April 20, 2004

Mr. D. M. Jamil
Vice President
Catawba Nuclear Station
Duke Energy Corporation
4800 Concord Road
York, South Carolina 29745

SUBJECT: CATAWBA NUCLEAR STATION, UNITS 1 AND 2 RE: REQUEST FOR ADDITIONAL INFORMATION (TAC NOS. MB9141 AND MB9142)

Dear Mr. Jamil:

By letter dated May 22, 2003, Duke Energy Corporation submitted information requesting relief from performing volumetric examinations on the Catawba Nuclear Station, Units 1 and 2, Regenerative Heat Exchangers as required by Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, 1989 Edition. The Nuclear Regulatory Commission (NRC) technical staff has reviewed your submittal and has determined that additional information is required for the NRC staff to complete its review, as identified in the enclosure.

We discussed these issues with your staff on April 1, 2004. Your staff indicated that you would attempt to provide your response by June 30, 2004.

Please contact me at (301) 415-1842, if you have any questions on these issues.

Sincerely,

/RA/

Sean E. Peters, Project Manager, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-413 and 50-414

Enclosure: Request for Additional Information

cc w/encl: See next page

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REQUEST FOR ADDITIONAL INFORMATION

DUKE POWER COMPANY

CATAWBA NUCLEAR STATION, UNITS 1 AND 2

DOCKET NOS. 50-413 AND 50-414

The Nuclear Regulatory Commission (NRC) staff has reviewed the licensee's submittal dated May 22, 2003, requesting relief from performing volumetric examinations on the Catawba Nuclear Station (Catawba), Units 1 and 2, Regenerative Heat Exchangers as required by Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), 1989 Edition for the second 10-year interval inservice inspection (ISI) program. The NRC staff has identified the following information that is needed to enable the continuation of its review.

1. Confirm the second interval end dates for Catawba, Units 1 and 2, are June 28, 2005, and August 18, 2006, respectively.

2. You requested relief from Examination Category C-A requirements for head-to-shell and tubesheet-to-shell welds on Catawba, Units 1 and 2, regenerative heat exchangers. The drawings you provided also show Class 2 nozzle-to-shell welds. Confirm that these nozzle-to-shell welds are exempt from volumetric and/or surface examination requirements per IWC-1222. If they are not exempt, provide information on any dose burden associated with the examination requirements for these welds.

Additionally, typical Westinghouse designed plants have regenerative heat exchangers that are three horizontal tube and shell type vessels connected in series, stacked vertically. The drawings you provided only show one of the three vessels for each unit. Provide drawings or describe the actual configuration of the heat exchangers in their entirety, showing interconnecting piping and other appurtenances. Also provide more detailed drawings that show cross-sectional views of the head-to-shell and tubesheet-to-shell welds included in this request. The drawings should list the materials' specifications, dimensions of the components, and clearly indicate interferences for performing ultrasonic and surface examinations. Include such drawings for the aforementioned nozzle-to-vessel welds, as applicable.

Furthermore, the ASME Code Table IWC-2500, Examination Category C-A, Note 3, states: "In the case of multiple vessels of similar design, size, and service (such as steam generators and heat exchangers), the required examinations may be limited to one vessel or distributed among the vessels." Discuss Duke's interpretation of Note 3, and more specifically, the pertinence of this note to regenerative heat exchanger welds at Catawba, Units 1 and 2.

Enclosure

3. You stated that flow induced vibration in letdown system piping had been observed in the past at Catawba, Units 1 and 2, and noted that vibrational loads emanating from the letdown orifices were attenuated by the (regenerative) heat exchanger configuration and its distance from the vibration source. You also indicated that you made modifications to reduce vibration in the letdown piping. The NRC staff acknowledges that, when compared to other pressurized water reactor (PWR) systems, most fatigue failures have occurred in chemical and volume control system (CVCS) piping, mainly caused by vibrational fatigue in either letdown or charging piping. However, most recently, a vibration fatigue failure was reported at the regenerative heat exchanger letdown nozzle outlet weld due to flow-induced vibration from positive displacement charging pump operation. In many cases, vibrational fatigue damage may occur during specific operating configurations. For example, in the aforementioned failure, vibrational loads were highest when only a single charging pump was in operation. Since single charging pump operation occurred infrequently, and since the piping was inside containment and inaccessible during normal operation, this condition was never identified nor observed during system walkdowns or Code-required system leakage tests. The other principal source of high vibration in CVCS piping has been from the letdown orifices, which is consistent with the experience at Catawba.

