber testing as follows: "For any snubber(s) determined to be unacceptable as a result of testing, an additional sample of at least one-half the size of the initial sample lot shall be tested until the total number tested is equal to the initial sample size multiplied by the factor 1 + C/2, where C is the total number of snubbers found to be unacceptable." The TMI, Unit 1 Technical Specifications testing plan results in an increase in the overall level of plant quality and safety based on a larger testing population should unacceptable testing results be encountered.

The TMI, Unit 1 Technical Specifications contain requirements for a snubber seal service life monitoring program. The TMI, Unit 1 Technical Specifications (4.17.1.i) require the following:

> "A snubber seal service life program shall be developed whereby the seal service life of hydraulic snubbers is monitored to ensure that the service life is not exceeded between surveillance inspections. The designated service life for the various seals shall be established based on engineering information. The seals shall be replaced so that the indicated service life will not be exceeded during a period when the snubber is required to be OPERABLE."

The TMI safety-related snubber population is comprised exclusively of hydraulic snubbers. TMI has procedures in place to implement the snubber program as described in Technical Specifications, Section 4.17.

The TMI, Unit 1 Technical Specifications snubber visual examination frequency is based on an operating cycle of 24 months. The TMI, Unit 1 Technical Specifications require visual examination of all safety-related snubbers to be performed in accordance with the following schedule:

Number of Inoperable Snubbers of Each Type per Inspection Period	Subsequent Visual Inspection Period**#
0	24 months ± 25%
1	16 months ± 25%
2	6 months ± 25%
3, 4	124 days ± 25%
5, 6, 7	62 days ± 25%
8 or more	31 days ± 25%

** The inspection interval for each type of snubber shall not be lengthened more than one step at a time unless a generic problem has been identified and corrected; in that event the inspection interval may be lengthened one step the first time and two steps thereafter if no inoperable snubbers of that type are found.

The provisions of Technical Specifications Table 1.2 are not applicable.

The TMI, Unit 1 Technical Specifications visual examination frequency is similar to the visual examination frequency defined in OM Part 4. OM Part 4, 2.3.2.2 requires essentially identical visual examination frequencies when two or more unacceptable snubbers are identified. The TMI, Unit 1 Technical Specifications visual examination frequency for 0 unacceptable snubbers is 24 months, and for 1 unacceptable snubber is 16 months. The OM Part 4, 2.3.2.2 visual examination frequency for 0 or 1 unacceptable snubber is 18 months and 12 months, respectively. The OM Part 4 requirement did not initially account for 24 month fuel cycles which were not predominant at the time of issuance. The OM Part 4 visual examination frequency could require plant shutdown just for snubber visual examinations when 24-month operating cycles are implemented.

The TMI, Unit 1 Technical Specifications do not specifically address preservice visual examination of snubbers. TMI will perform preservice visual examination of snubbers following maintenance activities (e.g., replacement, repair, modification, etc.).

In conclusion, the visual examination and functional testing of snubbers at TMI, Unit 1 will be performed in accordance with Technical Specifications, Section 4.17. These visual examinations and functional tests will be performed in lieu of the inspection and testing requirements of Paragraphs IWF-5200(a) and (b) and Paragraphs IWF-5300(a) and (b). The general requirements of Subsection IWA, such as examination methods, personnel qualifications, etc. remain applicable. Based on this approach, TMI, Unit 1 has determined that implementation of the Technical Specifications, Section 4.17, snubber program will assure an acceptable level of quality and safety.

5.0 PROPOSED ALTERNATIVE AND BASIS FOR USE:

TMI, Unit 1 requests approval to use Technical Specifications, Section 4.17, "Shock Suppressors (Snubbers)", and associated Bases, as found within the TMI, Unit 1 Technical Specifications for visual examination, scheduling, re-examinations, and functional testing requirements.

Snubber preservice and inservice visual examinations will be conducted using the VT-3 visual examination method (i.e., VT-3 qualified procedures and personnel) described in Paragraph IWA-2213 of ASME Section XI.

Repair/replacement activities performed on snubbers shall be in accordance with Article IWA-4000 of ASME Section XI.

Snubbers installed, corrected, or modified by repair/replacement activities shall be preservice examined and preservice tested in accordance with the applicable Technical Specifications requirements prior to return to service.

6.0 DURATION OF PROPOSED ALTERNATIVE:

Relief is requested for the fourth ten-year ISI interval for TMI, Unit 1.

7.0 PRECEDENTS:

Similar relief requests have been approved for:

Limerick Generating Station, Units 1 and 2, third ISI interval Relief Request I3R-05 was authorized per U.S. Nuclear Regulatory Commission (USNRC) Safety Evaluation Report (SER) dated March 11, 2008.

