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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Commission

In the Matter of:	)	June 11, 2008
AmerGen Energy Company, LLC	)	Docket No. 50-219-LR
(License Renewal for Oyster Creek Nuclear Generating Station)	)	

AMERGEN'S INITIAL BRIEF IN RESPONSE TO CLI-08-10

AmerGen hereby responds to the Commission's May 25, 2008 Order,[1] in which the Commission directed the parties to address a narrow factual issue related to whether AmerGen's commitment to perform a 3-dimensional ("3-D") structural analysis of the drywell shell at the Oyster Creek Nuclear Generating Station ("OCNGS") "matches or bounds the sensitivity analyses that Judge Baratta would impose"[2] and "whether additional analysis is necessary."[3]

The issues the Commission raises, while narrow, are very factual and technical in nature, requiring a supporting affidavit.[4] The attached affidavit from John F. O'Rourke, the Project Manager for the 3-D analysis, provides AmerGen's detailed technical response.[5] Mr. O'Rourke explains that the analysis is comprised of a "base case" and sensitivity analyses,[6] and is designed to better quantify the margin that exists above the Code required minimum by modeling the

1 Order (Requesting Additional Briefs), CLI-08-10.

2 *Id.* at 3 (referring to *AmerGen Energy Co., LLC* (Oyster Creek Nuclear Generating Station), LBP-07-17, 66 NRC 327, 376 (Judge Baratta, Additional Statement)).

3 *Id.*

4 While the Order does not specify whether supporting affidavits may be part of a party's response, AmerGen cannot adequately respond to the Order without an affidavit.

5 John F. O'Rourke Aff. ¶¶ 1, 2 ("Affidavit").

6 *Id.*, ¶¶ 12, 17.

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drywell thickness realistically, with some conservatism (versus an overly conservative model).[7] The drywell shell thickness inputs to the base case were determined separately for each bay.[8]

To further address uncertainties in the existing condition of the shell, AmerGen directed its engineering consultant to perform two analyses to determine how sensitive the margin quantified in the base case is to certain parameters. The first analysis evaluates the sensitivity of the base case to uncertainties in the thickness of locally-thinned areas,[9] while the second analysis evaluates uncertainties in areas of general area thinning.[10] Mr. O'Rourke concludes that the first sensitivity analysis matches or bounds Judge Baratta's sensitivity analysis recommendation because it models a locally-thinned area as much larger and thinner than actually measured.[11] The second sensitivity analysis matches or bounds Judge Baratta's sensitivity analysis recommendation because it models the general area in a bay as thinner than actually measured.[12] Mr. O'Rourke, therefore, concludes that no additional analysis is necessary.[13]

The Commission's use of the word "necessary" and the timing of its question, pending ruling on the appeal of the drywell contention, could be read to suggest that the 3-D structural analysis is required before the NRC can grant AmerGen a renewed license for OCNGS. That is not the case. As AmerGen's commitment specifies, the 3-D analysis is not needed to confirm that the drywell shell meets the ASME Code or that there is reasonable assurance that the drywell shell will continue to perform its intended functions throughout the period of extended operation: the 3-D analysis is intended to "better *quantify* the margin that exists *above* the Code

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7 *Id.*, ¶ 12.

8 *Id.*, ¶¶ 14-16. There are ten bays that comprise the drywell shell, each with an odd number, from 1 through 19.

9 *Id.*, ¶ 18.

10 *Id.*, ¶ 21.

11 *Id.*, ¶ 20.

12 *Id.*, ¶ 24.

13 *Id.*, ¶ 25.

required minimum for buckling."[14] The ACRS concluded the same in its February 8, 2007, letter to the Commission: "This analysis will provide a more accurate quantification of the margin above the Code required minimum for buckling." The LRA, and the aging management program for managing the drywell shell that it incorporates—including UT inspections every 4 years, visual inspections of the epoxy coating that protects the exterior of the drywell shell in the sand bed region, and visual inspections during the operating cycle for the presence of water exiting the sandbed region—provides that reasonable assurance. The completion of that analysis should not, therefore, be a prerequisite to the NRC issuing the renewed license.

AmerGen is performing a 3-D analysis which includes sensitivity analyses that match or bound those recommended by Judge Baratta. For that and other reasons, no additional analyses are required.

Respectfully submitted,

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[14] LBP-07-17, at 367 n.55.

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Dated in Washington, D.C.
this 11th day of June 2008

COUNSEL FOR
AMERGEN ENERGY COMPANY, LLC

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of:	)	June 11, 2008
AmerGen Energy Company, LLC	)	Docket No. 50-219
(License Renewal for Oyster Creek Nuclear Generating Station)	)	

AFFIDAVIT OF JOHN F. O'ROURKE

Background and Experience

1. My name is John F. O'Rourke. I am a Senior Project Manager, License Renewal, for Exelon, AmerGen Energy Company, LLC's ("AmerGen") parent company. I have been in that position since 2006. I work in the Exelon corporate office located in Kennett Square, Pennsylvania.

