

June 11, 2008

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of)
)
AMERGEN ENERGY COMPANY, LLC) Docket No. 50-219-LR
)
(Oyster Creek Nuclear Generating Station))

NRC STAFF'S BRIEF RESPONDING TO THE COMMISSION'S ORDER

INTRODUCTION

In accordance with the Commission's May 28, 2008 "Order (Requesting Additional Briefs)" ("Order") the Staff of the U.S. Nuclear Regulatory Commission ("Staff") hereby responds to the Commission's request that the parties "[e]xplain whether the structural analysis that AmerGen has committed to perform, and that is reflected in the Staff's proposed license condition, matches or bounds the sensitivity analyses that Judge Baratta would impose. In any event, explain whether additional analysis is necessary."

As explained in this pleading and in the attached Staff Exh. A1, Affidavit of Hansraj G. Ashar,¹ the Staff submits its opinion that the existing commitment and license condition address and bound the sensitivity analyses Judge Baratta would impose. In addition, the Staff's conclusion of reasonable assurance that the integrity of the drywell shell will be maintained consistent with the current licensing basis during the period of extended operation is based on analyses of the drywell shell that have already been performed, the results of the 2006 UT

¹ With the exception of Staff Exh. A1, all other exhibits referenced by the Staff are already part of the record of the proceeding.

inspections, and AmerGen's Aging Management Program as enhanced by commitments to perform full scope UT inspections every other outage. See Staff Exh. A1 at ¶10.²

DISCUSSION

During the February 1, 2007 Advisory Committee on Reactor Safeguards ("ACRS") meeting, AmerGen committed to perform a 3-D finite element structural analysis of the drywell shell using modern methods. Staff Exh. A1 at ¶4. That commitment became item 18 to Commitment 27. Staff Exh. 1 at A-30 to A-31. The commitment states, in part, that "[t]he analysis will include sensitivity studies to determine the degree to which uncertainties in the size of thinned areas affect the Code margins." *Id.* In accordance with the recommendation of the ACRS (Staff Exh. 3), the Staff made AmerGen's commitment a proposed license condition. Staff Exh. 1 at 1-18³

In its initial decision, the Board found reasonable assurance that the drywell shell will maintain the necessary safety margin during the period of extended operation based on the frequency of AmerGen's planned UT measurements, in combination with other elements of its aging management program. *AmerGen Energy Co. LLC (Oyster Creek Nuclear Generating Station)*, LBP-07-17, 66 NRC 327, 330. In an "Additional Statement" appended to the Initial Decision, Judge Baratta, stated that while he agreed with his colleagues, *id.* 373, he believes that AmerGen's 3-D analysis should include "a series of sensitivity analyses, at least one of

² Oyster Creek will be required by license condition to perform full scope inspections of the drywell shell in the sand bed region every other outage. Staff Exh. 1 at 1-18.

³ The proposed license condition "requires the applicant to perform a 3-D (dimensional) finite-element analysis of the drywell shell prior to the period of extended operation."

which includes the use of an extrapolation scheme to determine the thicknesses between measured locations.” *Id.* at 376.

On January 14, 2008, subsequent to the Board’s Initial Decision, AmerGen sent a letter clarifying commitments related to the aging management program for the Oyster Creek drywell shell, including item 18 of Commitment 27. Staff Exh. A1 at ¶7 (referencing Letter from Michael P. Gallagher, AmerGen, to NRC regarding Commitment Clarifications Related to the Aging Management Program for the Oyster Creek Drywell Shell, Associated with AmerGen’s License Renewal Application (ADAMS Accession No. ML080160540) (“January 14 Letter”). In the January 14 Letter at 2, AmerGen clarified that it “is including sensitivity analyses as part of its 3D structural analysis. These sensitivity analyses will use, as input, conservative thickness estimates for areas between UT thickness measurement locations, thereby producing a conservative assessment of the performance and capability of the drywell shell.”

