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An Exelon Company

10 CFR 50.55a

5928-07-20187
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U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

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

Subject: Response to Request for Additional Information
Relief Request No. 2007-TMI-01 - Structural Weld Overlays (SWOLs) of the
Pressurizer Surge, Pressurizer Spray, and Hot Leg Decay Heat Drop Line Nozzle
Dissimilar Metal Welds including the SWOL of Adjacent Welds


Reference: AmerGen letter 5928-07-20102 dated May 1, 2007, "Structural Weld Overlays
(SWOLs) of the Pressurizer Surge, Pressurizer Spray, and Hot Leg Decay Heat
Drop Line Nozzle Dissimilar Metal Welds including the SWOL of Adjacent Welds"

In the referenced letter, pursuant to 10 CFR 50.55a(a)(3)(i), AmerGen Energy Company, LLC (AmerGen) proposed an alternative to the repair/replacement requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME), Section XI, 1995 Edition, through 1996 Addenda, for the structural weld overlays on the pressurizer surge, pressurizer spray, and hot leg decay heat drop line nozzle dissimilar metal welds. This relief will also include the structural weld overlay of the identified adjacent welds.

In a discussion with the NRC staff on August 6, 2007, the NRC and AmerGen discussed several requests for information. Attached is our response to these requests.

If you have any questions, please contact Mr. Thomas R. Loomis (610-765-5510).

Respectfully,



Russell G. West
Vice President – TMI, Unit 1

Attachment: Response to Request for Additional Information

cc: S. J. Collins, Regional Administrator, Region I, USNRC
D. M. Kern, USNRC Senior Resident Inspector, TMI
P. Bamford, Project Manager, USNRC
File No. 05056

ATTACHMENT 1

Response to Request for Additional Information

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
RELIEF REQUEST NO. 2007-TMI-01
AMERGEN ENERGY COMPANY, LLC
THREE MILE ISLAND, UNIT 1

QUESTION:

- 1) On page 4 of 23 of the licensee's submittal, the licensee states that a liquid penetrant (PT) examination will be performed of the overlay area with an acceptance criteria that no indications greater than 1/16" is permitted. When will the PT examination be performed? Is it prior to the overlay and then again after the overlay? Please explain. Which welds will be subject to PT examinations and at what steps in the overlay process? Identify and discuss which welds will receive ultrasonic examination. Indicate when the identified welds will receive ultrasonic examination (i.e. before and/or after the overlay is installed).

RESPONSE:

TMI intends to perform PT examinations of all areas that will receive weld overlay material as well as the adjacent base material on each side of the overlay as required by Section XI, Appendix Q, Q-2000(b), Q-2000(c), and Q-4100(b). TMI intends to perform PT examination of the base metal/weld overlay at the following conditions/steps:

- On the base metal and existing welds after surface conditioning but prior to installing weld overlay material
- After excavation of any unacceptable flaws
- After application of the barrier layer if the barrier layer is used to seal a flaw
- After surface preparation of the completed weld overlay
- After any welded repairs in the weld overlay

TMI intends to perform UT examination of the Decay Heat and Pressurizer Surge nozzle weld overlays at the following conditions/steps:

- UT thickness measurement prior to applying any overlay weld material
- UT thickness measurement and Performance Demonstration Initiative (PDI) UT examination after final surface preparation of the weld overlay deposit material
- UT thickness measurement and PDI UT examination after any required repairs due to UT indications.

TMI does not intend to perform PDI UT examination on welds PR-021BM, DH-001BM, or DH-498 prior to applying the full structural weld overlay to these welds. Any flaws in the outer 25% through-wall of welds PR-021BM, DH-001BM, or DH-498 will be detected during the preservice examination required by Q-4200 of Section XI, Appendix Q. TMI intends to perform PDI UT examination on pressurizer spray welds PR-009BM and SP-021BM. A full structural weld overlay will be applied to the pressurizer spray welds only if

UT examination results are unacceptable.

QUESTION:

- 2) Please discuss why the evaluation to determine if additional exams will be conducted if an unacceptable service induced flaw in weld DH-498 as identified at the bottom of page 4 of 23 would be limited to the elements in the same segment. Please clarify if additional segments will be included in the evaluation if they are subject to the same root cause conditions. Describe what examinations will be performed on weld DH-498 prior to SWOL.

