

50-269/270/287



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

November 17, 1999

Mr. W. R. McCollum, Jr.
Vice President, Oconee Site
Duke Energy Corporation
7800 Rochester Highway
Seneca, SC 29672

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1 AND 3 RE: NOTICE OF
ENFORCEMENT DISCRETION (TAC NOS. MA7142 AND MA7143)
(NOED NO. 96-6-008)

Dear Mr. McCollum:

By letter dated November 16, 1999, Duke Energy Corporation (Duke) requested that the Nuclear Regulatory Commission (NRC) exercise enforcement discretion not to enforce compliance with certain of the requirements in Technical Specification (TS) 5.5.10, "Steam Generator (SG) Surveillance Program." The letter documented information previously discussed with the NRC in a telephone conference call on November 15, 1999, starting at 4:15 p.m. The principal NRC staff members who participated in that telephone conference call included H. Berkow, L. Olshan, C. Ogle, L. Plisco, R. Emch, V. McCree, J. Blake, E. Murphy, and E. Sullivan. You stated that on November 15, 1999, at approximately 4:10 p.m., based on discussions with the staff, Units 1 and 3¹ would not be in compliance with TS 5.5.10, Section e.6. This would require shutdown of both units in accordance with TS Limiting Condition for Operation 3.0.3.

As a result, Duke requested that a Notice of Enforcement Discretion (NOED) be issued pursuant to the NRC's policy regarding exercise of discretion for an operating facility, set out in Section VII.c. of the "General Statement of Policy and Procedures for NRC Enforcement Actions" (Enforcement Policy), NUREG-1600. Duke also requested that the NOED be effective for the period until the license amendment request that is expected to be submitted on November 17, 1999, is approved by the staff for the Oconee Nuclear Station, Units 1, 2 and 3. This letter documents our telephone conference call on November 15, 1999, when we orally issued the NOED at 5:05 p.m.

In early May 1998, operating experience data based on events at another facility were received by Duke. This information indicated that previous eddy current indications that were then classified as tube end anomalies (TEAs) had exhibited primary-to-secondary leakage at the facility, thus indicating they were in the pressure boundary. Consequently, Duke redefined TEAs and developed an analysis methodology and guidelines capable of distinguishing anomalies having indications extending below the outer surface of the upper tube sheet clad. These crack-like indications located between the primary face of the tube sheet clad and the tube sheet clad to carbon steel interface were referred to as tube end cracks (TECs).

¹ Units 1 and 3 are the subject of this NOED. The NOED does not apply to Unit 2 since it is in a refueling outage. The proposed amendment will address all three units.

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After discussions with the staff regarding its redefined analysis methodology and guidelines for indications extending below the outer surface of the upper tube sheet clad, Duke incorrectly concluded that indications above the outer surface of the upper tube sheet clad (now referred to as TEAs) were not part of the pressure boundary and could, therefore, be excluded from the TS requirements. On September 7, 1999, Duke submitted a letter to the staff that discussed this interpretation.

On November 10, 1999, in a telephone conversation with the staff, we suggested that this position may be contrary to the requirements of the TS. Based on the definitions of repair and tube inspection in TS 5.5.10, the TS require repair of defects in the tubing in the region of the tube end weld. Therefore, the staff concluded that the 40 percent repair criterion required by the TS was applicable to the indications above the outer surface of the upper tube sheet clad such that operation with these indications was contrary to the TS. Based on this staff position, on November 15, 1999, Duke determined that Oconee Units 1 and 3 were not in compliance with TS 5.5.10 and requested that the staff exercise discretion not to enforce compliance with the repair requirements in TS 5.5.10 for the Oconee Nuclear Station, Units 1 and 3.

Based on Duke's review of the eddy current data for tubes with TEC indications, the indications are typically characterized as crack-like and axially oriented. Circumferential indications have also been identified, as well as a small number of volumetric indications. Multiple axial indications and combinations of axial and circumferential indications have also been identified. Based on this data, Duke believes that the TECs initiate on the inside surface of the steam generator tube, are typically short, axially oriented, and located in the rolled portion of the tube, near the heat affected zone created by the tube-to-tube sheet weld. While no laboratory examination data on TECs are available, these indications have been verified as through-wall cracks based on bubble tests performed at other Babcock and Wilcox plants. The rolling and welding processes create residual stress that may make the material more susceptible to Primary Stress Corrosion Cracking (PWSCC). For this reason, it is believed that the TECs are PWSCC initiated. Duke stated that the Oconee steam generators have been bubble tested during the last five refueling outages for a total of ten tests, and leakage has not been identified from any TEA indication.