Hope Creek Generating Station, third ISI interval Relief Request HC-I3R-02 was authorized per USNRC SER dated October 16, 2008.

Susquehanna Steam Electric Station, Units 1 and 2, third ISI interval Relief Request 3RR-03 was authorized per USNRC SER dated September 24, 2004.

Request for Relief From Qualification Requirements of ASME Section XI, Appendix VIII, Supplement 11, for Examination of Structural Weld Overlays (SWOLs) In Accordance with 10 CFR 50.55a(a)(3)(i)

1.0 ASME CODE COMPONENTS AFFECTED:

Code Class:	1
Reference:	ASME Section XI, Mandatory Appendix VIII, Supplement 11
Examination Category:	B-F, B-J
Item Number:	B5.40, B9.11
Description:	Qualification Requirements of ASME Section XI, Appendix VIII, Supplement 11, for Examination of Structural Weld Overlays (SWOLs)
Drawing Number:	1D-ISI-RC-002, 1D-ISI-RC-012, 1D-ISI-DH-001

2.0 APPLICABLE CODE EDITION AND ADDENDA:

1. American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, 2004 Edition, No Addenda.
2. ASME Section XI, 2001 Edition, No Addenda, Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," mandated through 10 CFR 50.55a(b)(2)(xxiv).
3. ASME Section XI, 2001 Edition, No Addenda, Appendix VIII, Supplement 11, "Qualification Requirements for Full Structural Overlaid Wrought Austenitic Piping Welds," mandated through 10 CFR 50.55a(b)(2)(xxiv).

3.0 APPLICABLE CODE REQUIREMENT:

Full structural weld overlays of austenitic piping welds shall be examined using procedures and examiners qualified in accordance with ASME Section XI, Mandatory Appendix VIII, Supplement 11.

10 CFR 50.55a(b)(2)(xxiv) prohibits use of Appendix VIII and associated supplements beyond the 2001 Edition, No Addenda of ASME Section XI.

TMI, Unit 1 has applied full structural weld overlays (SWOL) on three dissimilar metal weld locations (Reference Table 1 for specific locations). In Relief Request I4R-02, it was indicated that ultrasonic examination of completed weld overlay repaired welds will be performed in accordance with ASME Section XI, Non-Mandatory Appendix Q. Article Q-

4000 states: "Ultrasonic examination personnel shall be certified in accordance with the Owner's written practice. Procedures and personnel shall be qualified in accordance with Appendix VIII." Appendix VIII, Supplement 11 is applicable to ultrasonic examination of weld overlay repaired locations.

4.0 REASON FOR REQUEST:

Pursuant to 10 CFR 50.55a(a)(3)(i), TMI, Unit 1 requests relief from the qualification requirements of Supplement 11 and proposes instead to use the ultrasonic (UT) qualification program for weld overlay inspections developed and administered through the Electric Power Research Institute (EPRI) Performance Demonstration Initiative (PDI) qualification program.

U.S. nuclear utilities created the PDI program to implement performance demonstration requirements contained in Section XI, Appendix VIII. PDI has developed a program for qualifying equipment, procedures, and personnel for examinations of weld overlays in accordance with the UT criteria of Supplement 11. Prior to the Supplement 11 program, EPRI maintained a performance demonstration program for weld overlay examination qualification under the Tri-party Agreement. Instead of having two programs with similar objectives, the USNRC staff recognized the PDI program for weld overlay examination qualifications as an acceptable alternative to the Tri-party Agreement (Reference 3).

Although the PDI program does not fully conform with the existing requirements of Supplement 11, it is routinely assessed by the USNRC staff for consistency with the current ASME Code and proposed changes. The major differences between the PDI program compared to Supplement 11 are associated with flaw locations contained in test specimens and fabricated flaw tolerances. The changes in flaw locations within the test specimens allowed using the test specimens from the Tri-party Agreement, and changes in fabricated flaw tolerances provide UT acoustic responses similar to those associated with Intergranular Stress Corrosion Cracking (IGSCC).

Table 2 of this relief request provides the requirements of Supplement 11 along with the associated EPRI PDI requirement. Discussion of the differences between the two programs is as follows:

Paragraph 1.1.(b) of Supplement 11 states limitations to the maximum thickness for which a procedure may be qualified. The ASME Code states that "The specimen set must include at least one specimen with overlay thickness within -0.10-inch to +0.25-inch of the maximum nominal overlay thickness for which the procedure is applicable." While the ASME Code requirement addresses the specimen thickness tolerance for a single specimen set, it is confusing when multiple specimen sets are used. The PDI proposed alternative states that "the specimen set shall include specimens with overlays not thicker than 0.10-inch more than the minimum thickness, nor thinner than 0.25-inch of the maximum nominal overlay thickness for which the examination procedure is applicable." The proposed alternative provides clarification on the application of the tolerance. The tolerance is unchanged for a single specimen set; however, the proposed alternative clarifies the tolerance for multiple specimen sets by providing tolerances for both the minimum and the maximum thicknesses.

