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

April 1, 2013

Mr. Matthew W. Sunseri
President and Chief Executive Officer
Wolf Creek Nuclear Operating Corporation
Post Office Box 411
Burlington, KS 66839

SUBJECT: WOLF CREEK GENERATING STATION – SUMMARY OF STEAM GENERATOR CONFERENCE CALLS FOR REFUELING OUTAGE 19 (TAC NO. MF0736)

Dear Mr. Sunseri:

On February 28 and March 11, 2013, the U.S. Nuclear Regulatory Commission (NRC) staff conducted conference calls with representatives of the Wolf Creek Nuclear Operating Corporation (WCNOC, the licensee) and its contractors regarding the licensee's ongoing steam generator (SG) tube inspection activities at Wolf Creek Generating Station (WCGS) during refueling outage 19 (RFO19). Information provided by the licensee in support of the February 28, 2013, conference call is located in the Agencywide Documents Access and Management System (ADAMS) at Accession No. ML13058A178.

At the time of the conference calls, tube inspections were still in progress. A summary of the information that was discussed during the conference calls is provided in the Enclosure. If you have any questions, please contact me at 301-415-2296 or via e-mail at fred.lyon@nrc.gov.

Sincerely,

CFLyon

Carl F. Lyon, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-482

Enclosure
As stated

cc w/encl: Distribution via Listserv

SUMMARY OF STEAM GENERATOR CONFERENCE CALLS

FOR REFUELING OUTAGE 19

WOLF CREEK NUCLEAR OPERATING CORPORATION

WOLF CREEK GENERATING STATION

DOCKET NO. 50-482

On February 28 and March 11, 2013, the U.S. Nuclear Regulatory Commission (NRC) staff (K. Karwoski, A. Johnson, et al.) conducted conference calls with representatives (S. Wideman, P. Wagner, et al.) of the Wolf Creek Nuclear Operating Corporation (WCNOC, the licensee) and its contractors regarding the licensee's ongoing steam generator (SG) tube inspection activities at Wolf Creek Generating Station (WCGS) during refueling outage 19 (RFO19). Information provided by the licensee in support of the February 28, 2013, conference call is located at Agencywide Documents Access Management System (ADAMS) Accession No. ML13058A178.

WCGS has four Westinghouse Model F SGs. Each SG has 5,626 thermally treated Alloy 600 tubes with an outside diameter of 0.688 inches and a nominal wall thickness of 0.040 inches. The tubes are hydraulically expanded for the full-depth of the tubesheet at each end. The tubes are supported by stainless steel support plates with quatrefoil-shaped holes. The U-bend region of the tubes installed in Rows 1 through 10 was thermally treated after bending in order to reduce stress.

At the time of the conference calls, tube inspections were still in progress. The conference calls focused on inspection of tubing within the tubesheet and inspection of the channel head bowl. Information that was discussed during the conference calls and not included in the documents provided by the licensee is summarized below:

February 28, 2013, Conference Call:

Item 1: Divider plate-to-channel head weld flaw

- The divider plate-to-channel head weld is made with Alloy 600 type weld material. The cladding on the channel head is stainless steel.

- More detailed video examinations of the SG bowl area were performed this outage in response to industry operating experience. A flaw was detected in the divider plate-to-channel head fillet weld, which is most likely a fabrication defect. An ultrasonic test (UT) indicated the flaw was approximately 0.1 inch deep and approximately 2 inches long.

- The flaw at the edge of the divider plate-to-channel head weld in SG A was evaluated in accordance with Section XI, Paragraph IWB-3510.1 and Table IWB-3510-1, of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (ASME Code). The flaw was treated as a planar flaw. The evaluation considered flaw growth in the future. The licensee determined that it was acceptable to operate for the next planned operating

Enclosure

cycle, during which the licensee will perform a detailed fracture mechanics analysis of the flaw, to determine the long-term corrective action required.