2. I am assigned to the Oyster Creek Nuclear Generating Station ("OCNGS") License Renewal Project. As part of that Project Team, I am the Project Manager for the 3-D structural analysis and sensitivity studies of the drywell shell that an engineering consultant is currently performing for AmerGen.

3. I received a Bachelor of Science degree in Mechanical Engineering *cum laude* in 1973, a Master of Science degree in Mechanical Engineering in 1975, and a Master of Science degree in Engineering Management in 1983, all from Drexel University. I have been with Exelon (and its predecessors) for the past 35 years in various nuclear-related positions.

4. From 2003 to 2006, I was the Assistant Site Engineering Director at OCNGS. In that position, I managed the resources within the Engineering Department to support the

preparation of the License Renewal Application ("LRA") and to support the NRC audits and inspections following submittal of the LRA.

5. Following my transfer to the License Renewal Project Staff, I assisted with the preparation of presentations to the Advisory Committee on Reactor Safeguards ("ACRS") and the ACRS License Renewal Subcommittee, and was responsible for portions of presentations on January 18 and February 1, 2007. I also provided pre-filed written testimony to the Atomic Safety and Licensing Board ("ASLB") on the drywell shell contention during the summer and fall of 2007, and oral testimony during the two-day hearing on the drywell shell contention held by the ASLB in September 2007.

AmerGen's Commitment to Perform the 3-D Analysis

6. I am very familiar with the commitment that AmerGen made to the NRC on February 15, 2007, to perform a 3-D analysis of the OCNGS drywell shell. That commitment, contained in AmerGen Exh. 10, encl. at 11, specifies that AmerGen will, prior to the period of extended operation, "perform a 3-D finite element structural analysis of the primary containment drywell shell using modern methods and current drywell shell thickness data to better quantify the margin that exists above the Code required minimum for buckling. The analysis will include sensitivity studies to determine the degree to which uncertainties in the size of thinned areas affect Code margins."

7. The background of how sensitivity analyses came to be part of that commitment is helpful to put the commitment in context. During the February 1, 2007 meeting with the ACRS, AmerGen committed to perform a 3-D finite element analysis of the OCNGS drywell shell. On February 8, 2007, months before the ASLB hearing, the ACRS sent a letter to NRC Chairman Klein, referencing the 3-D analysis commitment. The ACRS letter introduced

the concept of sensitivity studies being part of the 3-D analysis as follows: "The analysis should include sensitivity studies to determine the degree to which uncertainties in the size of the thinned areas affect the Code margins."

8. On February 15, 2007, AmerGen submitted its commitment to perform the 3-D analysis to the NRC, specifically addressing the direction given in the February 8, 2007 ACRS letter, making the sensitivity studies part of the commitment. The Staff then included this wording and commitment in Appendix A (Commitment Table) of the Safety Evaluation Report (SER).

Response to the Commission's Order

9. I have read the Commission's May 28, 2008, "Order Requesting Additional Briefs" (CLI-08-10). The purpose of this affidavit is to respond to that Order; namely, to explain whether AmerGen's 3-D analysis and sensitivity studies "matches or bounds the sensitivity analyses that Judge Baratta would impose," and to "explain whether additional analysis is necessary."

10. The Commission Order states that "Judge Baratta would specifically require AmerGen 'to perform a series of sensitivity analyses, at least one of which includes the use of an extrapolation scheme to determine the thicknesses between the measured locations.'"

11. AmerGen's analysis fulfills Judge Barratta's statement. As I discuss below in this affidavit, AmerGen developed the thicknesses between actual measurements in a conservative but realistic profile of the drywell shell for the base case. This also fulfills Judge Barratta's statement on page 4, where he said "Thus I consider it essential to have a conservative best estimate analysis of the drywell shell before entering the period of extended operation."

12. As an overview, the 3-D analysis consists of a finite element structural "base case" analysis and sensitivity analyses. The "base case" analysis is designed to model the current condition of the drywell shell as defined by the ultrasonic testing ("UT") thickness measurements taken during the 2006 refueling outage, along with conservative thickness estimates for areas between UT thickness measurement locations. AmerGen's goal is to better quantify the margin that exists above the Code required minimum. To meet this goal, it is modeling the drywell thickness realistically, with some conservatism (versus an overly-conservative model), in the base case.