Paragraph 1.1(d)(1) requires that all base metal flaws be cracks. PDI determined that certain Supplement 11 requirements pertaining to location and size of cracks would be extremely difficult to achieve. For example, flaw implantation requires excavating a volume of base material to allow a pre-cracked coupon to be welded into this area. This process would add weld material to an area of the specimen that typically consists of only base material, and could potentially make ultrasonic examination more difficult and not representative of actual field conditions. In an effort to satisfy the requirements, PDI developed a process for fabricating flaws that exhibit crack-like reflective characteristics. Instead of all flaws being cracks, as required by Paragraph 1.1(d)(1), the PDI weld overlay performance demonstrations contain at least 70% cracks with the remainder being fabricated flaws exhibiting crack-like reflective characteristics. The fabricated flaws are semi-elliptical with tip widths of less than 0.002-inches. PDI limits flaws in cases where implantation of cracks produces spurious reflectors that are uncharacteristic of actual flaws.

Paragraph 1.1(e)(1) requires that at least 20% but not less than 40% of the flaws shall be oriented within ±20 degrees of the axial direction (of the piping test specimen). Flaws contained in the original base metal heat-affected zone satisfy this requirement; however, PDI excludes axial fabrication flaws in the weld overlay material. PDI has concluded that axial flaws in the overlay material are improbable because the overlay filler material is applied in the circumferential direction (parallel to the girth weld); therefore, fabrication anomalies would also be expected to have major dimensions in the circumferential direction.

Paragraph 1.1(e)(1) also requires that the rules of Subarticle IWA-3300 shall be used to determine whether closely spaced flaws should be treated as single or multiple flaws. PDI treats each flaw as an individual flaw and not as part of a system of closely spaced flaws. PDI controls the flaws going into a test specimen set such that the flaws are free of interfering reflections from adjacent flaws. In some cases this permits flaws to be spaced closer than what is allowed for classification as a multiple set of flaws by Subarticle IWA-3300, thus potentially making the performance demonstration more challenging than the existing requirement.

Paragraph 1.1(e)(2) requires that specimens be divided into base metal and overlay grading units. The PDI program adds clarification with the addition of the word "fabrication" and ensures that flaw identification will not be masked by other flaws with the addition of "Flaws shall not interfere with ultrasonic detection or characterization of other flaws." The PDI alternative provides clarification and assurance that the flaws are identified.

Paragraph 1.1(e)(2)(a)(1) requires that a base grading unit shall include at least three inches of the length of the overlaid weld, and the base grading unit includes the outer 25% of the overlaid weld and base metal on both sides. The PDI program reduced the criteria to one inch of the length of the overlaid weld and eliminated from the grading unit the need to include both sides of the weld. The proposed change permits the PDI program to continue using test specimens from the existing weld overlay program which have flaws on both sides of the welds. These test specimens have been used successfully for testing the proficiency of personnel for over 16 years. The weld overlay qualification is designed to be a near-side (relative to the weld) examination, and it is improbable that a candidate would detect a flaw on the opposite side of the weld due to the sound attenuation and re-direction caused by the weld microstructure. However, the presence of flaws on both sides of the original weld (outside the PDI grading unit) may actually provide a more challenging examination, as candidates must determine the relevancy of these flaws, if detected.

Paragraph 1.1(e)(2)(a)(2) requires, when base metal cracking penetrates into the overlay material, that a portion of the base grading unit shall not be used as part of the overlay grading unit. The PDI program adjusts for the changes in Paragraph 1.1(e)(2)(a)(2) and conservatively states that when base metal flaws penetrate into the overlay material, no portion of it shall be used as part of the overlay fabrication grading unit.

Paragraph 1.1(e)(2)(a)(3) requires that for unflawed base grading units, at least one inch of unflawed overlaid weld and base metal shall exist on either side of the base grading unit. This is to minimize the number of false identifications of extraneous reflectors. The PDI program stipulates that unflawed overlaid weld and base metal exists on all sides of the grading unit and flawed grading units must be free of interfering reflections from adjacent flaws which addresses the same concerns as the ASME Code.

Paragraph 1.1(e)(2)(b)(1) requires that an overlay grading unit shall include the overlay material and the base metal-to-overlay interface of at least six square inches. The overlay grading unit shall be rectangular, with minimum dimensions of two inches. The PDI program reduces the base metal-to-overlay interface to at least one inch (in lieu of a minimum of two inches) and eliminates the minimum rectangular dimension. This criterion is necessary to allow use of existing examination specimens that were fabricated in order to meet USNRC Generic Letter 88-01 (Tri-party Agreement, July 1984). This criterion may be more challenging to meet than that of the ASME Code because of the variability associated with the shape of the grading unit.