RESPONSE:

Weld DH-498 is a stainless steel to stainless steel weld and not an alloy 600/82/182 weld. Any expansion of the examination scope due to unacceptable flaws in weld DH-498 will be based on an evaluation of the unacceptable flaw characteristics. This evaluation will include whether other elements in the segment or segments are subject to the same root cause conditions. Segment, as applicable to TMI, is defined in EPRI Report TR-112657, Revision B-A "Revised Risk-Informed Inservice Inspection Evaluation Procedure", Section 3.5.1. No additional examinations will be performed if there are no additional elements identified as being susceptible to the same root cause conditions. If the evaluation does identify a common degradation mechanism, then further examinations would be performed on those elements.

TMI does not intend to UT examine weld DH-498 prior to applying the full structural weld overlay because this weld was not selected to be examined during the 10 Year ISI Interval.

QUESTION:

- 3) The licensee states that flaw evaluations in accordance with Code Case N-504-2(g)(2) and shrinkage stress effects analyses in accordance with Code Case N-504-2(g)(3) will be addressed through the approved overlay designs that are currently in development. These documents will be completed and approved for use prior to application at TMI, Unit 1.
 - a) Discuss what is meant by the approved overlay designs that are currently in development. How were the overlay designs approved?

RESPONSE:

The weld overlay design is being prepared by AREVA for review and approval by AmerGen. This design activity determines the minimum structural requirements for the weld overlay size (thickness and length) per ASME B&PV Code Section XI, Division 1, Code Case N-504-2, and Appendix Q of ASME Section XI. Full

structural weld overlays are considered physical plant changes and will be approved in accordance with AmerGen Energy Company, LLC procedures.

QUESTION:

- b) Will the subject documents be submitted for NRC approval prior to application at TMI, Unit 1? How will the documents be approved for use?

RESPONSE:

Question subsequently withdrawn.

QUESTION:

- 4) The licensee states that "Prior to installation of the SWOL, TMI Unit 1 will complete a bare metal visual examination of the PZR surge and decay heat drop line nozzles immediately after the insulation is removed in the area around the nozzle and dissimilar metal weld are to ensure that no through wall cracks exist prior to applying the overlay."
- a) Discuss what criteria will be used to determine through wall cracks.

RESPONSE:

Bare metal visual examinations will be performed per an AmerGen procedure. The current procedure revision states "Any penetration\nozzle with **NO** evidence of boric acid is considered acceptable", and that "Any penetration\nozzle with evidence of boric acid is considered to be recordable and requires evaluation as to its origin." If boric acid is detected during the bare metal visual examination an evaluation of the condition will be performed to determine the source of the boric acid. In addition, a PT examination of the surface to be repaired will be performed as required by ASME Section XI, Q-2000(b) prior to weld metal deposition.

QUESTION:

- b) If a through-wall crack or cracks are identified, what process will the licensee follow? Discuss if a SWOL will still be used and if there will be any difference to a SWOL installed over a weld with a through wall crack compared to a SWOL installed over a weld without through wall indications.

RESPONSE:

The TMI full structural weld overlay design and implementation documentation includes contingencies for applying the overlay on nozzles with through-wall

flaws. If a flaw is to be sealed, the process requires peening of the flaw or excavation and repair welding of the flaw prior to applying weld overlay material. If the first layer of the weld overlay is used to seal a flaw this weld layer thickness will not be used in meeting the reinforcement design thickness requirements.

QUESTION:

- c) The bare metal visual examination of the pressurizer surge and decay heat drop line will not be able to detect flaws that initiate from the inside surface of the pipe and do not connect with the outside surface of the pipe. Also, once the weld overlay is installed on/over the original weld, the ultrasonic examination is only qualified to detect flaws in the outer 25 percent of the pipe thickness. Therefore, the integrity of the original weld/base metal region will not be able to be verified. Code Case N-740 of the ASME Code, Section XI provides requirements for crack growth calculations to demonstrate the structural integrity of the inner 75 percent pipe wall region. Discuss how the integrity of the original welds at TMI-1 will be demonstrated and what effects the assumed flaws will have on the SWOL design.

