



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

June 9, 2017

Mr. Peter P. Sena, III
President and Chief Nuclear Officer
PSEG Nuclear LLC - N09
P.O. Box 236
Hancocks Bridge, NJ 08038

SUBJECT: HOPE CREEK GENERATING STATION – COMPLETION OF REVIEW OF THE
IMPLEMENTATION OF LICENSE RENEWAL LICENSE CONDITIONS 2.C.(27)b
AND 2.C.(27)c (CAC NO. MF9284)

Dear Mr. Sena:

By letter dated February 7, 2017,¹ PSEG Nuclear LLC, the licensee for Hope Creek Generating Station, submitted a summary of the results of the ultrasonic thickness measurements and leakage detection from penetrations obtained during Refueling Outage 20 in accordance with Renewed Facility Operating License No. NPF-57, License Conditions 2.C.(27)b and 2.C.(27)c. The actions required by the license conditions are also described in license renewal Commitment No. 28 in Appendix A of NUREG-2102, "Safety Evaluation Report Related to the License Renewal of Hope Creek Generating Station."² These license conditions require the licensee to perform UT measurements of identified portions of the drywell, monitor specific penetrations for leakage when the reactor is flooded, and provide a summary of the ultrasonic thickness results to the U.S. Nuclear Regulatory Commission (NRC).

The NRC staff reviewed the information provided in the licensee's letter, and based on this review, the NRC staff finds that the licensee has completed the actions required by License Conditions 2.C.(27)b and 2.C.(27)c for Refueling Outage 20. The NRC staff's review of the licensee's submittal is summarized in the enclosure to this letter. This completes the NRC staff's efforts for CAC No. MF9284.

¹ Agencywide Documents Access and Management System (ADAMS) Accession No. ML17038A452

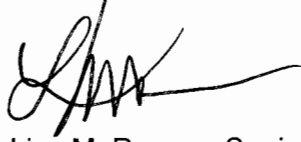
² ADAMS Accession No. ML11200A221

P. Sena

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If you have any questions regarding this matter, please contact me at (301) 415-1906 or Lisa.Regner@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read 'LMA', with a long horizontal flourish extending to the right.

Lisa M. Regner, Senior Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-354

Enclosure:
Office of Nuclear Reactor Regulation
Review of Information Provided

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

OFFICE OF NUCLEAR REACTOR REGULATION

REVIEW OF INFORMATION PROVIDED AS REQUIRED BY

LICENSE CONDITIONS 2.C.(27)b AND 2.C.(27)c RELATED TO DRYWELL EXAMINATIONS

PSEG NUCLEAR LLC

HOPE CREEK GENERATING STATION

DOCKET NO. 50-354

1.0 INTRODUCTION

By letter dated February 7, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17038A452), PSEG Nuclear LLC, the licensee of Hope Creek Generating Station (Hope Creek), submitted a summary of the results of the ultrasonic thickness (UT) measurements and leakage detection from penetrations obtained during Refueling Outage (RFO) 20 in accordance with Renewed Facility Operating License No. NPF-57, License Conditions 2.C.(27)b and 2.C.(27)c. The actions required by the license conditions are also described in license renewal Commitment No. 28 in Appendix A of NUREG-2102, "Safety Evaluation Report Related to the License Renewal of Hope Creek Generating Station" (ADAMS Accession No. ML11200A221). These license conditions require the licensee to perform UT measurements of identified portions of the drywell, monitor specific penetrations for leakage when the reactor is flooded, and provide a summary of the UT results to the U.S. Nuclear Regulatory Commission (NRC).

2.0 BACKGROUND

Renewed Facility Operating License No. NPF-57 for Hope Creek was issued on July 20, 2011 (ADAMS Accession No. ML11116A148). The renewed license contains several license conditions related to license renewal and, in particular, to the Hope Creek drywell air gap drains. Some portions of these license conditions were included in the RFO 17 scope and were worked during the outage that began on April 13, 2012, and ended on May 9, 2012. Continued investigations by the licensee were included in the RFO 18 scope and were worked during the outage that began on October 11, 2013, and ended on November 10, 2013. Monitoring of the air gap leakage and performance of drywell shell UT thickness measurement were included by the licensee in the RFO 19 scope and were worked during the outage that began on April 10, 2015, and ended on May 13, 2015. Further monitoring of air gap leakage and performance of drywell shell UT thickness measurement were included by the licensee in the RFO 20 scope and were worked during the outage that began on October 14, 2016, and ended on November 11, 2016.

