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October 1, , 2008 (4:20pm)

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**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
ATOMIC SAFETY AND LICENSING BOARD**

Before Administrative Judges:

**E. Roy Hawkens, Chair
Dr. Paul B. Abramson
Dr. Anthony J. Baratta**

In the Matter of:)

AmerGen Energy Company, LLC)

(License Renewal for Oyster Creek Nuclear
Generating Station))

October 1, 2008

Docket No. 50-219-LR

AMERGEN'S SUPPLEMENTAL BRIEF FOLLOWING ORAL ARGUMENT

The parties have had many opportunities to brief the issue posed in CLI-08-10.¹ These opportunities included initial and reply briefs,² oral argument, and now, in response to the Board's directive during oral argument, this round of supplemental briefs. Citizens' claims are based on errors, mischaracterizations of the record, and include arguments far outside the scope of the limited question originally referred by the Commission in its August 21 Order. As explained in AmerGen's previous briefs, and as further explained below, the base case and sensitivity cases that comprise the 3-D structural analysis that AmerGen has committed to

¹ *AmerGen Energy Co., LLC* (License Renewal for Oyster Creek Nuclear Generating Station), CLI-08-10, 68 NRC __, slip op. (May 25, 2008) ("CLI-08-10").

² AmerGen Initial Brief in Response to CLI-08-10 (June 11, 2008) ("AmerGen Initial Brief"); NRC Staff's Brief Responding to the Commission's Order (June 11, 2008); Citizens' Response to Commission Order Dated May 28, 2008 (June 11, 2008); AmerGen's Reply to Citizens' Response to CLI-08-10 (June 18, 2008); NRC Staff's Reply in Response to Citizens' Response to Commission Order Dated May 28, 2008 (June 18, 2008); Citizens' Reply to NRC Staff and AmerGen Responses to Commission Order Dated May 28, 2008 (June 18, 2008) ("Citizens' Reply Brief").

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perform for the drywell shell at the Oyster Creek Nuclear Generating Station, in fact, “match[] or bound[] the sensitivity analyses that Judge Baratta would impose.”³

I. DISCUSSION

Below, AmerGen addresses questions posed by the Board during oral argument, refutes statements that Citizens made during oral argument, and clarifies its commitment to submit a summary of the 3-D analysis to the NRC Staff, thereby making it available for public review.⁴

A. AmerGen’s Analysis Addresses the Board’s Questions

As Judge Baratta stated, the latest round of briefs and oral arguments “resulted from an attempt by me to address the uncertainty that we have with respect to the number of [UT] data points.”⁵ AmerGen is addressing this uncertainty by performing a structural analysis that contains a “base case” that models the drywell shell thickness realistically, with some conservatism (versus an overly-conservative model),⁶ using an extrapolation scheme to develop general area thicknesses as well as the thicknesses for five, locally-thinned areas.⁷ The structural analysis includes two sensitivity cases to evaluate the sensitivity of the base case to uncertainties in both local and general area thicknesses.⁸

These sensitivity cases model the thickness of the sand bed region of the drywell shell as significantly thinner than actually measured based on either internal or external UT

³ CLI-08-10, slip op. at 2.

⁴ Letter from M. Gallagher to NRC Document Control Desk, “Commitment Clarifications Related to the Aging Management Program for the Oyster Creek Drywell Shell, Associated with AmerGen’s License Renewal Application (TAC No. MC7624)” at 1 (Jan. 14, 2008), available at ADAMS Accession No. ML0801605400 (“Commitment Clarification Letter”).

⁵ Oral Argument, Tr. at 967-78.

⁶ AmerGen Initial Brief at 2; Affidavit of John O’Rourke, ¶ 12 (attached to AmerGen Initial Brief).

⁷ O’Rourke Aff. ¶ 15; see also Citizens’ Exh. 45 and 46.

⁸ O’Rourke Aff. ¶¶ 17-24.

measurements.⁹ Together with the base case, the sensitivity cases address Judge Baratta's concern that the structural analysis should include "an extrapolation scheme to determine the thicknesses between measured locations."¹⁰ The Board asked specific questions during oral argument, which AmerGen now further addresses.

AmerGen Addressed the Bath Tub Ring. Judge Abramson asked whether the "bath tub" ring of corrosion is addressed by the use of general area thinning.¹¹ The answer is "yes." As explained in Citizens' Exhibit 45, which is AmerGen's Technical Evaluation supporting the thickness inputs for the 3-D model, pictures taken of the external shell surface in some bays (after sand removal) confirmed the presence of a "transition" line at approximate elevation 11', above which the shell thickness is close to nominal, and below which corrosion historically reduced the thickness from nominal. This transition, referred to as a bath tub ring, was caused by the location of the former sand-air interface at around the 11' elevation. Below this transition the shell is thicker, as indicated by the trench data from Bays 5 and 17.¹²

AmerGen took this transition into account in the 3-D model. Specifically, AmerGen assigned different thicknesses to the areas above and below 11'0", with the exception of Bays 1, 11, 13, and 19, where AmerGen assigned conservative general area thicknesses for all elevations.¹³ To the extent different values were used for above and below the 11' elevation, the

⁹ *Id.* ¶¶ 19, 24; *see also* Oral Argument Tr. at 951-54 (discussing how the chosen sensitivity analyses are "bounding and conservative").