Paragraph 1.1(e)(2)(b)(2) requires that unflawed overlay grading units shall be surrounded by unflawed overlay material and unflawed base metal-to-overlay interface for at least one inch around its entire perimeter. The PDI program redefines the area by noting unflawed overlay fabrication grading units shall be separated by at least one inch of unflawed material at both ends and sufficient area on both sides to preclude interfering reflections from adjacent flaws. This change may provide a more challenging demonstration than required by ASME Code because of the possibility for having a parallel flaw on the opposite side of the weld.

Paragraph 1.1(e)(2)(b)(3) requirements are retained in the PDI program. In addition, the PDI program requires that initial procedure qualification contain three times the number of flaws required for a personal qualification. To qualify new values of essential variables, the equivalent of at least one personnel qualification is required.

Paragraph 1.1(f)(1) requirements are retained in the PDI program, with the clarification change of the term "flaws" for "cracks." In addition, the PDI program includes the requirements that sizing sets shall contain a distribution of flaw dimensions to verify sizing capabilities. The PDI program also requires that initial procedure qualification contain three times the number of flaws required for a personnel qualification. To qualify new values of essential variables, the equivalent of at least one personnel qualification is required.

Paragraphs 1.1(f)(3) and 1.1(f)(4) requirements are clarified by the PDI program by replacing the term "cracking" with "flaws" because of the use of alternative flaws.

Paragraphs 2.1 and 2.2(d) requirements are clarified by the PDI program by the addition of the terms "metal" and "fabrication". These terms were added to clarify the description of the grading units present in a specimen. "Metal" was added to "base" to read "base metal" and "fabrication" was added to "overlay" to read "overlay fabrication".

Paragraph 2.3 requires that, for depth sizing tests, 80% of the flaws shall be sized at a specific location on the surface of the specimen identified to the candidate. This requires detection and sizing tests to be performed separately. The PDI revised the weld overlay program to allow sizing to be conducted either in conjunction with, or separately from, the flaw detection test. If performed in conjunction with detection and the detected flaws do not meet the Supplement 11 range criteria, additional specimens will be presented to the candidate with the regions containing flaws identified. Each candidate will be required to determine the maximum depth of the flaw in each region. For separate sizing tests, the regions of interest will also be identified and the maximum depth and length of each flaw in the region will similarly be determined. In addition, PDI stated that grading units are not applicable to sizing tests, and that each sizing region will be large enough to contain the target flaw, but small enough such that candidates will not attempt to size a different flaw.

Paragraph 3.1 requires that examination procedures, equipment and personnel (as a complete ultrasonic system) are qualified for detection or sizing of flaws, as applicable, when certain criteria are met. The PDI program allows procedure qualification to be performed separately from personnel and equipment qualification. Historical data indicate that, if ultrasonic detection or sizing procedures are thoroughly tested, personnel and equipment using those procedures have a higher probability of successfully passing a qualification test. In an effort to increase this passing rate, PDI has elected to perform procedure qualifications separately in order to assess and modify essential variables that may affect overall system capabilities. For a procedure to be qualified, the PDI program requires three times as many flaws to be detected (or sized) as shown in Supplement 11 for the entire ultrasonic system. The personnel and equipment are still required to meet the Supplement 11 requirement.

Paragraph 3.2(b) requires that all extensions of base metal cracking into the overlay material by at least 0.10-inch are reported as being intrusions into the overlay material. The PDI program omits this criterion because of the difficulty in actually fabricating a flaw with a 0.10-inch minimum extension into the overlay, while still knowing the true state of the flaw dimensions. However, the PDI program requires that cracks be depth-sized to the tolerance specified in the ASME Code which is 0.125-inches. Since the ASME Code tolerance is close to the 0.10-inch value of Paragraph 3.2(b), any crack extending beyond 0.10-inch into the overlay material would be identified as such from the characterized dimensions.

5.0 PROPOSED ALTERNATIVE AND BASIS FOR USE:

Pursuant to 10 CFR 50.55a(a)(3)(i), UT examination technique and personnel qualifications for the existing and future SWOLs will be performed using EPRI PDI demonstrated procedures in conjunction with PDI qualified examiners in lieu of the ASME Section XI, Appendix VIII, Supplement 11 requirements. The EPRI PDI qualification program provides a recognized acceptable alternative to the requirements of Supplement 11 and provides an acceptable level of quality and safety.