RESPONSE:

The weld overlay being installed on the pressurizer surge and decay heat drop line nozzles is a full structural weld overlay assuming 100% through-wall flaws. This design transfers pressure boundary function to the applied overlay material (no pressure retaining function is credited for the original weld material). The design life flaw growth analysis will assume that a 75% through-wall flaw exists at the time of weld overlay deposit, based on flaw detection capability in the outer 25% through-wall of the original weld. If a flaw is detected in the outer 25% through-wall of the repaired welds the design life flaw growth analysis will be revised to address the actual flaw condition detected as required by ASME Section XI, Appendix Q.

QUESTION:

- 5) The licensee states that "The PZR spray nozzle dissimilar metal welds will receive bare metal visual and ultrasonic examinations and will only be overlay repaired if examination results indicate repair is necessary."
- a) Discuss and justify what criteria will be used to determine if a repair is necessary.

RESPONSE:

If a through-wall flaw is detected by bare metal visual examination in the pressurizer spray nozzle a full structural weld overlay repair similar to those being applied to the decay heat drop line nozzle and pressurizer surge nozzle will be

implemented in accordance with Relief Request 2007-TMI-01.

Flaws detected by ultrasonic examinations will be evaluated in accordance with IWB-3514 and, if necessary, IWB-3600 of ASME Section XI, 1995 Edition through 1996 Addenda, to determine acceptability for continued service or repair. TMI will submit any IWB-3600 evaluations to the NRC for approval as required by IWB-3610(e).

For clarity, AmerGen is not requesting relief from the flaw evaluation process as defined in the ASME code. Relief request 2007-TMI-01 addresses the weld overlay methodology that will be applied at TMI.

QUESTION:

- b) Describe the design of the SWOL that will be used to repair the PZR spray nozzle, include the differences between the design for SWOL for question 4(b) and 4(c) above.

RESPONSE:

TMI will not complete the design of the full structural weld overlay prior to the October, 2007 refueling outage because recent UT examinations of the pressurizer spray nozzle dissimilar metal welds did not identify PWSCC. If a weld overlay repair is required on the pressurizer spray nozzle dissimilar metal welds, the design approach will be the same as that discussed in 4(b) and 4(c) above.

QUESTION:

- 6) Describe how the licensee will monitor and control the heat input during welding.

RESPONSE:

The welding process parameters affecting input for temper bead welding will be controlled to ranges within the heat input ranges qualified as required by Code Case N-638-1. Welding parameters are controlled, monitored and recorded in accordance with the AREVA NP welding program. Thermocouples will be attached to the base metal near the weld overlay deposit area. Temperature monitoring will be performed to assure temperature is maintained within minimum and maximum limits.

QUESTION:

- 7) List which of the welds covered by Relief Request Number 2007-TMI-01 are covered by Leak-Before-Break (LBB) analysis, if any. Evaluate and discuss if the LBB analysis is still valid with the proposed structural weld overlay for each of the welds covered in LBB analysis.

RESPONSE:

Question subsequently withdrawn.

QUESTION:

- 8) On the bottom of page 4 and the top of page 5 of Attachment 2 of the May 1, 2007 submittal, the licensee discusses the weld overlay of stainless steel weld DH-498. Clarify when and how weld DH-498 will be treated as part of the risk-informed ISI program. What subsequent ISI program will cover weld DH-498 once it has been overlayed.

RESPONSE:

TMI will remove any welds repaired under relief request 2007-TMI-01, including DH-498, from the risk informed ISI program. TMI will examine these overlay repaired welds in accordance with Q-4300 of ASME Section XI.

QUESTION:

- 9) Discuss the acceptance criteria to disposition detected indications in the proposed overlays and base metal and the original welds during preservice and/or acceptance examination, and subsequent ISI examinations.

RESPONSE:

TMI is implementing Non-Mandatory Section XI, Appendix Q to Code Case N-504-2 as required by NRC Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1". Subsections Q-4100 and Q-4200 define initial installation acceptance criteria, and Subsection Q-4300 defines inservice examination acceptance criteria. These acceptance criteria will be applied to the full structural weld overlays included in this relief request.

QUESTION:

- 10) Describe the ISI program plans for the proposed SWOL population. Discuss the frequency, population and examination techniques.

RESPONSE:

TMI will remove any welds repaired under relief request 2007-TMI-01 from the risk informed ISI program. TMI will examine these weld overlays in accordance with Q-4300 of ASME Section XI, which defines the frequency, population, and technique.