¹⁰ *See AmerGen Energy Co., LLC* (Oyster Creek Nuclear Generating Station), LBP-07-17, 66 NRC 327, 376 (2007) (Judge Baratta, Additional Statement) ("LBP-07-17").

¹¹ Oral Argument Tr. at 1032.

¹² *See* LBP-07-17, 66 NRC at 368; Hearing Tr. at 344-45 (Gallagher), 342 (Hausler).

¹³ *See* O'Rourke Aff., Table 1; *see also* diagram circulated to the parties and the Board on September 16, 2008, assigning 826 mils as the general thickness for Bay 1, 860 mils for Bay 11, 907 mils for Bay 13, and 826 mils for Bay 19. In one bay (Bay 17), the assigned general area thickness for the lower portion of the
(footnote continued)

model evaluates this unrealistic¹⁴ transition in thickness (*i.e.*, the step change) as an area of stress concentration. Thus, the bath tub ring, to the extent it exists, is modeled in the 3-D base case and sensitivity analyses.¹⁵

AmerGen Appropriately Evaluated Individual UT Points Relevant To Buckling. In discussing Bay 1, Judge Baratta asked about the sensitivity of the model to “one uncorroded [UT] point” because he viewed it as potentially having a “tremendous influence on the average that was used in the 3D model.”¹⁶ Because, at oral argument, AmerGen’s counsel may not have fully addressed Judge Baratta’s questions about the role of the external measurements in general, and in Bay 1 in particular, AmerGen provides the following additional explanation.

Focus on the external data points to determine the *general* thickness of any bay is not technically appropriate. First, as Mr. O’Rourke stated (and as the Board found in its Initial Decision¹⁷), “[t]hese *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.”¹⁸

sand bed region (963 mils) exceeds the thickness assigned to the upper portion (863 mils). O’Rourke Aff., Table 1 (Bay 17, as corrected in Sept. 12, 2008 Errata). This is based on the detailed trench data that are available for the lower portion of this bay. *See id.*

¹⁴ Visual observations and pictures of the exterior drywell shell do not confirm a step-change across the entire circumference of the sand bed region.

¹⁵ The modeling of the so-called bath tub ring assigns a uniform thickness to the lower portions of each bay. As explained above, however, this is an additional conservatism because the trench data indicate that drywell shell thickness increases below the area of the former sand-air interface. *See* LBP-07-17, 66 NRC at 368.

¹⁶ Oral Argument Tr. at 1030-31.

¹⁷ LBP-07-17, 66 NRC at 349 n.30.

¹⁸ O’Rourke Aff. ¶ 15 (emphasis added).

Also, very localized areas of thinning do not have a significant effect on buckling, as Dr. Hardayal Mehta explained during the evidentiary hearing.¹⁹ Individual external UT data points represent only a 3/8-inch diameter area.²⁰ This small an area cannot significantly affect buckling.

For Bay 1, AmerGen conservatively modeled the base case with a general area thickness of 826 mils.²¹ AmerGen developed the general area thickness from adjacent Bay 19, which exhibited similar corrosion.²² The general thickness is reasonable in light of the 51-inch diameter, locally thinned area that was included in the base case with a thickness of 696 mils.²³ This area is based on an extrapolation from only 6 external UT points, each of which measured less than 736 mils in 2006.²⁴ To ensure a conservative result for the thinned area, AmerGen ignored thicker UT measurements between these points.²⁵

Citizens urge AmerGen to use the average of the external UT points to develop the general area thicknesses for the 3-D model. AmerGen did use those points to develop conservative, locally-thinned areas. But to use those points to develop the general area thickness would not be realistic because of how those points were initially selected.²⁶ And the purpose of

¹⁹ Hearing Tr. at 475-77.

²⁰ *Id.* at 460 (noting that the head of the UT probe is only 3/8-inch in diameter). For perspective, the 6"x 6" internal UT grids provide a representative average thickness for 36 square inches. Because the external readings are selected independently of each other, each only represents 0.14 square inches. Using simple math, it would take 257 external UT readings to cover 36 square inches.

²¹ See O'Rourke Aff., Table 1 (Bay 1).

²² *Id.*

²³ *Id.* ¶ 15, 18, Table 1 (Bay 1).

