



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

May 13, 2013

Mr. Thomas Joyce
President and Chief Nuclear Officer
PSEG Nuclear LLC
P.O. Box 236, N09
Hancocks Bridge, NJ 08038

SUBJECT: HOPE CREEK GENERATING STATION - CLOSEOUT OF REVIEW OF THE
IMPLEMENTATION OF LICENSE RENEWAL LICENSE CONDITIONS (TAC
NO. ME9426)

Dear Mr. Joyce:

By letter dated July 19, 2012,¹ PSEG Nuclear LLC (PSEG), the licensee for the Hope Creek Generating Station (Hope Creek), submitted a summary of results from the boroscopic examinations, ultrasonic thickness measurements, and leakage detections from penetrations associated with license conditions 2.C.26 and 2.C.27, for Hope Creek. 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 establish drainage capability from the bottom of the drywell air gap, perform ultrasonic thickness (UT) measurements of identified portions of the drywell, monitor specific penetrations for leakage when the reactor cavity is flooded, and provide a summary of the results to the Nuclear Regulatory Commission (NRC).

The NRC staff reviewed the information in the licensee's letter and supplement dated February 22, 2013,³ and based on this review, the NRC staff concludes that the licensee has completed the actions required by license condition 2.C.26, and described in Commitment No. 28. Other activities required by license condition 2.C.27, and described in Commitment No. 28, will continue during the next refueling outage. The review of the licensee's submittal is summarized in enclosure to this letter. This completes the NRC staff efforts for TAC No. ME9426.

¹ Agencywide Documents Access and Management System (ADAMS) Accession No. ML12228A388.

² ADAMS Accession No. ML11200A221.

³ ADAMS Accession No. ML13063A100.

T. Joyce

- 2 -

If you have any questions regarding this letter, please contact me at (301) 415-3204.

Sincerely,

A handwritten signature in black ink, appearing to read "John Hughey", followed by the word "For" in a similar cursive style.

John Hughey, Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-354

Enclosure:
As stated

cc: Distribution via ListServ

OFFICE OF NUCLEAR REACTOR REGULATION
REVIEW OF INFORMATION PROVIDED AS REQUIRED BY
LICENSE CONDITIONS 2.C.26 AND 2.C.27 RELATED TO DRYWELL EXAMINATIONS
PSEG NUCLEAR LLC
HOPE CREEK GENERATING STATION
DOCKET NUMBER 50-354

1.0 INTRODUCTION

By letter dated July 19, 2012,¹ PSEG Nuclear LLC (PSEG), the licensee submitted a summary of results from the boroscopic examinations, ultrasonic thickness measurements, and leakage detections from penetrations associated with license conditions 2.C.26 and 2.C.27, for the Hope Creek Generating Station (Hope Creek). 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 establish drainage capability from the bottom of the drywell air gap, perform ultrasonic thickness (UT) measurements of identified portions of the drywell, monitor specific penetrations for leakage when the reactor cavity is flooded, and provide a summary of the results to the Nuclear Regulatory Commission (NRC).

2.0 REGULATORY EVALUATION

In accordance with Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," of Title 10 of the *Code of Federal Regulations* (10 CFR Part 54), the NRC issued Renewed Operating License NPF-57 for Hope Creek on July 20, 2011. NUREG-2102, "Safety Evaluation Report Related to the License Renewal of Hope Creek Generating Station," dated June 2011, documents the NRC staff's technical review of the license renewal application for Hope Creek. Appendix A, "HCGS License Renewal Commitments," of NUREG-2102 lists the commitments that were made in relation to the licensee's aging management programs (AMPs) and time-limited aging analyses (TLAAs) for managing the aging effects for the Hope Creek structures, systems, and components during the period of extended operation.

Renewed Operating License NPF-57 for Hope Creek contains several license conditions, including license conditions 2.C.26 and 2.C.27 which require activities to be completed related to establishing drainage capability from the bottom of the drywell air gap in approximately four equal quadrants. Until drainage is established, the licensee will complete the following actions during each refueling outage: (a) perform boroscope examinations of the bottom of the drywell

¹ Agencywide Documents Access and Management System (ADAMS) Accession No. ML12228A388.

² ADAMS Accession No. ML11200A221.

Enclosure

air gap; (b) perform UT measurements of the drywell below penetration J13 and around the full circumference, the results of which will be used to establish a corrosion rate; (c) monitor penetration sleeve J13 daily for leakage when the reactor cavity is flooded; and, (d) provide a summary of the results to the NRC. These actions are also described in license renewal Commitment No. 28.

In its letter dated July 19, 2012, the licensee stated that activities performed prior to and during refueling outage 17 (RF17) confirmed that there are four functional drains from the drywell air gap. The drains were boroscopically examined or visually inspected to verify the drains were clear and able to port leakage away from the drywell shell. The licensee further stated that boroscopic examinations were performed of the bottom of the drywell air gap by certified VT-1 inspectors in accordance with ASME Section XI, Subsection IWA-2300 requirements. The licensee also stated that UT measurements were performed for the full circumference of the drywell at the junction of the concrete floor and the drywell shell and below the J13 and J14 penetrations. No significant shell thinning was observed at the concrete floor when the RF16 results were compared to the RF17 results. For the measurements below the penetrations, the lowest UT was 1.475 inches in RF16 and 1.470 inches in RF17. The licensee explained that this resulted in an assumed corrosion rate of 5 mils per cycle, which would not reach the analysis limit of 1.4375 inches for over nine cycles. The licensee also explained that the actual design limit was below the analysis limit and that this corrosion rate was conservative because the lower readings could be due to original construction tolerances. In addition, the licensee explained that UT measurements will be taken for the three outages after drainage has been established and these measurements will be used to update the corrosion rate. If a significant corrosion rate is identified, the condition will be entered into the corrective action program.