- Based on the corrosion properties of the stainless steel cladding and Alloy 600 weld material, and because the primary chemistry is usually maintained in a condition that scavenges oxygen, the licensee concluded that the flaw in the divider plate-to-channel head weld was only able to grow when there were oxidizing conditions in the primary coolant (i.e., for a short period prior to each shutdown due to peroxide addition during the shutdown process) and when SG A was open for inspection. Based on this estimated exposure period and boric acid corrosion rates in literature, the licensee predicted the flaw would be approximately 0.1 inches, assuming the corrosion started at the beginning of plant operation. This matches the actual extent of degradation observed, as determined from the ultrasonic examination. Using a flaw growth rate of approximately 5 mils (0.005 inches) per operating cycle, the licensee concluded the flaw would be approximately 0.105 inch deep at the next refueling outage.

- The licensee performed a review of historical SG A bowl visual inspections that were on digital video discs and noted that the rust spot was not visible in RFO18, but was visible in RFO17 and RFO15. SG A was not inspected in RFO16. The licensee has additional video tapes of older RFO inspections and is assessing whether to perform additional reviews of historical video tape footage.

- The licensee believes that any inspection of the divider plate-to-channel head weld during initial fabrication would have been a visual examination.

- Because there are structural interferences that prevent a zero degree ultrasonic test (UT) examination of the divider plate-to-channel head weld flaw, the licensee cannot confirm that there is no delamination between the stainless steel cladding and the low alloy steel channel head in the area directly under the flaw. The licensee has confirmed that there are no delaminations between the cladding and the channel head in those areas around the divider plate-to-channel head weld flaw, where there is access for a zero degree UT examination.

- The licensee clarified that while there was a loose part found previously in the SG channel head bowl of SG D, there was no history of loose parts in the SG channel head bowl of SG A.

- The licensee stated that it had notified the industry of this finding. The licensee also clarified that it is planning to re-inspect this flaw at the next scheduled RFO in order to monitor/confirm the flaw growth rate.

Item 2: Crack-like indication associated with a bulge

- A crack-like indication was detected in a tube approximately 6 inches below the top-of-the-tubesheet (TTS). The crack-like indication was associated with a bulge.

- The licensee clarified that this was the first indication of a crack at this location.

- The planned hot-leg TTS exam in SGs A, B, C, and D was 25 percent of the tubes from 3 inches above to 15.21 inches below (+3/-15.21) the TTS. In addition, all periphery tubes (approximately two tubes into the bundle) were inspected +3/-3 inches in the cold leg and +3/-15.21 inches on the hot-leg.

- The TTS exam in SG B was expanded to a 100 percent inspection of the hot-leg tubes containing bulges or overexpansions from 3 inches above to 15.21 inches below (+3/-15.21) the TTS. On the hot-leg side of SGs A, C, and D, the TTS exam was verified to include at least a 20 percent sample of tubes containing bulges or overexpansions from +3/-15.21 inches of the TTS.

- When asked about the expansion of its inspection scope in response to the finding of a circumferential primary water stress-corrosion cracking indication, the licensee stated that they were consistent with the current industry guidelines. The NRC staff noted that regardless of the inspection guidance contained within the Electric Power Research Institute SG examination guidelines, the objective of the SG program is to ensure tube integrity, and that using a sampling process to search for a very small population of indications (e.g., one possible indication in a SG) increases the chance that an indication may not be detected. The licensee indicated that the operation assessment will reflect the actual sampling strategy employed in SGs A, C, and D.

- The licensee clarified that bulges (BLG) were defined as greater than or equal to 18 Volts on the 550 kilohertz channel and overexpansions were defined as a tube inside diameter greater than or equal to 1.5 mils (0.0015 inches) larger than the tube's average diameter. The BLG in the tube with the crack-like indication measured 23.71 volts in 2008.

- The licensee stated that it had adopted Technical Specifications Task Force Traveler 510 (TSTF-510).

The NRC staff requested a follow-up conference call with the licensee, to clarify questions about the UT techniques that were used to inspect the flaw region and to understand how the licensee confirmed that the flaw in the weld was not a result of cracking or fatigue.

March 11, 2013, Conference Call:

Item 1: Divider plate-to-channel head weld flaw

- The licensee reported that it had completed a review of historical SG A bowl visual inspections (from RFO11 and RFO7) that were on video tape. The rust spot reported during this outage (RFO19) is visible in both the RFO11 and RFO7 video recordings, although the video recording from RFO7 (1994) is a black and white recording and not a color recording. The RFO7 video is the earliest video recording of this area.