6.0 PERIOD FOR WHICH RELIEF IS REQUESTED:

Relief is requested for the fourth ten-year ISI interval for TMI, Unit 1.

7.0 PRECEDENTS:

Similar relief requests have been approved for:

TMI, Unit 1, third inspection interval Relief Request was authorized per U.S. Nuclear Regulatory Commission (USNRC) Safety Evaluation Report (SER) dated October 17, 2007 (Reference 4).

TMI, Unit 1, third inspection interval Relief Request from flaw removal, heat treatment, and nondestructive examination requirements was authorized per USNRC SER dated July 21, 2004 (Reference 5).

Braidwood Station, Units 1 and 2, second inspection interval Relief Request I2R-48 was authorized per USNRC SER dated September 17, 2007 (Reference 6).

8.0 REFERENCES:

1. ASME Code, Section XI, 2001 Edition, No Addenda, Appendix VIII, Supplement 11, "Qualification Requirements for Full Structural Overlaid Wrought Austenitic Piping Welds".

2. Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," Revision 15, October 2007.

3. Letter from W. Bateman (USNRC) to M. Bratton (Entergy Nuclear Southwest), "Weld Overlay Performance Demonstration Administered by PDI as an Alternative for Generic Letter 88-01 Recommendations," dated January 15, 2002 (ML020160532).

4. Letter from H. Chernoff (USNRC) to C. Crane (AmerGen Energy Company, LLC), "Three Mile Island Nuclear Station, Unit 1 (TMI-1), Relief Request 2007-TMI-01, Regarding Structural Weld Overlays on Pressurizer Surge, Pressurizer Spray, and Hot Leg Decay Heat Drop Line Nozzles, (TAC NO. MD5427)," dated October 17, 2007 (ML072770051).

5. Letter from R. Laufer (USNRC) to C. Crane (AmerGen Energy Company, LLC), "Three Mile Island Nuclear Station, Unit 1 (TMI-1) Request for Relief from Flaw Removal, Heat Treatment, and Nondestructive Examination Requirements for the Third 10-Year Inservice Inspection (ISI) Interval (TAC NO. MC1201)," dated July 21, 2004 (ML041670510).

6. Russell Gibbs (USNRC) to C. Crane (Exelon Generation Company, LLC), "Braidwood Station, Units 1 and 2 Evaluation of Inservice Inspection Program Relief Request I2R-48 Pertaining to Structural Weld Overlays on Pressurizer Spray, Relief, Safety, and Surge Nozzle Safe Ends (TAC NOS. MD4590, and MD4591)," dated September 17, 2007 (ML072430034).

Table 1

WELD IDENTIFICATION	ITEM #	SIZE	ADJACENT WELD IDENTIFICATION	DESCRIPTION
SR0010BM	B9.11	10"	NA	Pressurizer surge nozzle to pipe dissimilar metal weld at hot leg "A".
PR0021BM	B5.40	10"	NA	Pressurizer surge nozzle to safe end dissimilar metal weld at the pressurizer.
DH0001BM	B9.11	12"	DH0498	Decay heat nozzle to safe end weld at hot leg "B". This location also includes the adjacent safe end to pipe weld.

Note: The SWOL application SER approvals for these welds were provided in References 5 and 6.

TABLE 2
MODIFICATIONS TO APPENDIX VIII, SUPPLEMENT 11
(2001 Edition, No Addenda)

Appendix VIII, Supplement 11	PDI Modification
1.0 SPECIMEN REQUIREMENTS	
Qualification test specimens shall meet requirements listed herein, unless a set of specimens is designed to accommodate specific limitations stated in the scope of the examination procedure (e.g., pipe size, weld joint configuration, access limitations). The same specimen may be used to demonstrate both detection and sizing qualification.	No Change
1.1 General. The specimen set shall conform to the following requirements.	No Change
1.1(a) Specimens shall have sufficient volume to minimize spurious reflections that may interfere with the interpretation process.	No Change
1.1(b) The specimen set shall consist of at least three specimens having different nominal pipe diameters and overlay thicknesses. They shall include the minimum and maximum nominal pipe diameters for which the examination procedure is applicable. Pipe diameters within a range of 0.9 to 1.5 times a nominal diameter shall be considered equivalent. If the procedure is applicable to pipe diameters of 24 inches or larger, the specimen set must include at least one specimen 24 inches or larger but need not include the maximum diameter. The specimen set must include at least one specimen with overlay thickness within -0.1 inches to +0.25 inches of the maximum nominal overlay thickness for which the procedure is applicable.	The specimen set shall consist of at least three specimens having different nominal pipe diameters and overlay thicknesses. They shall include the minimum and maximum nominal pipe diameters for which the examination procedure is applicable. Pipe diameters within a range of 0.9 to 1.5 times a nominal diameter shall be considered equivalent. If the procedure is applicable to pipe diameters of 24 inches or larger, the specimen set must include at least one specimen 24 inches or larger but need not include the maximum diameter. The specimen set shall include specimens with overlays not thicker than 0.1 inches more than the minimum thickness, nor thinner than 0.25 inches of the maximum nominal overlay thickness for which the procedure is applicable.
1.1(c) The surface condition of at least two specimens shall approximate the roughest surface condition for which the examination procedure is applicable.	No Change
(d) Flaw Conditions	
1.1(d)(1) Base metal flaws. All flaws must be cracks in or near the butt weld heat-affected zone, open to the inside surface, and extending at least	Base metal flaws. All flaws must be in or near the butt weld heat-affected zone, open to the inside surface, and extending at least 75% through the

