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March 31, 1983

Mr. Ronald C. Haynes, Administrator
U. S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region 1
631 Park Avenue
King of Prussia, Pennsylvania 19406

Dear Mr. Haynes:

SIGNIFICANT CONSTRUCTION DEFICIENCY
CRD HOUSING WELDS
HOPE CREEK GENERATING STATION 50-354
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On November 24, 1982, a verbal report was made to Region 1, Office of Inspection and Enforcement representative, Mr. W. Lazarus, advising of a potential significant construction deficiency concerning the use of incorrect weld filler material by General Electric in the root of the welds connecting the Control Rod Drive Housing to the Reactor Pressure Vessel stub tubes. On December 27, 1982, a written report was submitted to your office, outlining corrective actions taken and describing further analysis to be provided.

The following information is submitted as per the reporting requirements of 10CFR50.55(e):

As described in our previous report, incorrect weld rods were issued to one welder and used for the root pass on three CRD housings and a portion of the root on a fourth housing. The incorrect material was discovered by the welder prior to completing the fourth pass and welding was halted. Liquid Penetrant Examination of the three suspect root passes showed evidence of cracking in all three welds. All root welds of CRD housings are examined by this method and none of the others had shown any sign of root cracking. We therefore conclude

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that the use of incorrect filler metal was limited to the four welds identified, and the corrective actions described in our previous report suffice.

Analysis of Safety Implications

The defects noticed in the root welds were due to dilution of the Inconel base material into the ER 308L stainless steel weld metal which had been inadvertently used. With little or essentially no dilution, the stainless weld metal would fuse to a sound deposit, which would represent a safe condition. With moderate dilution, fissures would develop because the composition, ER 308L plus Inconel, is susceptible to hot cracking. The shrinkage strain from solidification and cooling causes small fissures to open. These fissures are generally the length of one ripple on the weld bead surface, and are commonly visible to the unaided eye. Greater amounts of dilution and/or increased strain can cause the fissures to become cracks.

The 308L stainless steel filler material was only used for the manual GTAW root pass. The remaining layers of these multipass welds were to be made using automatic welding equipment and spooled Inconel weld wire. Use of the incorrect material could not, therefore, have continued past the root layer.

The weld joint design is that of a partial penetration type weld. In these designs, root cracks have relatively little significance, compared with the inherent root notch that exists. Also, the partial penetration groove is reinforced with a fillet weld. The root pass, therefore, is a relatively small percentage of the total cross section of the weld. Because of the conservative design and the low permissible stress for such partial penetration welds, there is little concern that root pass defects might propagate or adversely affect the adequacy of the weld.

From a materials point of view, small fissures in austenitic stainless steel, or nickel alloys do not necessarily cause failure or unsafe conditions. Small root pass defects have little significance in multipass welds. Tensile tests and bend tests have demonstrated that fissures have relatively little effect on the inherently tough and ductile metallurgical structure of austenitic stainless steel or nickel alloys.

However, the remote possibility exists that during the life of

the plant, one or more of the fissures could propagate through the completed weld and provide a small path for escape of water from the Reactor Vessel. Thus, this deficiency is considered reportable in accordance with 10CFR50.55(e).

Should you have any further questions, please advise.

Very truly yours,

cc: Office of Inspection and Enforcement
Division of Reactor Construction Inspection
Washington, D. C.

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