- In response to the NRC staff's inquiry, the licensee stated that there is no direct evidence that the flaw at the rust spot location was not caused by stress corrosion cracking (SCC) or fatigue. However, the licensee clarified that there is indirect evidence to support the conclusion that the flaw was not caused by SCC or fatigue. The licensee stated that SCC has never been observed in stainless steel or carbon steel in the SG, and the existence of the rust stain is evidence that the carbon steel channel head is corroding. The rust spot is around a black spot that appears to be either a weld crater pit or weld porosity. The rust spot appears to be about ½ inch long and ¼ inch wide. Also, the licensee stated that the fatigue stress analysis showed that the fatigue stresses in this location of the SG are very low. The licensee stated that there could be additional paths of SCC in the weld, but there was currently no evidence of these additional paths. The licensee concluded that the black spot is a fabrication defect in the weld metal and that a breach through the stainless steel cladding was probably created as a result of the high tensile stresses from the weld geometry.

- The licensee clarified that the external surface of the channel head (where the UT inspections were performed), was an unpainted carbon steel surface with no apparent corrosion. The UT technique used to inspect the flaw in the channel head was a reactor pressure vessel qualified procedure. The root mean square sizing error associated with the UT inspection procedure varied from 0.15 inches to 0.25 inches, depending on the specific inspection conditions. The dimensions of the flaw estimated by the licensee were based on a 50 percent amplitude drop in the UT signal, when moving the UT probe up and down, and left and right, across the channel head. The probe was at a 30-degree skew angle below the location of the flaw. The licensee also clarified that it was not possible to see indications in the divider plate-to-channel head fillet weld from the outside of the SG channel head.

- The licensee classified the SG as degraded but operable, and will perform a detailed fracture mechanics and fatigue growth analysis of the flaw during the next operating cycle, in accordance with Section XI of the ASME Code. The licensee will re-inspect this area during the next RFO, to determine the flaw growth rate.

The NRC staff did not identify any issues that warranted immediate follow-up action.

April 1, 2013

Mr. Matthew W. Sunseri
President and Chief Executive Officer
Wolf Creek Nuclear Operating Corporation
Post Office Box 411
Burlington, KS 66839

SUBJECT: WOLF CREEK GENERATING STATION – SUMMARY OF STEAM GENERATOR CONFERENCE CALLS FOR REFUELING OUTAGE 19 (TAC NO. MF0736)

Dear Mr. Sunseri:

On February 28 and March 11, 2013, the U.S. Nuclear Regulatory Commission (NRC) staff conducted conference calls with representatives of the Wolf Creek Nuclear Operating Corporation (WCNOC; the licensee) and its contractors regarding the licensee's ongoing steam generator (SG) tube inspection activities at Wolf Creek Generating Station (WCGS) during refueling outage 19 (RFO19). Information provided by the licensee in support of the February 28, 2013, conference call is located in the Agencywide Documents Access and Management System (ADAMS) at Accession No. ML13058A178.

At the time of the conference calls, tube inspections were still in progress. A summary of the information that was discussed during the conference calls is provided in the Enclosure. If you have any questions, please contact me at 301-415-2296 or via e-mail at fred.lyon@nrc.gov.

Sincerely,

/RA/

Carl F. Lyon, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-482

Enclosure
As stated

cc w/encl: Distribution via Listserv

DISTRIBUTION:

PUBLIC	RidsNrrLAJBurkhardt Resource	KKarwoski, NRR/DE
LPLIV r/f	RidsNrrPMWolfCreek Resource	JDrake, RIV
RidsAcrsAcnw_MailCTR Resource	RidsOgcRp Resource	RKopriva, RIV
RidsNrrDeEsgb Resource	RidsRgn4MailCenter Resource	
RidsNrrDorlLpl4 Resource	AJohnson, NRR/DE/ESGB	

ADAMS Accession No.: ML13077A073

OFFICE	NRR/DORL/LPL4/PM	NRR/DORL/LPL4/LA	NRR/DE/ESGB/BC	NRR/DORL/LPL4/BC	NRR/DORL/LPL4/PM
NAME	FLyon	JBurkhardt	GKulesa	MMarkley	FLyon
DATE	3/22/13	3/19/13	3/27/13	4/1/13	4/1/13

OFFICIAL RECORD COPY