In its letter, the licensee further stated that the J13 penetration sleeve was monitored daily for water leakage while the reactor cavity was flooded (April 17 through April 30, 2012). During the walk downs, water was observed leaking from the J13 penetration sleeve or nearby penetrations on several days. The leakage varied from four drops to 15 drops per minute. The leakage stopped when the reactor cavity was drained. The licensee explained that identifying the source of the reactor cavity leakage is an ongoing investigation which will continue during RF18. While the leakage persists, the necessary actions prescribed in license conditions 2.C.27(b) and 2.C.27(c) will be performed.

The licensee stated that the presence of four functional drywell air gap drains was confirmed and the associated inspections were completed, so license condition 2.C.26 is satisfied. Implementation activities required per license condition 2.C.27 will continue into the next refueling outage.

3.0 TECHNICAL EVALUATION

The NRC staff reviewed the licensee's submittal and noted that the licensee stated that with a corrosion rate of five mils per cycle, the analysis limit of 1.4375 inches would not be reached for over nine refueling cycles. However, with a low thickness measurement of 1.470 inches identified in RF17, and assuming a linear corrosion rate of five mils per cycle, it appears the current margin of 32.5 mils would be exhausted, and the analysis limit would be reached, in just

over six refueling cycles. By letter dated February 11, 2013,³ the NRC staff requested the licensee provide a discussion that explains how the analysis limit for the thickness of steel containment drywell shell would not be reached for over 9 cycles. A draft of this RAI was discussed with the licensee during a teleconference call on February 4, 2013.

By letter dated February 22, 2013,⁴ the licensee responded to the RAI and stated that the July 19, 2012, submittal contained a typographical error; the submittal should have stated that the "limit would not be reached for over six cycles." The licensee provided an updated submittal which corrected the error, along with two additional non-consequential errors that were discovered by the licensee. The NRC staff reviewed the licensee's response and found it acceptable because the licensee corrected the number of cycles remaining before the corrosion margin would be exhausted, assuming a linear five mil per cycle corrosion rate. The correction of the error did not have any effect on the purpose or the effectiveness of the license conditions or the regulatory commitment. The licensee will continue to perform the inspections as required by the license condition and has plans in place to address any degradation before the analysis limit is reached. The NRC staff's concern discussed in the RAI is resolved.

The NRC staff also reviewed the updated submittal and noted that the licensee had completed all of the actions required by license condition 2.C.26. The four drywell gap drains were verified to be functional via boroscopic examinations (26), VT-1 inspectors performed boroscopic examinations of the bottom of the drywell air gap (26-a), UT measurements were taken of the drywell wall in the required locations and the measurements were compared to previous measurements (26-b), the penetrations were monitored daily for leakage while the reactor cavity was flooded (26-c), and the licensee provided a summary of the inspections and their results by letter dated July 19, 2012 (26-d). As discussed above, the licensee did identify a change in thickness of the drywell shell of five mils from RF16 to RF17. Assuming this corrosion rate continues, the drywell shell thickness will remain above the analyzed limit for the next six cycles. The NRC staff finds this acceptable because the licensee will continue to monitor the thickness of the drywell shell for at least three more cycles, as required per license condition 2.C.27, and there is reasonable assurance that any significant degradation would be identified before the thickness limit is challenged. After each UT measurement, results will be compared to the previous measurements and the corrosion rate will be updated. If the actual thickness is near the analyzed limit, or the updated corrosion rate is significant, the condition will be entered into the corrective action program. The drywell shell is an ASME Code component; therefore, any required repair or replacement of the shell would be in accordance with ASME Section XI, Subsection IWE. The NRC staff also noted that no visual indications of corrosion were identified on the drywell shell during the boroscopic examinations. This indicates the differences in measured thickness of the drywell shell between RF16 and RF17 may be due to thickness differences within the original design tolerances of the plate that have existed since original construction.

The NRC staff noted that the licensee conducted walkdowns of the torus room while the reactor cavity was flooded and detected leakage from the penetrations ranging from approximately four drops per minute to 15 drops per minute. The NRC staff finds this minor leakage acceptable because the licensee is continuing to work to identify the leakage source and stop the leakage,

³ ADAMS Accession No. ML13036A429.

⁴ ADAMS Accession No. ML13063A100.

and measures are in place to monitor the drywell shell for degradation, as discussed above. In addition, the licensee will continue to work to prevent the leakage, and will continue walkdowns of the torus room to monitor leakage until it is stopped, as required per license condition 2.C.27.

4.0 CONCLUSION

Based on this review, the NRC staff concludes that the licensee has completed the actions required by license condition 2.C.26, and described in Commitment No. 28. Other activities required by license condition 2.C.27, and described in Commitment No. 28, will continue during the next refueling outage.

T. Joyce

- 2 -

If you have any questions regarding this letter, please contact me at (301) 415-3204.

Sincerely,

/ra/ (JWhited for)

John Hughey, Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-354

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As stated

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