



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

August 12, 2014

Vice President, Operations
Arkansas Nuclear One
Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72802

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT NO. 1 – REVIEW OF THE 2013 STEAM
GENERATOR TUBE INSPECTIONS DURING REFUELING OUTAGE 1R24
(TAC NO. MF3251)

Dear Sir or Madam:

By letter dated October 23, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13296A746), as supplemented by letter dated April 30, 2014 (ADAMS Accession No. ML14120A496), Entergy Operations, Inc., the licensee, submitted information to the U.S. Nuclear Regulatory Commission (NRC) summarizing the results of the spring 2013 steam generator tube inspections performed during refueling outage 1R24 at Arkansas Nuclear One, Unit 1.

The NRC staff has completed its review of the submittals and concludes that the licensee provided the information required by its technical specifications. No additional follow-up is required at this time. The results of the NRC staff's review are enclosed.

If you have any questions, please contact me at (301) 415-1081 or by e-mail at Andrea.George@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "A. E. George", is written over a horizontal line.

Andrea E. George, Project Manager
Plant Licensing Branch IV-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-313

Enclosure:
As stated

cc w/encl: Distribution via Listserv

OFFICE OF NUCLEAR REACTOR REGULATION
STAFF REVIEW OF RESULTS OF SPRING 2013 STEAM GENERATOR TUBE
INSERVICE INSPECTIONS PERFORMED DURING REFUELING OUTAGE 1R24
ENTERGY OPERATIONS, INC.
ARKANSAS NUCLEAR ONE, UNIT 1
DOCKET NO. STN 50-313

By letter dated October 23, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13296A746), and supplemented by letter dated April 30, 2014 (ADAMS Accession No. ML14120A496), Entergy Operations, Inc., the licensee, submitted information summarizing the results of the spring 2013 steam generator (SG) tube inspections performed during refueling outage 1R24 at Arkansas Nuclear One, Unit 1 (ANO-1). In addition to these reports, the U.S. Nuclear Regulatory Commission (NRC) staff summarized a conference call held with the licensee concerning the 2013 SG tube inspections, in a letter dated July 9, 2013 (ADAMS Accession No. ML13172A029).

The SGs at ANO-1 are Enhanced Once-Through Steam Generators (EOTSG) manufactured by AREVA. The EOTSG is a straight shell and tube type heat exchanger installed in a vertical position. The Alloy 690 thermally treated tubing has a 0.625-inch diameter and a 0.037-inch wall thickness. The tubes were expanded hydraulically for the full depth of the tubesheet. There are 15 tube support plates (TSPs) that are constructed of Type 410 stainless steel. These supports have a trefoil-shaped hole design.

The licensee provided the scope, extent, methods and results of its SG tube inspections in the documents referenced above. In addition, the licensee described corrective actions (i.e., tube plugging) taken in response to the inspection findings. The tubes in both SGs A and B were inspected this outage.

After reviewing the information provided by the licensee, the NRC staff has the following comments/observations:

- The 1R24 refueling outage tube inspections were primarily conducted to determine the extent of bowing of the tie rods and to validate the growth rate for tube-to-tube wear. To date, there has been no tube wear associated with tie rod bowing in either SG.
- The licensee indicated that there is plastic deformation in the first-span tie rod region of both SGs and that as a result, residual bowing may occur during normal power operation. Based on the amount of plastic deformation that currently exist and projected to occur, tubes were plugged and stabilized to surround the affected tie rods. The gap between the tie rods and the adjacent tubes is approximately 0.25 inches. Once the amount of plastic deformation exceeds the

Enclosure

0.25 inches, there is potential for the tie rod to come in contact with a tube and could potentially result in mechanical wear.

- The direction of tie rod bowing in SG B is circumferential while the direction of tie rod bowing in SG A is radially inward.
- Peripheral tubes were inspected for signs of denting to assist in identifying locations where TSPs are suspected not to be freefloating. The circumferential extent of locking at the top TSP (15S) appears to be increasing with each operating cycle. Tube support plate 15S showed a slight circumferential progression of new dents in 1R24. The licensee indicated that the progression was not as significant as seen in prior outages. All dent voltages were below or near 1.0 Volt, and there was no noticeable difference in the voltages of any dents that had been previously identified.
- The licensee indicated that the 1R24 inspections were not an American Society of Mechanical Engineers (ASME) Code type inspection. The NRC staff notes that the SG tube inspections are governed, in part, by both the ASME Code and the plant's technical specifications. Whereas, the performance of this particular inspection may not have been needed to meet some of the requirements of the ASME Code, there are other requirements (ASME and technical specifications) that still apply to the 1R24 inspection.

Based on a review of the information provided, the NRC staff concludes that the licensee provided the information required by the ANO-1 technical specifications. In addition, the 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 (with the exception of tie-rod bowing) appear to be consistent with industry operating experience at similarly designed and operated units.

August 12, 2014

Vice President, Operations
Arkansas Nuclear One
Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72802

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT NO. 1 – REVIEW OF THE 2013 STEAM
GENERATOR TUBE INSPECTIONS DURING REFUELING OUTAGE 1R24
(TAC NO. MF3251)

Dear Sir or Madam:

By letter dated October 23, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13296A746), as supplemented by letter dated April 30, 2014 (ADAMS Accession No. ML14120A496), Entergy Operations, Inc., the licensee, submitted information to the U.S. Nuclear Regulatory Commission (NRC) summarizing the results of the spring 2013 steam generator tube inspections performed during refueling outage 1R24 at Arkansas Nuclear One, Unit 1.

The NRC staff has completed its review of the submittals and concludes that the licensee provided the information required by its technical specifications. No additional follow-up is required at this time. The results of the NRC staff's review are enclosed.

If you have any questions, please contact me at (301) 415-1081 or by e-mail at Andrea.George@nrc.gov.

Sincerely,

/RA/

Andrea E. George, Project Manager
Plant Licensing Branch IV-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-313

Enclosure:
As stated

cc w/encl: Distribution via Listserv

DISTRIBUTION:

PUBLIC
LPL4-1 Reading
RidsAcraAcnw_MailCTR Resource
RidsNrrDeEsGb Resource
RidsNrrDorLp4-1 Resource

RidsNrrLAJBurkhardt Resource
RidsNrrPMANO Resource
RidsRgn4MailCenter Resource
GKulesa, NRR/DE/ESGB
KKarwoski, NRR/DE

ADAMS Accession No. ML14223A803

***by memo dated**

| OFFICE | NRR/DORL/LPL4-1/PM | NRR/DORL/LPL4-1/LA | NRR/DE/ESGB/BC* | NRR/DORL/LPL4-1/BC(A) | NRR/DORL/LPL4-1/PM |
|--------|--------------------|--------------------|-----------------|-----------------------|--------------------|
| NAME | AGeorge | JBurkhardt | GKulesa | EOesterle | AGeorge |
| DATE | 8/11/14 | 8/11/14 | 7/31/14 | 8/12/14 | 8/12/14 |

OFFICIAL RECORD COPY