TABLE 2
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Appendix VIII, Supplement 11	PDI Modification
75% through the base metal wall. Flaws may extend 100% through the base metal and into the overlay material; in this case, intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the cracking. Specimens containing IGSCC [intergranular stress corrosion cracking] shall be used when available.	base metal wall. Intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the base metal flaws. Specimens containing IGSCC shall be used when available. At least 70% of the flaws in the detection and sizing tests shall be cracks and the remainder shall be alternative flaws. Alternative flaw mechanisms, if used, shall provide crack-like reflective characteristics and shall be limited by the following: (a) The use of alternative flaws shall be limited to when the implantation of cracks produces spurious reflectors that are uncharacteristic of actual flaws. (b) Flaws shall be semielliptical with a tip width of less than or equal to 0.002 inches.
1.1(d)(2) Overlay fabrication flaws. At least 40% of the flaws shall be non-crack fabrication flaws (e.g., sidewall lack of fusion or laminar lack of bond) in the overlay or the pipe-to-overlay interface. At least 20% of the flaws shall be cracks. The balance of the flaws shall be either type.	No Change
(e) Detection Specimens	
1.1(e)(1) At least 20% but less than 40% of the flaws shall be oriented within +/- 20 degrees of the pipe axial direction. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access. The rules of Subarticle IWA-3300 shall be used to determine whether closely spaced flaws should be treated as single or multiple flaws.	At least 20% but less than 40% of the base metal flaws shall be oriented within +/- 20 degrees of the pipe axial direction. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access.
1.1(e)(2) Specimens shall be divided into base and overlay grading units. Each specimen shall contain one or both types of grading units.	Specimens shall be divided into base metal and overlay fabrication grading units. Each specimen shall contain one or both types of grading units. Flaws shall not interfere with ultrasonic detection or characterization of other flaws.
1.1(e)(2)(a)(1) A base grading unit shall include at least 3 inches of the length of the overlaid weld. The base grading unit includes the outer 25% of	A base metal grading unit includes the overlay material and outer 25% of the original overlaid weld. The base metal grading unit shall extend

TABLE 2 MODIFICATIONS TO APPENDIX VIII, SUPPLEMENT 11 (2001 Edition, No Addenda)	
Appendix VIII, Supplement 11	**PDI Modification**
the overlaid weld and base metal on both sides. The base grading unit shall not include the inner 75% of the overlaid weld and base metal overlay material, or base metal-to-overlay interface.	circumferentially for at least 1 inch and shall start at the centerline and be wide enough in the axial direction to encompass one half of the original weld crown and a minimum of 0.50 inch of the adjacent base material.
1.1(e)(2)(a)(2) When base metal cracking penetrates into the overlay material, the base grading unit shall include the overlay metal within 1 inch of the crack location. This portion of the overlay material shall not be used as part of any overlay grading unit.	When base metal flaws penetrate into the overlay material, the base metal grading unit shall not be used as part of any overlay fabrication grading unit.
1.1(e)(2)(a)(3) When a base grading unit is designed to be unflawed, at least 1 inch of unflawed overlaid weld and base metal shall exist on either side of the base grading unit. The segment of weld length used in one base grading unit shall not be used in another base grading unit. Base grading units need not be uniformly spaced around the specimen.	Sufficient unflawed overlaid weld and base metal shall exist on all sides of the grading unit to preclude interfering reflections from adjacent flaws.
1.1(e)(2)(b)(1) An overlay grading unit shall include the overlay material and the base metal-to-overlay interface of at least 6 square inches. The overlay grading unit shall be rectangular, with minimum dimensions of 2 inches.	An overlay fabrication grading unit shall include the overlay material and the base metal-to-overlay interface for a length of at least 1 inch.
1.1(e)(2)(b)(2) An overlay grading unit designed to be unflawed shall be surrounded by unflawed overlay material and unflawed base metal-to-overlay interface for at least 1 inch around its entire perimeter. The specific area used in one overlay grading unit shall not be used in another overlay grading unit. Overlay grading units need not be spaced uniformly about the specimen.	Overlay fabrication grading units designed to be unflawed shall be separated by unflawed overlay material and unflawed base metal-to-overlay interface for at least 1 inch at both ends. Sufficient unflawed overlaid weld and base metal shall exist on both sides of the overlay fabrication grading unit to preclude interfering reflections from adjacent flaws. The specific area used in one overlay fabrication grading unit shall not be used in another overlay fabrication grading unit. Overlay fabrication grading units need not be spaced uniformly about the specimen.
1.1(e)(2)(b)(3) Detection sets shall be selected from Table VIII-S2-1. The minimum detection sample set is five flawed base grading units, ten unflawed base grading units, five flawed overlay grading units, and ten unflawed overlay grading	Detection sets shall be selected from Table VIII-S2-1. The minimum detection sample set is five flawed base metal grading units, ten unflawed base metal grading units, five flawed overlay fabrication grading units, and ten unflawed overlay fabrication