13. The base case uses OCNGS-specific input data, including operating and accident conditions, drywell penetration information, seismic response spectra, piping loads, materials, internal loads, boundary conditions and shell thicknesses. Load combinations are as specified in the plant's UFSAR. The base case is designed to quantify the margin above the ASME Code safety factor for the limiting accident condition.

14. Base Case Thicknesses. An understanding of the base case is important to understand the sensitivity analyses. The base case thicknesses for the sandbed region were developed from the internal grid UT measurements taken at elevation 11'-3" and from the internal trenches excavated in Bays 5 and 17.[1] Where the internal grid measurements in a particular bay present an unrealistic representation of the shell thickness (because, for example, the grids were above the elevation of corrosion on the external side of the drywell shell), engineering judgment was used to provide somewhat conservative but more realistic thicknesses for use in the 3-D analysis based on the UT grid data from the adjacent bays.

15. The *individual external* UT thickness measurement points were primarily used to define

[1] There are ten bays that comprise the drywell shell, each with an odd number, from 1 through 19.

areas of local thinning that encompassed a number of the external points. Five locally thinned areas were modeled in the sandbed region as circular shaped ranging from 18 to 51 inch diameter and thickness of 658 to 850 mils. These modeled areas are conservative since this amount of thinning does not actually exist. These *individual external* UT points provide a very localized and conservative representation of shell thickness because they were selected as the thinnest points in each bay, and some metal was removed to prepare the surface for UT measurement. The area between the measured points is thicker. External point measurements were also used to confirm the basis for an engineering judgment and to define certain areas of local thinning.

16. I present a bay-by-bay explanation of the rationale for what thicknesses are being used in the base case in Table 1 at the end of this affidavit. The information in Table 1 was provided in a document that AmerGen disclosed to Citizens, and that Citizens attached as Exhibit 46 to their Rebuttal Statement of August 17, 2007.

17. Sensitivity Analyses. AmerGen determined that two sensitivity analyses are sufficient to bound the uncertainties in the current condition of the drywell shell: 1) the first analysis assesses the sensitivity of the base case to uncertainties in the thickness of locally-thinned areas; and 2) the second analysis assesses the sensitivity of the base case to uncertainties in the thickness of an entire bay that has relatively thin bays on either side. AmerGen has directed its engineering consultant to perform these two sensitivity analyses. The purpose of these analyses is to determine how sensitive the margin quantified in the base case is to certain parameters, such as localized or general area thinning. This addresses uncertainties in the existing condition of the shell.

18. The first analysis assesses the sensitivity of the base case to uncertainties in the thickness

of locally-thinned areas. This sensitivity analysis uses a hypothetical, locally-thinned area in Bay 1 (*i.e.*, a 51-inch diameter circle with an average thickness of 696 mils), and reduces the thickness of that area by 100 mils, to 596 mils.

19. This first sensitivity analysis is conservative. It uses a locally-thinned area that is thinner than the thinnest area measured in any of the bays. For reference, that thinnest locally-thinned area is in Bay 13 with a conservatively determined average thickness of 658 mils. This analysis also uses the largest defined locally-thinned area (51-inch diameter circle).

20. The first sensitivity analysis matches or bounds Judge Baratta's sensitivity analysis recommendation because it models the locally-thinned area in Bay 1 as much larger in area and thinner than actually measured. This analysis conservatively bounds uncertainties in the size and thickness of areas of local thinning.

21. The second sensitivity analysis will demonstrate the sensitivity of the base case to a thinner general area within one bay with relatively thin bays on either side (to prevent masking the impact of the thinner general area on the structural rigidity of the shell, as would be expected to occur if the model used adjacent bays with relatively thicker general thicknesses). This second sensitivity analysis uses a bay with the thinnest general area thickness, which is Bay 19 at 826 mils.

22. This sensitivity analysis models the general area of the bay with a 50 mil reduction (*i.e.*, 776 mils). The general area is defined as horizontally to 8.5 feet on either side of the centerline of the vent pipe and vertically from the bottom of the penetration reinforcement pad to the bottom of the sandbed region.

23. This sensitivity analysis also models a locally-thinned area of 51-inches in diameter with a conservative average thickness of 720 mils, which had been modeled into the base case

analysis and remains unchanged for the sensitivity analysis. The thickness of the locally-thinned area is not reduced during the sensitivity analysis. However, like the locally-thinned area in the first sensitivity analysis, this locally-thinned area is larger than the largest area measured in any of the bays.

24. The second sensitivity analysis also matches or bounds Judge Baratta's sensitivity analysis recommendation because it models the general area in Bay 19 as thinner than actually measured. It also models the locally-thinned area in Bay 19 as larger than actually measured. This analysis conservatively bounds uncertainties in the general area thickness measurements for the current condition.

