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May 30, 1986

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Dresden Station Units 2 and 3
Quad Cities Station Units 1 and 2
LaSalle County Station Units 1 and 2
ISI Credit for the Mechanical Stress Improvement Process (MSIP)
NRC Docket Nos. 50-237, 50-249; 50-254, 50-265; and 50-373, 50-374

References (a): Letter from W. R. Butler to D. L. Farrar dated November 18, 1985

Dear Mr. Denton;

The referenced letter responded to our request for your concurrence regarding use of the MSIP on LaSalle Unit 2. Your staff concluded that the MSIP can be used on stainless steel piping to reduce the probability of intergranular stress corrosion cracking and that its effect is expected to be comparable to that afforded Induction Heating Stress Improvement (IHSI) treated welds pending completion of the following action items:

1. Pipe samples containing MSIP treated weldments should be included in the ongoing EPRI test program.

2. Independent elasto-plastic analyses should be performed to confirm those already done by O'Donnell & Associates.

3. Through-the-wall experimental residual stress analyses should be performed to confirm the theoretical analysis results.

Furthermore, in order to prove the long-term benefits , the staff has requested a collection of results in actual service experience. This transmittal is provided to respond to the above items and to request that the MSIP be afforded the same credit as IHSI as a stress improvement process for ISI requirement purposes. This request applies to use of MSIP at Dresden, Quad Cities and LaSalle.

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Regarding the above items:

1. Pipe samples containing MSIP treated weldments are scheduled to be included in the EPRI test program. MSIP is to be applied to a 28 inch pipe to elbow weld which has been precracked. The weld will be fully documented and the cracks measured by UT. After treatment, the weld will be inspected by UT to address the concerns regarding the detectability of pre-existing cracks after MSIP application. The weld will also be analyzed for effects of cold work, and evaluated for through-wall stress pattern to confirm the finite element analysis which predicts compressive stress at the ID in the area of the heat affected zone. The testing is scheduled to begin in May 1986.

2. O'Donnell & Associates (ODAI) performed detailed inelastic finite element analyses on various pipe sizes and geometries, including elbows, safe-ends, and flange-like structural discontinuities. The self-consistency of these results obtained using a variety of finite element models in itself constitutes an independent check on their validity. ODAI also performed residual stress measurements before and after application of the process using the standard hole drilling strain gage technique. These confirmatory tests provided experimental verification of the analytical results. The safety-related analyses and tests were conducted under the QA program audited and accepted by CECo. The results were evaluated by EPRI and Westinghouse. Independent review was also performed by Structural Integrity Associates, Inc. We strongly believe the evaluation and review by Westinghouse and Structural Integrity Associates, Inc. provides more than sufficient independent check and confirmation. The Mechanical Stress Improvement Process was also reviewed for Commonwealth Edison by EPRI, and formally presented to the technical community by ODAI at the Structural Mechanics in Reactor Technology (SMIRT) Conference in Brussels in August of 1985 and the Post-SMIRT Seminar on Assuring Structural Integrity of Steel Reactor Pressure Boundary Components. The detailed results will, of course, remain available for continued independent review by the NRC staff.

3. Through-the-wall residual stresses in the hoop and axial direction for a 12" MSIP treated weld specimen have been measured by Argonne National laboratory. The results of this test were given to the NRC in a letter to A. Taboada from W.J. Shack dated February 3, 1986. The test confirms that strongly compressive stresses are induced in the heat-affected zone of the treated weld as predicted by the analytical models. A letter to A. Toboada from W.J. Shack dated February 18, 1986 describes the method and results of the through-wall stress measurements of the 12" MSIP treated weld. Additional information was provided to the staff in a letter from J.S. Porowski/E.J. Hampton (OPAI) to R. Volmer dated March 5, 1986.

We believe that the existing research and operating experience conclusively demonstrate that elimination of tensile residual stresses in weldments ensures their immunity to Stress Corrosion Cracking.

The completed analyses and tests have confirmed that the inner layer of material in the welded region of the MSIP treated pipe remains under compression. Moreover, the tests show that after MSIP, the stress distribution at the ID of the pipe is uniform. The process eliminates the usual significant scatter in the stresses measured in as-welded conditions.

The process is being applied at Dresden Unit 3 during the current Recirculation Pipe Replacement Project. Only non-replacement piping that will benefit from stress improvement will receive the MSIP. Five of the approximately 50 welds receiving the MSIP will be examined before and after application of MSIP. The examination of welds will be by UT scanning performed by Level II and III UT personnel who have been qualified at the EPRI NDE center by successfully completing the latest requalification program held in the fall of 1985. The results will be submitted to the NRC to provide a record of field operating experience in application of the process. We currently plan to repeat the examinations during the first subsequent outage.

A significant advantage of MSIP is its simplicity. The basic mechanics, ease of control and verifiability of the MSIP provide a higher degree of consistency and reliability than can be achieved with thermal processes. Moreover, the residual compressive strains which MSIP provides will further protect surface micro cracks and discontinuities exposed to the coolant. It is also much better than thermal processes for ALARA considerations. Field experience to date at Dresden Unit 3 has shown that the MSIP can be applied with less exposure to workers due to the minimal amount of support work associated with the MSIP. The support work associated with IHSI such as attaching thermal couples and running thermal couple leads, power cables, and cooling water hoses is eliminated with the MSIP. Further radiation exposure reductions are realized with the MSIP because less clearance is required for the equipment which results in less man-hours spent removing and replacing physical interferences near welds being stress improved.

We believe that these considerations along with the tests and analyses which have already been completed demonstrate that MSIP should be given the same credit as IHSI as a stress improvement process for ISI requirement purposes. We expect long-term testing of MSIP will support our conclusion that MSIP is superior to thermal processes for stress improvement.

We have made presentations and submitted technical information to the NRC which establishes that MSIP provides stress improvement mitigation for IGSCC and introduces no potential deleterious effects. We request a response to this letter by July 1, 1986 indicating whether or not the three action items from the November 18, 1985 letter are being satisfactorily met to seek credit for the MSIP as an IGSCC mitigator. This information is needed to support decisions on further stress improvement during up coming refuel outages at Dresden Unit 2, Quad Cities Unit 2 and LaSalle Unit 2.

In accordance with 10 CFR 170, a fee remittance in the amount of $150.00 is enclosed.

If you have any further questions please contact this office.

One signed original and ten (10) copies of the letter are provided for your use.

Very truly yours,

J. R. Wojnarowski
Nuclear Licensing Administrator

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cc: R. Gilbert - NRR
R. Bevan - NRR
Dr. A. Bournia - NRR
NRC Resident Inspector - Dresden, Quad Cities and LaSalle

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