It is the Staff’s opinion that AmerGen’s commitment to perform a 3-D finite element structural analysis addresses and bounds the sensitivity analyses that Judge Baratta would impose. Staff Exh. A1 at ¶9. Moreover, regardless of whether AmerGen’s commitment would satisfy Judge Baratta,⁴ no additional analysis is needed to support a finding of reasonable assurance that the structural integrity of the drywell shell will be maintained during the period of extended operation. *Id.* at ¶10. Analyses, including sensitivity analyses, have been performed. *Id.* For license renewal, the Staff inspected the drywell, conducted audits, and reviewed AmerGen’s inspection data and analytical modeling techniques. *Id.* at ¶13. The 2006 UT measurements of the drywell shell in the degraded areas were similar to earlier measurements,

⁴ The Staff notes the other two judges on the panel, including the other technical judge on the panel, Dr. Paul Abramson, did not join in Judge Baratta’s comment.

indicating that the epoxy coating has effectively arrested corrosion. *Id.* In addition, at the request of the Staff, Sandia National Laboratory performed a 3-D analysis of Oyster Creek's drywell shell which showed the drywell could perform its intended function. Staff Exh. A1 at ¶14.

AmerGen's commitment to perform a 3-D finite element structural analysis and the license condition requiring AmerGen to perform the 3-D analysis were prompted by the ACRS. Staff Exh. A1 at ¶4; Staff Exh. 3. In its report to the Commission, the ACRS "commended" AmerGen for committing to perform the 3-D finite element analysis to "provide a more accurate quantification of the margin above the Code required minimum for buckling" and recommended that the Staff impose a license condition requiring the 3-D finite element analysis "to ensure that the applicant completes the analysis prior to the period of extended operation." Staff Exh. 3 at 5-5. Thus the purpose of the license condition requiring the 3-D finite element analysis was to ensure AmerGen's timely compliance with its commitment to do the same.

CONCLUSION

For the reasons stated above and in the attached exhibit, the Commission should affirm the Board's decision in LBP-07-17.

Respectfully submitted,



Mary C. Baty
Counsel for NRC Staff

Dated at Rockville, Maryland
this 11th day of June 2008

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NUCLEAR REGULATORY COMMISSION

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| AMERGEN ENERGY COMPANY, LLC |) | Docket No. 50-219-LR |
| (Oyster Creek Nuclear Generating Station) |) | |

AFFIDAVIT OF HANSRAJ G. ASHAR

I, Hansraj G. Ashar, do hereby declare under penalty of perjury that the following statement is true and correct to the best of my knowledge and belief:

1. My name is Hansraj G. Ashar. I am employed as a Senior Structural Engineer in the Division of Engineering, Office of Nuclear Reactor Regulation ("NRR"), U.S. Nuclear Regulatory Commission ("NRC"). A statement of my professional qualifications was included in Staff Exh. D in the above-captioned proceeding. My role in connection with the staff's review of the License Renewal Application ("LRA") submitted by AmerGen Energy Company, LLC, ("AmerGen," "Applicant," or "Licensee") for the renewal of the Oyster Creek Facility is explained in NRC Staff Exhibit B. My prior testimony in this proceeding is contained in Staff Exhs. B, C, and C1 (which are already part of the record of this proceeding) and in the transcript of the evidentiary hearing.

2. The purpose of this affidavit is to address the Commission's May 28, 2008 Order (Requesting Additional Briefs) ("Order").

3. I have read the Commission's May 28 Order, and the Board's December 18, 2007 decision in LBP-07-17, 66 NRC 327 (2007), including the "Additional Statement" of Judge Baratta. I have also read "Citizens' Petition for Review of LBP-07-17 and the Interlocutory

Decisions in the Oyster Creek Proceeding” (Jan. 14, 2008), “AmerGen’s Answer Opposing Citizens’ Petition for Review of LBP-07-17 and the Interlocutory Decisions in the Oyster Creek Proceeding” (Jan. 14, 2008), and “NRC Staff’s Answer to Citizens’ Petition for Review of LBP-07-17” (Jan. 14, 2008).

4. The Applicant initially committed to perform a 3-D finite element analysis of the degraded drywell shell using the modern methods of modeling during the full ACRS Committee meeting on February 1, 2007. Applicant Exh. 10, Letter from M. P. Gallagher, AmerGen, to the NRC regarding Additional Commitments Related to the Aging Management Program for the Oyster Creek Drywell Shell, Associated with AmerGen’s License Renewal Application (Feb. 15, 2007) (ADAMS Accession No. ML070520252); Staff Exh. 1 at A-30 to A-31.