Therefore, provide additional details related to the vibration problems noted in the Catawba letdown lines and subsequent plant modifications. Also, describe the modifications' impact on measured vibration loads. Describe the operating practices (e.g., plant conditions, system configurations, and operating history, etc.) for the reciprocating positive displacement pumps at Catawba, Units 1 and 2. Identify peak velocities in letdown and charging piping between the regenerative heat exchanger nozzles (inlet and outlet) and the first fixed or pinned support, for all letdown orifice and charging pump (centrifugal and reciprocating) operating combinations. Confirm that each peak velocity is less then the allowable velocity criterion specified in ASME standard OM-S/G-1990, "Requirements for Pre-operational and Initial Start-up Vibration Testing of Nuclear Power Plant Piping Systems."

4. You indicated that average radiation levels near the regenerative heat exchangers at Catawba, Units 1 and 2, are approximately 0.7rem/hr. In order to attain these dose rates, a peroxide induced crud burst and subsequent water flush of the letdown lines and heat exchangers is performed each outage. Provide additional information describing how this procedure is performed, including chemical species present, flush path, flush time, component temperatures, and plant components (pumps) used to perform the flush. Assess the impact of this flushing operation on the continued structural integrity of the subject heat exchanger welds and confirm whether these existing crud control measures will continue to be performed.

5. Duke stated that oxygen levels in the primary system are strictly limited, thereby reducing the susceptibility to intergranular stress corrosion cracking (IGSCC), and noted that the nuclear power industry's operating experience suggests that the regenerative heat exchanger materials (welds and base materials) are not susceptible to significant corrosion IGSCC in primary water environments. The NRC staff agrees that during normal operation, primary water chemistry conditions are such that oxygen concentrations are expected to be very low. However, industry service experience has reported several stress corrosion cracking failures in PWR austenitic stainless steel (Type 304/316) piping systems. For Catawba, Units 1 and 2, regenerative heat exchangers, identify the ASME material specifications including mechanical and chemical properties. Identify durations and plant conditions when the regenerative heat exchangers and

connecting piping are exposed to oxygen or oxidizing species and the temperatures are greater than 150 degrees F, regardless of the plant operation mode.

6. Confirm that all Category C-A welds identified in Request for Relief 03-001 have been volumetrically inspected at least once during fabrication, pre-service inspection, or ISI. Describe the results of these examinations, and identify whether weld repairs have been performed on any of the subject welds.

7. You stated that a reactor coolant leak detection system is in place to detect any variation in reactor water inventory, including water levels present in both the shell and tube side of the regenerative heat exchangers. You further state that any (regenerative heat exchanger) weld failure would be detected by this leak detection system and that procedures and automatic system actions are in place to ensure that the heat exchangers would be isolated. Provide additional information describing the reactor coolant leak detection system, leakage measurement and prediction techniques, leakage monitoring frequencies, redundancy, and regenerative heat exchanger leak rate sensitivity. Identify the [regenerative heat exchanger] leakage flaw size (length and crack opening displacement) that will assure detection by the reactor coolant leakage detection system. This flaw size should be sufficient to assure that leakage is detected with a margin for uncertainties consistent with NRC leak-before-break evaluation procedures and identify the margin to critical (unstable) crack size. Also, describe the procedures and automatic system actions that are in place to isolate the regenerative heat exchangers.

8. If Request for Relief 03-001 were approved, the number of Code-required Category C-A weld examinations at Catawba, Units 1 and 2, will be significantly reduced (from 26 to 14 welds for Unit 1 and from 29 to 17 welds for Unit 2). You have requested relief from the Code requirement to complete 100 percent of these Category C-A welds by the end of the current interval (Table IWC-2412-1). However, if your proposal is approved, the population of Category C-A welds available for volumetric or surface examination will, in effect, be reduced by the number of welds included in the request. Therefore, relief from IWC-2412-1 is not required. Confirm that all other Category C-A welds on all Class 2 vessels are being examined in accordance with Code requirements.

Catawba Nuclear Station

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Catawba Nuclear Station

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