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January 10, 2008

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Subject: Duke Power Company LLC d/b/a Duke Energy Carolinas, LLC (Duke)
Catawba Nuclear Station, Unit 2
Docket Number 50-414
Inspection Results Required Per First Revised NRC Order (EA-03-009)

By letter dated February 20, 2004, the NRC issued the First Revised NRC Order (EA-03-009), "Establishing Interim Inspection Requirements for Reactor Vessel Heads at Pressurized Water Reactors". The Order imposed requirements for pressurized water reactor licensees to inspect reactor pressure vessel heads and related penetration nozzles and to submit a report detailing the inspection results within sixty days after returning the unit to operation.

Duke performed the required inspections on Catawba Unit 2 during the End-of-Cycle 15 Refueling Outage. The attachment to this letter provides the required inspection results.

This letter and its attachment do not contain any NRC commitments.

If there are any questions concerning this information, please contact L.J. Rudy at (803) 831-3084.

Very truly yours,

James R Morris

James R. Morris

Attachment

A101
NRR

James R. Morris affirms that he is the person who subscribed his name to the foregoing statement, and that all the matters and facts set forth herein are true and correct to the best of his knowledge.

James R. Morris, Vice President

Subscribed and sworn to me: 1/10/08
Date

Notary Public

My commission expires: 7/2/2014
Date

SEAL
NOTARY PUBLIC
MY COMMISSION EXPIRES JULY 2ND, 2014
STATE OF SOUTH CAROLINA

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RGC Date File
ELL-EC050
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Attachment

Catawba Nuclear Station, Unit 2 End-of-Cycle 15 Reactor Pressure Vessel (RPV) Head Inspection Results Report

During the Catawba Unit 2 End-of-Cycle 15 Refueling Outage, Duke performed inspections of the RPV head in accordance with the schedule required by the First Revised NRC Order EA-03-009 dated February 20, 2004. The inspections detected no evidence of pressure boundary leakage, cracking, or wastage.

The susceptibility of the RPV head to Primary Water Stress Corrosion Cracking (PWSCC) related degradation, as represented by a value of Effective Degradation Years (EDY), was calculated. The calculated value determined that the Catawba Unit 2 RPV head remains in the Low Susceptibility Category.

The Bare Metal Visual (BMV) inspection examined 100% of the RPV upper head surface, including 360° around each RPV head penetration nozzle. The RPV head was found to be free of boron deposits with no evidence of wastage or pressure boundary leakage.

The Ultrasonic Testing (UT) inspection examined the vent line, each thermocouple penetration, and each Control Rod Drive Mechanism (CRDM) penetration volume from two inches above the highest point of the root of the J-groove weld to one inch below the lowest point at the toe of the J-groove weld, with the exception of thermocouple penetration nozzles #74-78. This inspection included all RPV head penetration nozzle surfaces below the J-groove weld that have an operating stress level of 20 ksi tension and greater. No crack-like indications were detected in the CRDM, thermocouple, or vent line penetrations.

The configuration of thermocouple penetration nozzles #74-78 did not allow for a complete volumetric examination as required by the Order. The limited projected nozzle length and weld profile below the internal surface of the RPV head, as well as the tapered tip of the thermocouple columns, restricted the examination volume. Duke submitted Request for Relief 07-CN-005 to the NRC on October 30, 2007 stating that compliance with the coverage requirements of the Order for penetration nozzles #74-78 would result in hardship without a compensating increase in the level of quality and safety.

In addition to the external BMV inspection, UT leak path detection was used to assess if leakage has occurred into the annulus between the RPV head penetration nozzle and the RPV head low-alloy steel for all CRDM and thermocouple penetrations. No UT leak path signals were detected.

Because the vent line penetration was installed without a shrink fit, surface examination using dye penetrant supplemented the volumetric inspection of the vent line penetration. Surface examination included the wetted surface of the vent line penetration J-groove weld and the bottom of the vent line penetration where UT coverage was limited due to geometry. No indications were detected during the surface examination of the vent line.

During the Unit 2 startup and Mode 3 containment walkdown, a boron film was identified on the exterior of the vertical portion of the RPV head mirror insulation, just above the refueling cavity floor. The thin film of boron covered an area approximately 5 feet high and 4 to 6 feet wide. This boron was located near the sandbox for the 2A cold leg. There were also several small deposits of boron, each a few square inches or less, located on the refueling cavity floor.

Based on visual inspections, testing, gamma isotopic, and chemical analysis, Engineering concluded that the boron on the reactor vessel mirror insulation and refueling cavity floor was caused by borated water that leaked past the reactor vessel cavity seal and sandbox covers into the mirror insulation. Leakage past the reactor vessel cavity seal and sandbox covers was identified during the outage while the reactor refueling cavity was flooded. Chemical analysis supports a conclusion that the boron was transported from the reactor vessel mirror insulation to the head insulation and cavity floor concurrent with primary system heatup. Heat from the reactor vessel and the flow of air upwards from the incore tunnel area was the transport mechanism. Based on the evaluations performed during plant startup, Engineering concluded that an active leak from the reactor coolant system did not exist.

The evaluation to identify the source of the boron on the reactor vessel insulation included the following activities:

- Repetitive walkdowns and visual inspections of the reactor vessel upper head and main flange area were performed. The areas inspected included the reactor vessel 1-inch and 3-inch head vent lines, the CETNA mechanical joints, and CRDM canopy seal welds. No evidence of borated water leakage from the pressure boundary components above the head was observed during these visual inspections. In addition, there was no indication of elevated temperature on the main flange o-ring leakoff line to suggest o-ring leakage. Since the boron deposits were located on the vertical side of the reactor head insulation, external to the support structure, no mirror insulation was removed from the RPV head area.

- Isotopic analysis of samples taken from the boron residue identified a Co-58/Co-60 ratio consistent with recent reactor coolant system water chemistry. These results did not provide conclusive data for determining whether the samples were from leakage during refueling activities or from leakage during unit startup.
- Chemical analysis of additional samples identified that the boron deposits contained no lithium (i.e., the results were below the detection limits of the analysis). During refueling operations, the water within the refueling canal that leaked past the reactor vessel cavity seal and sandbox covers contained no lithium. During unit startup, at the time that the additional samples were taken, there was a presence of lithium in the reactor coolant system that would have yielded a detectable result. These results support a conclusion that the most likely source was borated water leakage from the refueling cavity.

Further evaluations performed subsequent to plant startup included:

- Containment Atmosphere Particulate Radiation Monitor (2EMF-38) filter media was evaluated for evidence of primary system leakage. Catawba's particulate monitor uses a fixed filter media design that is periodically replaced and can be analyzed for radioactive isotopes as an indication of reactor coolant system leakage. Unit 2 began Mode 1 operation on November 15, 2007, and filter changes on November 21 and November 29 identified no evidence of radioactivity.
- Catawba's reactor coolant system leakage monitoring procedure includes Action Levels and Response Guidelines based on the recommendations of WCAP-16465-NP, "PWROG Standard RCSL Actions Levels and Response Guideline for Pressurized Water Reactors". With system instability associated with unit startup, the initial Unit 2 unidentified leakage Mean Value, Action Level 1, and Action Level 2 were slightly elevated relative to the previous

fuel cycle, with the values at 0.048 gpm, 0.130 gpm, and 0.171 gpm, respectively. Although some system instability continued over the month of December 2007, the most recently calculated reactor coolant system unidentified leakage Mean Value was 0.035 gpm, using system leakage results from December 5 through December 31. Overall, the current value for unidentified leakage has remained below the required Action Levels and shows no evidence of an adverse trend.