5. The Applicant’s commitment to perform a 3-D finite element analysis of the degraded drywell shell using modern method, in part, states: “The analysis will include sensitivity studies to determine the degree to which uncertainties in the size of the thinned areas affect the Code margins.” Staff Exh. 1 at A-30 to A-31.

6. In his “Additional Statement” Judge Baratta stated that he would require the Applicant to “perform a series of sensitivity analysis, at least one of which includes use of an extrapolation scheme to determine the thicknesses between the measured locations.” LBP-07-17, 66 NRC at 376.

7. Approximately a year after its initial commitment and subsequent to the Board’s Initial Decision, in a letter dated January 14, 2008, the Applicant elaborated on its commitment by stating: “These sensitivity analyses will use as input, conservative thickness estimates for areas between [ultrasonic testing] UT thickness measurement locations, thereby producing a conservative assessment of the performance capability of the drywell shell.” Letter from Michael P. Gallagher, AmerGen, to NRC regarding Commitment Clarifications Related to the Aging Management Program for the Oyster Creek Drywell Shell, Associated with AmerGen’s

License Renewal Application (Jan. 14, 2008) (ADAMS Accession No. ML080160540) at 2.

8. There are a number of ways the 106 locations where UT measurements were made in 2006, characterized as the thinnest metal thicknesses on the exterior of the drywell shell in the former sand bed area (LBP-07-17 at 348-350; Tr. at 560), can be utilized to perform conservative drywell shell structural analysis. The confirmatory analysis performed by Sandia National Laboratory for the staff (Staff Exh. 6) is one conservative way of depicting the drywell shell degradation in a 3-D model. It is possible to use a variety of different schemes to depict the degraded drywell shell. From the structural analysis perspective these schemes are considered as conservative analysis assumptions. The applicant, however, committed to perform sensitivity studies using a number of such analyses to bound the uncertainties in the degraded areas between the 106 UT thickness measurements.

9. In his Additional Statement, Judge Baratta writes: "While I concur with my colleagues that further corrosion of the drywell is unlikely, it cannot be ruled out. Thus, I consider it essential to have a conservative best estimate analysis of the drywell shell before entering the period of extended operation." LBP-07-17, 66 NRC at 375. When this ultimate aim of Judge Baratta is taken in context with the additional requirement he would impose, the staff believes that the Applicant's commitment to perform a 3-D finite element structural analysis addresses and bounds the sensitivity analyses that Judge Baratta desires.

10. In any event, no additional analysis is necessary to support a finding of reasonable assurance that the structural integrity of the drywell shell can be maintained during the period of extended operation because, as explained below, analyses, including sensitivity studies, of the drywell shell demonstrating that the structural integrity of the drywell shell will be maintained during the period of extended operation have already been performed, and because inspections indicate that corrosion has been arrested. The Staff's conclusion that there is reasonable assurance that the intended function of the drywell shell will be maintained during

the period of extended operation is based upon (1) the analyses that have already been performed, (2) the results of the inspections done in 2006, and (3) the AmerGen Aging Management Program as enhanced by commitments to perform full scope UT measurements of the drywell shell every other outage (as required by license condition¹) to ensure that shell thickness acceptance criteria continues to be met.

11. After the corrosion of the drywell was discovered in the late 1980s, the Applicant's predecessor had General Electric perform a number of sensitivity studies related to the degraded shell that could be used in the analytical modeling to demonstrate that the shell could perform its intended function in confirmation with the current licensing basis, *i.e.* that would satisfy the applicable ASME code provisions. Applicant Exh. 39.

