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U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Gentlemen:

Subject: Oyster Creek Nuclear Generating Station (OCNGS)
Docket No. 50-219
Facility Operating License No. DPR-16
Oyster Creek IGSCC Examinations and Weld Overlay Repairs

References: (1) NRC Letter, "Safety Evaluation of IGSCC Examinations and Weld Overlay Repairs (TAC No. M80558)", August 25, 1992.

(2) NRC Letter, "Review of Proposed Changes of IGSCC Inspection Program for Oyster Creek Cycle 14R Refueling Outage (TAC No. M83985)", September 30, 1992.

In the Reference (1) letter, the NRC requested GPU Nuclear to commit to (1) performing a walkdown inspection of the piping supports (for systems subject to weld shrinkage due to overlay repair) to ensure that setpoints and air gaps are properly adjusted, and (2) explain why the refracted longitudinal wave technique or the UT techniques used to inspect for IGSCC in cast stainless steel pipe in PWRs would not yield meaningful results in GPU Nuclear's specific application (for cast stainless steel components).

In response to the first NRC request, GPU Nuclear agrees to perform walkdown inspections of piping supports for systems subject to weld shrinkage due to overlay repairs. These inspections are currently planned for completion during the upcoming 14R Outage.

In response to the second NRC request, GPU Nuclear provides Attachment I to this letter. This attachment is a detailed explanation as to why current inspection methodologies would not yield meaningful results in IGSCC inspections for cast stainless steel components.

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Currently, GPU Nuclear plans, consistent with Reference (2) requirements, to classify five recirculation pump casing-to-suction elbow weld as category A (IGSCC RESISTANT) under GL 88-01. Based on this and the fact that GPU Nuclear has determined that no reliable ultrasonic method is currently available, GPU Nuclear does not plan on performing an ultrasonic testing inspection. Should a reliable and repeatable ultrasonic examination method be developed, GPU Nuclear will reconsider performing these examinations.

If you have any questions or comments on this submittal, please contact Mr. Michael Laggart, Manager, Corporate Nuclear Licensing at (201) 316-7968.

Very truly yours,

J. C. DeVine, Jr.
Vice President and Director
Technical Functions

cc: Administrator, Region 1
Senior Resident Inspector
Oyster Creek NRC Project Manager

ATTACHMENT I

ULTRASONIC EXAMINATION OF CAST STAINLESS STEEL

The following problems are associated with ultrasonic wave propagation of cast stainless steel.

Cast stainless steels are elastically anisotropic in nature. This causes the ultrasonic wave propagation to experience velocity changes, attenuation, beam deviation, and beam scattering. These problems are caused by the various types of grain structure produced during the cooling process. Stated in an article written by the EPRI NDE Center and Drexel University, "...The majority of U.T. work is based on the arrival time analysis in which wave velocity is assumed to be constant". When the velocity and beam direction are changed, due to the cast stainless steel, the technique is no longer valid. To compound the problem, it is possible to have different grain structures in castings on different sides of each weld (i.e., pump to elbow).

In order to combat this problem, first an understanding of how grain structures affect ultrasonic wave propagation is necessary. Once this is done, then the necessary changes to equipment/transducer can be made to improve the reliability of defect detection. To date there has been some progress in this area. The EPRI NDE Center with Drexel University have made samples of various cast materials for the understanding of wave propagation parameters. The results show that identification of grain structures of materials to be inspected is very important. This is claimed to be possible using longitudinal or in some cases shear waves. This is just the first step. Their conclusion does say, "...However, further investigation is needed in order to obtain a broader perspective for reliable field application."

In 1988, Wolf Creek Nuclear Station conducted a workshop with the EPRI NDE Center to develop and demonstrate reliable ultrasonic techniques for cast stainless steels. Wolf Creek is a PWR and has centrifugally cast stainless steel. All block samples were received from the Westinghouse Owners' Group, whose main concern is PWR problems. Each sample (block) contains artificially induced mechanical or thermal fatigue cracks near the root area. Note that IGSCC cracks, which are tighter and harder to detect in homogeneous, isotropic materials let alone anisotropic materials, were not included. The inspection of these blocks was performed by nine teams which consisted of five manual and four automated ultrasonic testing teams.

The overall results of this workshop has claimed a 70-80% detection rate. It also notes a better detection rate on thermal fatigue cracks than on mechanical fatigue cracks. The tight crack openings of mechanical fatigue cracks appear to be the reason, which is similar to IGSCC cracks. Also noted was that the automated teams performed exceptionally better than the manual teams and that centrifugally cast coarse grained structure was the most difficult to examine, next the statically cast and the forged was the easiest. This last finding is in conflict with other published articles.

EPRI's conclusion of this workshop has noted significant progress in ultrasonic examinations. But they also state, "...Because of the variety of cast stainless steel grain structures and their considerable local variations within the same structure, the grain effects on wave parameters vary substantially. Consequently, no single technique is applicable for all conditions".

GPU Nuclear has been in contact with Northeast Utilities and Yankee Atomic Electric Company who are working together to hold a round robin workshop at EPRI on this same subject. Both utilities have noted that there is no reliable ultrasonic method for cast stainless steels and are tying to determine if any vendor is capable of reliable detection of flaws.

Yankee Atomic sent a cast stainless steel block indicative of their plant to one of the vendors who took part in Wolf Creek's Workshop. The results show a 50% detection rate. Both utilities will be inviting any vendor who claims to be able to reliably detect flaws in any type of cast stainless steel to attend. They are hoping for results of the workshop sometime in the spring of 1993. GPU Nuclear has asked them to keep us informed of their progress.

Recently, Niagara Mohawk's Nine Mile Point Unit 1 experienced cracking in cast stainless steel valves on the emergency cooling condenser return line. The thermal fatigue cracks were around the valves' drain hole. The initial detection of the crack was by visually seeing leaks through the insulation. Further characterization was performed by visual and dye penetrant examinations after the valve was disassembled. Also, some of the cracks were detected on double wall radiographs where the lines were drained of water. A variety of ultrasonic techniques were applied by several different technicians. The valve bodies measured about 1.25" in thickness. The areas of known cracking were scanned and the results of trying to characterize the length and depth was poor at best. The technicians agreed that cracks open to the inside surface were not detectable. Very deep cracks were thought to be detected but similar signals could be obtained in other areas of the valve bodies where no cracking was present.

CONCLUSIONS

1. At this time, due to the nature of cast stainless steels, reliable ultrasonic examination, has not been proven.

2. All studies to date have addressed mechanical or thermal fatigue cracks. GPU Nuclear is not aware of any studies which address IGSCC in castings.

3. Understanding the type of casting and the grain structure of the part to be inspected is a must. This would be just the starting point in the process to developing a ultrasonic technique.

4. No two castings are alike. Even if calibration blocks are made, assurances that the actual part being inspected is similar is unlikely.

5. The grain structure of castings affects wave propagation such as velocity, beam skew, attenuation, and beam distortion.

6. Manual ultrasonic examination will yield little to no results.

7. Future inspection will have to be automated or semi-automated with data acquisition system with the ability to analyze signals.

8. Special transducers need to be developed to improve the signal-to- noise ratio. Although some have been developed to date, none in our judgment have proven to be reliable.

9. Oyster Creek's recirculation pump casing-to-elbow weld may not lend itself to auto-scanners without modifications. There are various instrumentation lines coming out of the elbows.

10. GPU Nuclear will keep abreast of round-robin testing at EPRI. Any new developments that prove to be reliable will be considered for application by GPU Nuclear.