



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 30, 2015

Mr. Scott Batson
Site Vice President
Oconee Nuclear Station
Duke Energy Carolinas, LLC
7800 Rochester Highway
Seneca, SC 29672-0752

SUBJECT: OCONEE NUCLEAR STATION, UNIT 1 – REVIEW OF THE FALL 2014 STEAM GENERATOR TUBE INSERVICE INSPECTION REPORT FOR REFUELING OUTAGE 28 (TAC NO. MF6411)

Dear Mr. Batson:

The U.S. Nuclear Regulatory Commission (NRC) staff formally reviews all steam generator (SG) inservice inspection summary reports submitted by licensees in accordance with the plant's Technical Specification (TS) requirements. By letter dated March 6, 2015, Duke Energy Carolinas, LLC (the licensee), submitted information summarizing the results of the fall 2014 SG tube inspections performed at Oconee Nuclear Station, Unit 1. These inspections were performed during refueling outage 28.

The NRC staff has completed its review of the information provided and concludes that the licensee provided the information required by their TSs and no additional follow-up is required at this time. The NRC staff's review is enclosed and concludes the review associated with TAC MF6411.

If you have any questions, please contact me at (301) 415-4090 or via e-mail at Jeffrey.White@nrc.gov.

Sincerely,

Handwritten signature of Jeffrey A. White in black ink.

Jeffrey A. White, Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-269

Enclosures:
As stated

cc w/encls: Distribution via ListServ

OFFICE OF NUCLEAR REACTOR REGULATION
REVIEW OF THE 2014 STEAM GENERATOR TUBE INSERVICE INSPECTION REPORT
PERFORMED DURING REFUELING OUTAGE 28
DUKE ENERGY CAROLINAS, LLC
OCONEE NUCLEAR STATION, UNIT 1
DOCKET NO. 50-269

By letter dated March 6, 2015,¹ Duke Energy Carolinas, LLC (the licensee) submitted information summarizing the results of the fall 2014 steam generator (SG) tube inspections performed at the Oconee Nuclear Station, Unit 1 (ONS-1). These inspections were performed during refueling outage 28.

ONS-1 has two replacement once-through steam generators (OTSGs) designed and fabricated by Babcock and Wilcox International. These OTSGs were put into service in 2004. Each OTSG has 15,631 thermally treated Alloy 690 tubes that have a nominal outside diameter of 0.625 inches and a nominal wall thickness of 0.038 inches. The tubes were hydraulically expanded into the tubesheet for 13 inches from the tube end. The tubesheet is 22 inches thick.

The licensee provided the scope, extent, methods, and results of the OTSG tube inspections in the letter referenced above and the call referenced below. In addition, the licensee described corrective actions (i.e., tube plugging) taken in response to the inspection findings.

On December 16, 2014, the U.S. Nuclear Regulatory Commission (NRC) and the licensee held a conference call to discuss one indication of tube wear from a tube support plate (TSP) that was 59 percent through-wall (TW), which was slightly larger than the 57.6 percent predicted in the previous operational assessment.

- The indication of TSP wear was located in SG A, in the tube located in Row 16, Column 60 and at the 10th TSP. The tube had adequate structural integrity and there was margin to the structural limit.
- In performing the previous operational assessment, the licensee had calculated the 95th percentile predicted growth rates for several indication populations. The 95th percentile predicted growth rate for the entire population of tube wear indications was 2.67 percent TW per effective full power year (EFPY). The 95th percentile predicted growth rate for the subset of tube wear indications that were greater than or equal to 10 percent TW, was 4.4 percent TW per EFPY. This was the growth rate used in the previous operational assessment (performed in 2012). The 95th percentile predicted growth rate

¹ Agencywide Documents Access and Management System Accession No. ML15072A185.

for the subset of tube wear indications that were greater than or equal to 20 percent TW, was 7.7 percent TW per EFPY.

- The operational assessment for the current operating cycle used the 95th percentile predicted growth rate for the subset of tube wear indications that were greater than or equal to 20 percent through-wall. The 95th percentile growth rate was 7.1 percent TW per EFPY. If this method had been used for the prior operational assessment (performed in 2012), the current (2014) inspection results would have been conservatively predicted.
- The licensee stated that 14 percent TW per EFPY growth rate could have been used and the structural integrity performance criteria in the operational assessment for the current operating cycle would still be met.
- The projected maximum indication at the next inspection is approximately 63 percent TW.
- The last operating cycle was the first 24-month operating cycle completed by ONS-1. Both ONS-2 and 3, have already completed one 24-month operating cycle. The licensee has transitioned to 24-month fuel cycles with SG tube inspections every refueling outage.
- The licensee stated that there was no tube-to-tube wear identified in the most recent SG inspections at ONS-1.