12. In its analytical modeling, based on the analyses performed by GE, the licensee has used a general shell thickness criterion (against buckling) of 0.736 inch, which is conservative when contrasted with the as-built shell thickness of over 1 inch. For the localized thin locations, where the 106 UT readings were taken, the licensee has used a local shell thickness acceptance criterion of 0.536 inch. Applicant Exh. B Part III at A5. However, none of the UT measurements indicated the remaining metal thickness to be as low as 0.536 inch. *Id.*

13. As part of license renewal activities, the staff inspected the drywell, audited the licensee's in-service inspection activities, held a number of public discussions, and thoroughly reviewed the validity of the applicant's data related to drywell thinning, and analytical modeling. Based upon its review, the staff concluded that the 106 exterior locations where UT measurements were taken conservatively characterize the degraded drywell shell. In addition, the UT measurements taken in 2006 in the shell degraded areas indicated approximately the

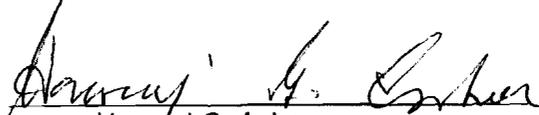
¹ Staff Exh. 1 at 1-18.

same results as those documented during the earlier measurements, thereby suggesting that the epoxy coating is effective in arresting further corrosion of the shell.

14. In addition to reviewing the analyses performed by General Electric and the Applicant, the Staff asked Sandia National Laboratory to perform a confirmatory analysis using the licensee's input data for the configuration of the shell, and the degraded areas represented by the 106 UT measurements. Staff Exh. 6. Sandia's confirmatory analyses, which used three dimensional (3-D) modeling of the drywell shell, concluded that the drywell shell could perform its intended function under all the postulated load conditions.

15. In sum, the Applicant's Commitment 27 item 18 addresses and bounds the sensitivity analysis Judge Baratta would require.

This affidavit was executed this 11th day of June, 2008, at Rockville, Maryland.


Hansraj G. Ashar

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CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF'S BRIEF RESPONDING TO THE COMMISSION'S ORDER" and "STAFF EXHIBIT A1" in the above-captioned proceeding have been served on the following by electronic mail with copies by deposit in the NRC's internal mail system or, as indicated by an asterisk, by electronic mail, with copies by U.S. mail, first class, this 11th day of June 2008.

E. Roy Hawkens, Chair
Administrative Judge
Atomic Safety and Licensing Board
Mail Stop: T-3F23
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
E-mail: ERH@nrc.gov

Anthony J. Baratta
Administrative Judge
Atomic Safety and Licensing Board
Mail Stop: T-3F23
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
E-mail: AJB5@nrc.gov

Paul B. Abramson
Administrative Judge
Atomic Safety and Licensing Board
Mail Stop: T-3F23
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
E-mail: PBA@nrc.gov

Office of the Secretary
ATTN: Docketing and Service
Mail Stop: O-16G4
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
E-mail: HEARINGDOCKET@nrc.gov

Office of Commission Appellate
Adjudication
Mail Stop: O-16G4
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
E-mail: OCAAMail@nrc.gov

Emily Krause
Law Clerk
Atomic Safety and Licensing Board
Mail Stop: T-3F23
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
E-mail: ElK1@nrc.gov

Suzanne Leta Liou*
New Jersey Public Interest Research Group
11 N. Willow St.
Trenton, NJ 08608
E-mail: sliou@environmentnewjersey.org

Donald Silverman, Esq.*
Alex S. Polonsky, Esq.
Kathryn M. Sutton, Esq.
Raphael P. Kuyler, Esq.
Morgan, Lewis & Bockius LLP
1111 Pennsylvania Ave., N.W.
Washington, DC 20004
E-mail: dsilverman@morganlewis.com
apolonsky@morganlewis.com
ksutton@morganlewis.com
rkuyler@morganlewis.com

Paul Gunter, Director*
Kevin Kamps
Reactor Watchdog Project
Nuclear Information
And Resource Service
6930 Carroll Avenue Suite 340
Takoma Park, MD 20912
E-mail: paul@beyondnuclear.org
kevin@beyondnuclear.org

J. Bradley Fewell, Esq.*
Exelon Corporation
4300 Warrenville Road
Warrenville, IL 60555
E-mail: bradley.fewell@exeloncorp.com

Richard Webster, Esq.*
Julia LeMense, Esq.
Eastern Environmental Law Center
744 Broad Street, Suite 1525
Newark, NJ 07102
Email: rwebster@easternenvironmental.org
jlemense@easternenvironmental.org


Mary C. Baty
Counsel for the NRC Staff