UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO RELIEF REQUEST NO. 88-04

DUKE POWER COMPANY

MCGUIRE NUCLEAR STATION, UNIT NO. 1

DOCKET NO. 50-369

1.0 INTRODUCTION

By letter dated May 5, 1988, the licensee, Duke Power Company (DPC) advised the NRC that a 6-inch inspection port had been added to the shell of Containment Spray (NS) Heat Exchanger 1A on McGuire Nuclear Station, Unit 1 to provide for periodic assessment of fouling buildup on the heat exchanger tubes and the need for cleaning. DPC noted that the inspection port had included a reinforcing collar welded to the shell to maintain pressure vessel strength, and that DPC considered this connection to be an "alteration" (as compared to a "repair") to the pressure vessel per the National Board Inspection Code Book. The associated hydrostatic pressure testing requirement for a pressure vessel alteration is that the entire heat exchanger be pressurized to 110% of its design pressure (which, in this case, is 200 psig, corresponding to a test pressure of 220 psig). DPC stated that pressurizing the entire heat exchanger was impractical and that DPC had performed an alternate, pneumatic test of the collar at a pressure of 220 psig after welding to the shell but prior to penetrating the shell. DPC also perfomed an in-service inspection (ISI) at system pressure following the return of the vessel to service. The purpose of DPC's letter was to request relief from ASME Code Section XI pursuant to 10 CFR 50.55a(g)(5)(iii). DPC's request was identified as Relief Request No. 88-04.

2.0 BACKGROUND

The NS Heat Exchanger is of the shell and tube type for which ECCS water from either the Refueling Water Storage Tank or the containment sump circulates through the tubes while Nuclear Service Water (RN) circulates through the shell side. The NS system is an engineered safety feature which, in the event of a LOCA, removes thermal energy from the Containment Building, transferring it through the NS heat exchanger to the Ultimate Heat Sink by way of the RN system. The RN system is designed as a low pressure (135 psig), low temperature (95°F) system, while the NS heat exchanger vessel is designed for 200 psig.

10 CFR 50.55a(g) requires each licensee to develop and implement a program for ISI and testing of systems and components classified as ASME Code Class 1, Class 2, and Class 3. Consistent with the guidance in Regulatory Guide 1.26, the tube side of the heat exchanger is classified as ASME Section III Class 3 and the shell side is classified as ASME Section VIII. Thus, in a literal reading of

10 CFR 50.55a(g)(4), the shell side of the heat exchanger would not fall within the scope of the McGuire ISI program. However, 10 CFR 50.55a(g)(6)(ii) states "The Commission may require the licensee to follow an augmented inspection program for systems and components for which the Commission deems that added assurance of structural reliability is necessary." Consistent with 10 CFR 50.55a(g)(6)(ii) the NS and RN systems are safety related systems, and the heat exchangers are appropriately included in McGuire's ISI program.

3.0 EVALUATION

DPC states that hydrostatic testing of welds associated with this alteration of NS Heat Exchanger 1A was impractical because the shell side of the heat exchanger could not be adequately isolated. The inlet and outlet isolation valves are 18 inch butterfly type valves. Historically, these butterfly valves were known to be incapable of holding design hydrostatic pressures without significant leakage (the hydrostatic pressure would have been limited to 110% of 135 psig or 149 psig because of limiting RN system design parameters). DPC believed that additional hydro pump capacity would not have resulted in the desired pressure due to leakage past these butterfly valves. Alternative methods of achieving isolation were not used because they would have resulted in considerable hardships. The installation of blind flanges upstream and downstream of the outlet isolation valves would have required complete draindown of the RN supply and return header, and this would have required in excess of 72 hours to accomplish. In lieu of this alternative, DPC performed the pneumatic test of the collar at 220 psig and ISI at system pressure, as discussed above.

In its submittal, DPC considers the work performed to be an "alteration," rather than a "repair," and to involve the "National Board Inspection Code Book." The NRC does not recognize such a document, and takes no position on its relevance or appropriateness. Because the subject component is included in the McGuire ISI program, our evaluation is based upon Section XI (1980 Edition with Winter 1980 Addenda).

Section XI of the ASME Code does not directly address "alterations or modifications." However, the rules of Articles IWA-4000, Repair Procedures, and IWA-7000, Replacements, are relevant. Section XI does not provide explicit rules for design or installation of new or replacement parts, but generally defers to the "Original Code for Construction," in this case Section VIII Division I. Section VIII Division 1, as compared to Section III, has simplified rules for design and construction of pressure vessels. In recognition of this fact, Section VIII requires hydrostatic testing of the pressure boundary at 150% of design pressure.

Thus, the pressure test on the "alteration" should have been conducted at 150% of design pressure or 300 psig, not 220 psig. By testing only to the lower pressure, DPC has, in effect, derated the heat exchanger (shell side) from 200 psig to 2/3 of 220 psig, or 147 psig. Because the test was completed and the shell penetrated prior to submittal of the request for relief, retesting at the higher test pressure is no longer practical. Thus, DPC's relief request is viewed as a request for NRC acceptance of the derated heat exchanger. In this respect, we note that the derated pressure (147 psig) still exceeds the RN system design pressure of 135 psig and provides a reasonable level of

structural integrity. Replacing the heat exchanger or reworking the alteration to achieve a proper test pressure would cause considerable hardship without a compensating increase in the level of quality and safety.

Accordingly, relief from the hydrostatic test requirements is granted for McGuire Unit 1, pursuant to 10 CFR 10 50.55a(g)(6)(i). This relief is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest given due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.