3.0 REGULATORY EVALUATION

Renewed Facility Operating License No. NPF-57 for Hope Creek contains several license conditions, including License Condition 2.C.(27)b, which requires the daily monitoring of penetration sleeve J13 for water leakage when the reactor cavity is flooded up, and License Condition 2.C.(27)c, which requires UT measurements of the drywell shell. More specifically, License Condition 2.C.(27) delineates those activities required to be performed following the establishment of drainage capability from the drywell air gap – that is, following completion of License Condition 2.C.(26) – and reads as follows:

- (27) After drainage has been established from the bottom of the air gap in all four quadrants, the licensee will:
 - a. Submit a report to the NRC staff in accordance with 10 CFR 50.4 describing the final drain line configuration and summarizing the testing results that demonstrate drainage has been established for all four quadrants.
 - b. Monitor penetration sleeve J13 daily for water leakage when the reactor cavity is flooded up. In addition, perform a walkdown of the torus room to detect any leakage from other drywell penetrations. These actions shall continue until corrective actions are taken to prevent leakage through J13 or through the four air gap drains.
 - c. Perform UT measurements of the drywell shell between elevation 86'-11" (floor of the drywell concrete) and elevation 93'-0" (bottom of penetration J13) below penetration J13 area during the next three refueling outages. In addition, UT measurements shall be performed around the full 360 degree circumference of the drywell between elevations 86'-11" and 88'-0" (underside of the torus down comer vent piping penetrations). The results of the UT measurements will be used to identify drywell surfaces requiring augmented inspections in accordance with IWE requirements for the period of extended operation, establish a corrosion rate, and demonstrate that the effects of aging will be adequately managed such that the drywell can perform its intended function until April 11, 2046. Within 90 days of completion of each refueling outage, submit a report to the NRC staff in accordance with 10 CFR 50.4 summarizing the results from the UT measurements and if appropriate, corrective action.

This review addresses the RFO 20 actions and results related to the monitoring of air gap leakage and performance of drywell shell UT thickness measurement to ensure that the steel from the drywell shell exterior surface is not degraded. The review of the actions and results related to the monitoring of air gap leakage and performance of drywell shell UT thickness measurement from RFO 18 and RFO 19 were addressed previously by letter dated June 2, 2014, "Hope Creek Generating Station – Completion of Review of the Implementation of Licensing Conditions 2.C.(27).b and 2.C.(27).c (TAC No. MF3537)" (ADAMS Accession No. ML14111A239), and by letter dated February 11, 2016, "Hope Creek Generating Station – Completion of Review of the Implementation of License Renewal Conditions 2.C.(27)b and 2.C.(27)c (CAC No. MF6686)" (ADAMS Accession No. ML16027A194).

4.0 TECHNICAL EVALUATION

4.1 License Condition 2.C.(27)a

The action required by License Condition 2.C.(27)a was completed, and the results were submitted to the NRC in PSEG Nuclear LLC Letter No. LR-N12-0212 dated July 19, 2012 (ADAMS Accession No. ML12228A388). The NRC staff reviewed the results and documented its conclusion in a letter dated May 13, 2013 (ADAMS Accession No. ML13114A965).

4.2 License Condition 2.C.(27)b

During RFO 20, the licensee monitored the J13 penetration sleeve daily for leakage while the reactor cavity was flooded from October 18, 2016, through November 3, 2016. Also, the licensee monitored the penetrations adjacent to penetration J13 (i.e., J19, J14, J29, J24, and J37, called the "J13 penetration group"), monitored daily the air gap drains for water leakage, and performed independent walkdowns by the operators and engineering. Consistent with previous refueling outages, the licensee observed water leakage at the 225 degree azimuth from the J13 penetration group (specifically, the J19 penetration), and unlike to the previous two refueling outages, the licensee identified zero leakage at the excavated access tunnel located at the 250 degree azimuth (a credited air gap drain).

On October 19, 2016, the licensee identified leakage from penetration sleeves J13 and J19 at a leak rate of approximately 5 drops per minute (dpm). The licensee stated that the leak rate increased to approximately 125 dpm for penetration sleeves J13, and 166 dpm for penetration sleeves J19 on October 20, 2016. The licensee also stated that the leak rate from penetration sleeve J13 diminished to zero between October 26, 2016, and October 30, 2016, and the leak rate from penetration sleeve J19 reduced to approximately 28 dpm on October 30, 2016. In a similar pattern, on October 19, 2016, the licensee identified leakage from penetration sleeve J14 at a leak rate of approximately 125 dpm. The licensee identified that the leakage from penetration sleeve J14 increased from 332 dpm on October 20, 2016, to 498 dpm on October 25, 2016, and later diminished to zero between October 26, 2016, and October 30, 2016. The licensee also reported that no leakage was observed from any of the air gap penetrations from the end of the other air gap drains (at 80, 160, and 340 degree azimuths), or from the excavated tunnels at 250, 290, 155, and 115 degree azimuths. The licensee noted that the cavity remained flooded through November 3, 2016, and that all leakage stopped before the reactor cavity was drained.