On August 18, 2015, the licensee clarified the following regarding their report:

- The SGs have operated 102.1 effective full power months (EFPM) since the first inservice inspection after replacement. The SGs have operated a total of 116.9 EFPM since installation.
- There were 21,289 indications in 9,412 tubes in SG 1A and 17,612 indications in 9,194 tubes in SG 1B.
- The number of indications in SG 1A has increased slightly. The number of indications in SG 1B has remained essentially the same.
- Both the 95/50 and the average growth rates have decreased since the previous operating cycle.
- The maximum indication noted was 59 percent TW, and was discussed with the NRC during the December 16, 2014, outage call.

Based on the NRC staff's review of the information submitted by the licensee, the NRC staff has the following observations:

- Wear with a relatively flat profile occurs in the inspection port regions of both SGs. The maximum flat wear depth seen in either SG was 20 percent TW.
- A small population of shallow wear indications was observed during refueling outage 28 at drilled hole locations at the 14th support plate. The deepest of these indications was 19 percent TW with a circumferential extent of 70 degrees and an axial length of 0.21 inches.
- The NRC staff notes that the growth rates for wear indications generally decreases with increasing depth of wear indications.

Based on a review of the information provided, the NRC staff concludes that the licensee provided the information required by their TSs. In addition, the NRC staff concludes that there are no technical issues that warrant follow-up action at this time since the inspections appear to be consistent with the objective of detecting potential tube degradation and the inspection results appear to be consistent with industry operating experience at similarly designed and operated units.

Principal Contributor: Andrew Johnson, DE

September 30, 2015

Mr. Scott Batson
Site Vice President
Oconee Nuclear Station
Duke Energy Carolinas, LLC
7800 Rochester Highway
Seneca, SC 29672-0752

SUBJECT: OCONEE NUCLEAR STATION, UNIT 1 – REVIEW OF THE FALL 2014 STEAM GENERATOR TUBE INSERVICE INSPECTION REPORT FOR REFUELING OUTAGE 28 (TAC NO. MF6411)

Dear Mr. Batson:

The U.S. Nuclear Regulatory Commission (NRC) staff formally reviews all steam generator (SG) inservice inspection summary reports submitted by licensees in accordance with the plant's Technical Specification (TS) requirements. By letter dated March 6, 2015, Duke Energy Carolinas, LLC (the licensee), submitted information summarizing the results of the fall 2014 SG tube inspections performed at Oconee Nuclear Station, Unit 1. These inspections were performed during refueling outage 28.

The NRC staff has completed its review of the information provided and concludes that the licensee provided the information required by their TSs and no additional follow-up is required at this time. The NRC staff's review is enclosed and concludes the review associated with TAC MF6411.

If you have any questions, please contact me at (301) 415-4090 or via e-mail at Jeffrey.Whited@nrc.gov.

Sincerely,
/RA/

Jeffrey A. Whited, Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-269

Enclosures:
As stated

cc w/encls: Distribution via ListServ

DISTRIBUTION:

| | | | |
|-----------------------------|------------|--------------------------------|----------------|
| PUBLIC | LPL2-1 R/F | RidsAcrcsAcnw_MailCTR Resource | AJohnson, NRR |
| RidsRgn2MailCenter Resource | | RidsNrrDeEsgb Resource | KKarwoski, NRR |
| RidsNrrDorIDpr Resource | | RidsNrrDorILPL2-1 Resource | |
| RidsNrrLASFiguroa Resource | | RidsNrrPMOconee Resource | |

ADAMS Accession No.: ML15271A338 *via memo dated

| OFFICE | LPL2-1/PM | LPL2-1/LA | DE/ESGB | LPL2-1/BC | LPL2-1/PM |
|--------|------------|------------|------------|-------------|------------|
| NAME | JWhited | SFiguroa | GKulesa* | RPascarelli | JWhited |
| DATE | 09/29/2015 | 09/29/2015 | 08/27/2015 | 09/29/2015 | 09/30/2015 |

OFFICIAL RECORD COPY