25. Finally, the Commission has asked the parties to "explain whether additional analysis is necessary." The answer to that query is "No." The base case and sensitivity analyses sufficiently match or bound those recommended by Judge Baratta and are sufficiently conservative to bound potential uncertainties.

TABLE 1

Bay #	Rationale for Thickness Input to 3-D Model Base Case
1	This bay does not exhibit a normal distribution pattern based on the grid average. Since this bay is adjacent to Bay 19, and these two bays were judged to be the most corroded generally, the average grid value of 826 mils from Bay 19 is used for the general thickness of Bay 1. Using external UT data points would support a value higher than 826 mils; therefore, to use 826 mils is conservative and acceptable.
3	This bay has nominal or above wall thickness above elevation 11'-0"; however, using the grid average for the entire bay would not adequately represent the corrosion below 11'-0". Above 11'-0", the grid average of 1180 mils is used. Below 11'-0", the average below 11'-0" from Bays 1 (826 mils) and 5 (1074 mils) is used for Bay 3 (950 mils).
5	This bay also has nominal or above wall thickness above elevation 11'-0"; therefore, the grid average of 1185 mils is used. Below 11'-0", the average of the trench readings above the sandbed floor, since the trench spans the entire length from the floor to close to elevation 11'-0", appropriately represents the general thickness of the bay below 11'-0". This value is 1074 mils.

7	This bay has close to nominal wall thickness above elevation 11'-0"; therefore, the grid average of 1133 mils is used. Below 11'-0", similar to Bay 3, a representative thickness of the average between Bay 5 (1074 mils) and Bay 9 (993 mils) is used for the shell thickness below elevation 11'-0" (1034 mils).
9	This bay exhibits corrosion both above and below elevation 11'-0". Above 11'-0", the thickness is appropriately represented by the weighted average (one is a 49 point grid and the other is a 7 point grid) of the two internal grids (1074 mils). Below 11'-0", it was more appropriate to use the smaller of the two internal grid averages for the general shell thickness. This value is 993 mils.
11	This bay exhibits corrosion both above and below elevation 11'-0". Therefore, the average of the internal grid measurements is used for the general shell thickness for the entire bay. This value is 860 mils (average of 822 and 898).
13	This bay also exhibits corrosion both above and below elevation 11'-0". There are three internal grid measurements in this bay (two 49 point grids and one 7 point grid). The 7 point grid indicates no significant metal loss and appears to be an anomaly in this bay given that the other two grids indicate external corrosion. Therefore, the average of only the two 49 point internal grids is used for the general shell thickness for the entire bay. This value is 907 mils.
15	This bay exhibits greater thicknesses above elevation 11'-0". Therefore, this bay is split and the weighted average of the two grids (one 49 point and one 7 point) is used for the thickness of the shell above 11'-0". This value is 1062 mils. Below 11'-0", similar to Bays 3 & 7, a representative thickness of the average between Bay 13 (907 mils) and Bay 17 (954 mils) is used for the shell thickness (931 mils).
17	This bay has two 49 point grids and a portion of a grid that is partially in Bay 17 and partially in Bay 19. Since this third grid is at the edge of the bay, it is not used to determine representative thickness of the bay. Of the remaining two grids, the majority of the area above elevation 11'-0" is best represented by the weighted average of the bottom of the grid closest to Bay 15 (Grid 17A) and the entire middle grid (Grid 17D). This value is 864 mils. Below 11'-0", Bay 17 has a trench similar to Bay 5. Measurements from the trench provide representative data for most of the sandbed region between elevations 8'-11" and 11'-0". Therefore, the average of the internal grid measurements in the trench area is used for the shell thickness below 11'-0". This value is 954 mils.
19	This bay exhibits corrosion both above and below elevation 11'-0". Therefore, the average of the internal grid measurements (three 49 point grids) is used for the shell thickness for the entire bay. This value is 826 mils.

In accordance with 28 U.S.C. § 1746, I state under penalty of perjury that the factual statements and opinions I express in this affidavit are true and correct to the best of my personal knowledge and belief:

John O'Rourke 6-11-2008

John O'Rourke Date

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Commission

In the Matter of:	)	June 11, 2008
AmerGen Energy Company, LLC	)	Docket No. 50-219-LR
(License Renewal for Oyster Creek Nuclear Generating Station)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "AmerGen's Initial Brief in Response to CLI-08-10" were served this day upon the persons listed below, by e-mail and first class mail.

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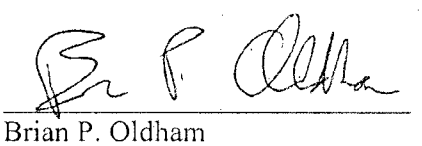

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