4.3 License Condition 2.C.(27)c

The licensee performed the UT measurements required by License Condition 2.C.(27)c during RFO 20. Based on the UT measurements, the licensee concluded that no significant corrosion is occurring on the drywell shell.

UT measurements were performed by the licensee on the drywell shell at the 225 degree azimuth between 86'-11" and 93'-0" elevation (below the J13 penetration group). The lowest UT measurements occurred on a plate below the J13 penetration group and measured 1.475" in RFO 16, 1.470" in RFO 17, 1.477" in RFO 18, 1.490" in RFO 19, and 1.482" in RFO 20. Comparing the lowest reading of 1.470" from RFO 17 to the analysis limit of 1.4375" shows that approximately 0.0325" thickness margin remains.

UT measurements were also performed by the licensee for the full circumference of the drywell shell between elevations 86'-11" and 88'-0". The lowest UT measurements at the bottom of the drywell were 1.480" in RFO 16, 1.477" in RFO 17, 1.471" in RFO 18, 1.475" in RFO 19, and 1.481" in RFO 20. Comparing the lowest reading of 1.471" from RFO 18 to the analysis limit of 1.4375" shows that approximately 0.0335" thickness margin remains. Based on the results of these UT measurements, the licensee states that no corrosion is occurring in the drywell shell at the bottom of the drywell air gap.

The licensee also performed UT measurements on the weld located above penetrations J-14 and J-24, where the lowest UTs measured 1.518" in RFO 16, 1.579" in RFO 17, 1.584" in RFO 18, 1.583" in RFO 19, and 1.460" in RFO 20. Based on the results of these UT measurements, the licensee concluded that these results are not conducive to consistent data, and that if a conservative corrosion rate of 0.006" per cycle is assumed, the analysis limit of 1.4375" would not be reached for at least three cycles. The NRC staff notes that the lowest measured thickness remains above the design limit.

License Condition 2.C.(27)c requires these UT measurement activities for three RFOs following establishment of drainage capability from the bottom of the drywell air gap, and to requires the licensee to submit a report to the NRC staff in accordance with 10 CFR 50.4 summarizing the results and applicable corrective action(s). RFO 20 is the third of these outages, which completes the reporting requirements in License Condition 2.C.(27)c. The NRC staff notes that all measured thickness reported by the licensee for the shell and weld remains above the design limit. Further leakage monitoring results will help the licensee to establish data consistency and develop a reasonable corrosion rate, while ensuring that the drywell shell thickness is sufficient to perform its intended function.

4.4 Licensee Corrective Actions

As corrective actions, the licensee will continue to (1) monitor the reactor cavity leakage and document it in the corrective action program, and (2) perform the leakage monitoring actions prescribed by License Condition 2.C.(27) and the Hope Creek Updated Final Safety Analysis Report, Section A.5, Commitment No. 28, subcommitment 10, while the reactor cavity leakage continues to exist. These UT measurements will be performed in accordance with the Third Interval of the American Society of Mechanical Engineers (ASME), Section XI, Subsection IWE inspections under Category E-C, Item Number E4.12, and are to be performed once per period (every other outage). These actions are consistent with the Final License Renewal Interim Staff Guidance LR-ISG-2006-01 (ADAMS Accession No. ML063210041) recommendations, as evaluated in NUREG-2102.

5.0 CONCLUSION

Based on its review, the NRC staff concludes that the licensee has completed the required actions for License Conditions 2.C.(27)b and 2.C.(27)c for RFO 20 at Hope Creek. The results of the UT measurements demonstrate that the drywell shell has sufficient wall thickness to perform its intended function until the next licensee inspection. The corrective actions described by the licensee in the RFO 20 report are in accordance with the NRC staff recommendations in Final License Renewal Interim Staff Guidance LR ISG 2006 01 for performing augmented inspections in accordance with the ASME Subsection IWE. Since the licensee will continue to perform ASME IWE augmented inspections, the potential for loss of material due to corrosion is adequately managed for the period of extended operation.

Principal Contributor: Juan Lopez

Date: June 9, 2017

SUBJECT: HOPE CREEK GENERATING STATION – COMPLETION OF REVIEW OF THE IMPLEMENTATION OF LICENSE RENEWAL LICENSE CONDITIONS 2.C.(27)b AND 2.C.(27)c (CAC NO. MF9284) DATED JUNE 9, 2017

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ADAMS Accession No.: ML17143A287

*by memorandum

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