TABLE 2
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Appendix VIII, Supplement 11	PDI Modification
units. For each type of grading unit, the set shall contain at least twice as many unflawed as flawed grading units.	grading units. For each type of grading unit, the set shall contain at least twice as many unflawed as flawed grading units. For initial procedure qualification, detection sets shall include the equivalent of three personnel qualification sets. To qualify new values of essential variables, at least one personnel qualification set is required.
(f) Sizing Specimen	
1.1(f)(1) The minimum number of flaws shall be ten. At least 30% of the flaws shall be overlay fabrication flaws. At least 40% of the flaws shall be cracks open to the inside surface.	The minimum number of flaws shall be ten. At least 30% of the flaws shall be overlay fabrication flaws. At least 40% of the flaws shall be open to the inside surface. Sizing sets shall contain a distribution of flaw dimensions to assess sizing capabilities. For initial procedure qualification, sizing sets shall include the equivalent of three personnel qualification sets. To qualify new values of essential variables, at least one personnel qualification set is required.
1.1(f)(2) At least 20% but less than 40% of the flaws shall be oriented axially. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface which the candidate has physical or visual access.	No Change
1.1(f)(3) Base metal cracking used for length sizing demonstrations shall be oriented circumferentially.	Base metal flaws used for length sizing demonstrations shall be oriented circumferentially.
1.1(f)(4) Depth sizing specimens sets shall include at least two distinct locations where cracking in the base metal extends into the overlay material by at least 0.1 inch in the through-wall direction.	Depth sizing specimen sets shall include at least two distinct locations where a base metal flaw extends into the overlay material by at least 0.1 inch in the through-wall direction.

TABLE 2
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Appendix VIII, Supplement 11	PDI Modification
2.0 CONDUCT OF PERFORMANCE DEMONSTRATION	
The specimen inside surface and identification shall be concealed from the candidate. All examinations shall be completed prior to grading the results and presenting the results to the candidate. Divulgence of particular specimen results or candidate viewing of unmasked specimens after the performance demonstration is prohibited.	The specimen inside surface and identification shall be concealed from the candidate. All examinations shall be completed prior to grading the results and presenting the results to the candidate. Divulgence of particular specimen results or candidate viewing of unmasked specimens after the performance demonstration is prohibited. The overlay fabrication flaw test and the base metal flaw test may be performed separately.
2.1 Detection Test	
Flawed and unflawed grading units shall be randomly mixed. Although the boundaries of specific grading units shall not be revealed to the candidate, the candidate shall be made aware of the type or types of grading units (base or overlay) that are present for each specimen.	Flawed and unflawed grading units shall be randomly mixed. Although the boundaries of specific grading units shall not be revealed to the candidate, the candidate shall be made aware of the type or types of grading units (base metal or overlay fabrication) that are present for each specimen.
2.2 Length Sizing Test	
2.2(a) The length sizing test may be conducted separately or in conjunction with the detection test.	No Change
2.2(b) When the length sizing test is conducted in conjunction with the detection test and the detected flaws do not satisfy the requirements of 1.1(f), additional specimens shall be provided to the candidate. The regions containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the length of the flaw in each region.	No Change
2.2(c) For separate length sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the length of the flaw in each region.	No Change
2.2(d) For flaws in base grading units, the candidate shall estimate the length of that part of the flaw that is in the outer 25% of the base wall thickness.	For flaws in base metal grading units, the candidate shall estimate the length of that part of the flaw that is in the outer 25% of the base metal wall thickness.
2.3 Depth Sizing Test	
For the depth sizing test, 80% of the flaws shall	(a) The depth sizing test may be conducted