In the November 16, 1999, letter, Duke stated that the TEA indications are not predicted to contribute to primary-to-secondary leakage since the welds will remain functional and the TEAs do not extend into the clad. Therefore, until TEAs grow beyond the primary tube sheet face, a direct path from the primary side to the secondary side does not exist. The primary safety concern for primary-to-secondary leakage is during an accident condition. The axial loads and increased differential pressure during a postulated accident condition have the potential to increase the primary-to-secondary leakage, compared to normal operating conditions. This can only occur if the TEAs that are left in service extend beyond the primary surface and into the tube sheet clad. Duke stated that while growth into the clad and completely through-wall is not expected, it can be assessed for potential impact. To do the assessment, Duke assumed that the growth rates of a TEA would be similar to that of a TEC (since both are assumed to be due to PWSCC with the stress component being generated by the seal weld process). TEC growth rates were assessed in BAW-2346P, Rev. 0, "Alternate Repair Criteria for Tube End Cracking in the Tube-to-Tubesheet Roll Joint of Once Through Steam Generators." The growth rate indicated in the report is 0.0135 inches per 1.37 effective full power years. Assuming that growth rate, that the TEAs are 100 percent through-wall, and no leakage reduction due to the

tube-to-tube sheet roll, Duke stated that the leakage through these flaws can be conservatively calculated using the Tubeworks computer code. The results of this calculation show a main steam line break leak rate of 0.2 gallon per minute for 10,000 indications.

The staff has not reviewed the Tubeworks computer code but the results are believed to be conservative based on the fact that Duke assumed no leakage reduction for the tube-to-tube sheet roll. This assumption of no leakage reduction also serves to minimize the significance of growth rate uncertainties. Therefore, the staff finds the assessment reasonable.

Duke stated that primary-to-secondary leakage during normal operation is monitored according to the TS to ensure that any leakage remains less than the acceptable limit. Duke also stated that total operational leakage from TEAs left in service has remained well within the acceptable limits of the TS and, in fact, has been undetectable. Further, the presence of the tube sheet precludes the possibility of burst for tubes with TEAs.

In addition, Duke has concluded that, based on industry experience with Inconel 600 weld metal, the tube-to-tube sheet weld is not likely to crack and that the weld will not be affected by the TEAs. If the tubing next to the seal weld is cracked due to PWSCC, the crack growth should slow as the remaining stresses from the weld process are relieved. The crack is not expected to penetrate into the weld material. Therefore, Duke has stated that there is no evidence of cracks in the welds and stated that this is further supported by bubble tests of steam generator tubes performed at various plants.

The assessment of primary-to-secondary leakage during accident conditions is believed to be conservative and well within the main steam line break leakage requirements for steam generator integrity. Therefore, the staff finds that continued operation with TEAs left in service is acceptable for the period of time until a license amendment request is submitted and approved by the NRC staff.

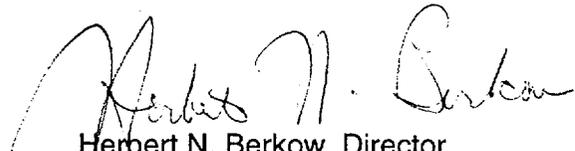
On the basis of the staff's evaluation of Duke's request, we have concluded that a NOED is warranted because we are clearly satisfied that this action involves minimal or no safety impact, is consistent with the enforcement policy and staff guidance, and has no adverse impact on public health and safety or the environment. Duke's assessment of primary-to-secondary leakage during accident conditions is believed to be conservative and well within the main steam line break leakage requirements for SG integrity. Therefore, it is our intention to exercise discretion not to enforce compliance with TS 5.5.10, Section e.6 for the SG TEA indications that exceed the repair limit on Oconee Nuclear Station, Units 1 and 3. This discretion is for the period from 5:05 p.m. on November 15, 1999, until issuance of the license amendments that will address the TEA issue for Oconee Nuclear Station, Units 1, 2, and 3, which is expected to be submitted on November 17, 1999. The staff plans to complete its review and issue the license amendments within 4 weeks of the date of this letter and prior to restart of Unit 2 from its refueling outage.

W. R. McCollum, Jr.

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As stated in the Enforcement Policy, action will be taken, to the extent that violations were involved, for the root cause that led to the noncompliance for which this NOED was necessary.

Sincerely,

A handwritten signature in cursive script, appearing to read "Herbert N. Berkow".

Herbert N. Berkow, Director
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, and 50-287

cc: See next page

As stated in the Enforcement Policy, action will be taken, to the extent that violations were involved, for the root cause that led to the noncompliance for which this NOED was necessary.

Sincerely,

Original signed by:

Herbert N. Berkow, Director
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, and 50-287

cc: See next page

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