TABLE 2
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Appendix VIII, Supplement 11	PDI Modification
be sized at a specific location on the surface of the specimen identified to the candidate. For the remaining flaws, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.	separately or in conjunction with the detection test. (b) When the depth sizing test is conducted in conjunction with the detection test and the detected flaws do not satisfy the requirements of 1.1(f), additional specimens shall be provided to the candidate. The regions containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region. (c) For a separate depth sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.
3.0 ACCEPTANCE CRITERIA	
3.1 Detection Acceptance Criteria	
Examination procedures, equipment, and personnel are qualified for detection when the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for both detection and false calls. The criteria shall be satisfied separately by the demonstration results for base grading units and for overlay grading units.	a) Examination procedures are qualified for detection when; 1) All flaws within the scope of the procedure are detected and the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for false calls. (a) At least one successful personnel demonstration has been performed meeting the acceptance criteria defined in (b). (b) Examination equipment and personnel are qualified for detection when the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for both detection and false calls. (c) The criteria in (a), (b) shall be satisfied separately by the demonstration results for base metal grading units and for overlay fabrication grading units.
3.2 Sizing Acceptance Criteria	

TABLE 2
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Appendix VIII, Supplement 11	PDI Modification
Examination procedures, equipment, and personnel are qualified for sizing when the results of the performance demonstration satisfy the following criteria.	No Change
3.2(a) The RMS error of the flaw length measurements, as compared to the true flaw lengths, is less than or equal to 0.75 inch. The length of base metal cracking is measured at the 75% through-base-metal position.	The RMS error of the flaw length measurements, as compared to the true flaw lengths, is less than or equal 0.75 inch. The length of base metal flaws is measured at the 75% through-base-metal position.
3.2(b) All extensions of base metal cracking into the overlay material by at least 0.1 inch are reported as being intrusions into the overlay material.	This requirement is omitted.
3.2(c) The RMS error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 inch.	(b) The RMS error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 inch.

Request for Relief for Alternative Requirements due to Applicability of ASME Code Case N-649, Alternative Requirements for IWE-5240 Visual Examination In Accordance with 10 CFR 50.55a(a)(3)(i)

1.0 ASME CODE COMPONENTS AFFECTED:

Code Class:	MC
Reference:	ASME Code Case N-649 and IWE-5240
Examination Category:	NA
Item Number:	NA
Description:	Applicability of ASME Code Case N-649, Alternative Requirements for IWE-5240 Visual Examination
Component Number:	Various

2.0 APPLICABLE CODE EDITION AND ADDENDA:

The ISI program is based on the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, 2004 Edition, No Addenda.

3.0 APPLICABLE CODE REQUIREMENT:

IWE-5240, "Visual Examination", requires that a detailed visual examination be performed during any IWE-5220 leakage test on areas affected by repair/replacement activities.

ASME Code Case N-649, Alternative Requirements for IWE-5240 Visual Examination, allows for a VT-3, VT-1, or detailed visual examination depending on the timing of the leakage test.

4.0 REASON FOR REQUEST:

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

The "Applicability Index for Section XI Cases" states that ASME Code Case N-649 is applicable up to and including the 1998 Edition with the 2000 Addenda of ASME Section XI. The Edition/Addenda references in the Code Case text itself also stop at the 1998 Edition with the 2000 Addenda. However, the requirements of Paragraph IWE-5240 are identical in both the 1998 Edition with the 2000 Addenda and the 2004 Edition, No Addenda. Paragraph IWE-5240 requires that a detailed visual examination of repaired areas be completed during a post repair pressure test. TMI has a concrete containment with a metal liner that is inaccessible during a post repair pressure test. ASME Code Case N-649 was issued to allow this visual examination to be performed during or after the pressure test in recognition of the impracticality of performing the visual examinations of concrete containment liners during the post repair pressure test. ASME did not address this impracticality in the Code until the 2004 Edition with the 2006 Addenda of ASME Section XI was issued, so ASME Code Case N-649 is actually needed for the 2004 Edition, No Addenda of ASME Section XI.

5.0 PROPOSED ALTERNATIVE AND BASIS FOR USE:

TMI, Unit 1 requests the applicability of ASME Code Case N-649 be extended to the 2004 Edition, No Addenda for use in the plant's fourth ISI interval. USNRC Regulatory Guide 1.147, Revision 15, lists ASME Code Case N-649 as acceptable for use with no conditions or limitations. The only issue being addressed by this relief request is the applicability listed in the "Applicability Index for Section XI Cases."

6.0 DURATION OF PROPOSED ALTERNATIVE:

Relief is requested for the fourth ten-year ISI interval for TMI, Unit 1.

7.0 PRECEDENTS:

None.