²⁴ See AmerGen Exh. 16, Figure 1-3; see also *id.*, Figure 1-7 (referenced in Citizens' Exh. 45 at 8).

²⁵ Compare AmerGen Exh. 16, Figure 1-3 with *id.*, Figure 1-2.

²⁶ We note that Sandia modeled the drywell shell using only the exterior points, and it concluded that the ASME Code factor of safety was 2.15 for the refueling condition. See NRC Staff Exh. 6 at 47 (explaining
(footnote continued)

this 3-D analysis is to model the drywell shell thickness realistically, with some conservatism (versus an overly-conservative model) to evaluate available margin.²⁷

Thus, AmerGen believes it has addressed the Board's remaining questions.

B. Citizens' Claims Are Erroneous, Mischaracterize the Record, and Abuse the Commission's Request

Citizens provide no valid reason to doubt that the proposed structural analysis matches or bounds the requirements that Judge Baratta would impose, nor do they show that any additional analysis is necessary. To the contrary, Citizens mischaracterize the record, make numerous errors, and abuse the Commission's request for briefings on a "limited" issue:

- Citizens ignored the five locally-thinned areas discussed *throughout* Mr. O'Rourke's Affidavit,²⁸ and which are further identified in Citizens' own Exhibit 45.
- Citizens' new contour plots²⁹ do not undermine AmerGen's base case. First, the Board found such contour plots unreliable in its Initial Decision³⁰, and that ruling is not being revisited here. Second, the plots include incorrectly located internal UT grids in relation to the external UT data points. The internal grids appear on the plots at significantly higher elevations relative to the external data points than their actual relative locations.³¹

Sandia's use of external points); LBP-07-17, 66 NRC at 343 n.20 (Sandia's analysis yielded a 2.15 factor of safety). And Citizens now admit that the Sandia analysis was appropriate. Oral Argument Tr. at 1011 ("Well, our experts have looked at these, and have found no serious problems with them.").

²⁷ AmerGen Initial Brief at 2; O'Rourke Aff. ¶ 12.

²⁸ See O'Rourke Aff. ¶¶ 15, 18, 19, 23, 24.

²⁹ Memorandum from R. Hausler to R. Webster re: Discussion of Sensitivity Analyses Proposed By NRC Staff and AmerGen (June 17, 2008) ("June 17 Hausler Memorandum").

³⁰ See 66 NRC at 349 n.30 ("[W]e find that the contour plots are not reliable representations of the condition of the drywell shell, because they are based on the exterior UT measurements, which are significantly biased in the thin direction.") (citations omitted).

³¹ Compare, e.g., the contour plot for Bay 7 (June 17 Hausler Memorandum, Figure 6) or the contour plot for Bay 9 (June 17 Hausler Memorandum, Figure 7), with the diagram on page 101 of Applicant's Exhibit 40.

- Citizens objected to AmerGen counsel’s description of how, using engineering judgment, AmerGen compared the external data points to a normal distribution, for the limited purpose of confirming that the use of adjacent bay average thickness data in the 3-D analysis base case was reasonable.³² However, that information is in the record.³³
- At oral argument, Citizens again went beyond the “limited” issue that the Commission referred to the Board by: (1) challenging the current licensing basis acceptance criteria;³⁴ (2) challenging the Sandia Report,³⁵ (3) challenging AmerGen’s use of an ASME code-approved modified capacity reduction factor (an issue that the ACRS put to rest),³⁶ (4) again demanding that UT or other thickness measurements be taken at *new* locations, when such a demand is outside the scope of the litigated contention,³⁷ and (5) rearguing the Board’s ruling that the external points are biased thin because they were chosen as

³² Oral Argument Tr. at 947-48; 977.

³³ See Citizens’ Exh. 46 at OCLR 29744; see also AmerGen Exh. 20 at 50 (discussing a similar comparison that analyzed external data points as representing the *tail* of a normal distribution).

³⁴ Compare Oral Argument Tr. at 997-99 with Licensing Board Memorandum and Order (Denying Citizens’ Motion for Leave to Add a Contention and Motion to Add a Contention) at 3 n.6 (Apr. 10, 2007) (unpublished) (“GE’s analysis is considered the analysis of record for Oyster Creek and part of its current licensing basis.”) (citation and quotation omitted).

³⁵ See Oral Argument Tr. at 999-1002; cf. *Va. Elec. & Power Co.* (North Anna Nuclear Power Station, Units 1 & 2), ALAB-551, 9 NRC 704, 708 (1979) (“if [a] remand related only to one or more specific issues, the finality doctrine would foreclose a broadening of its scope”).

³⁶ Oral Argument Tr. at 995.

³⁷ Compare *id.* at 1004-05 with LBP-07-17, 66 NRC at 336 n.14 (citing *AmerGen Energy Co., LLC* (Oyster Creek Nuclear Generating Station), LBP-06-22, 64 NRC 229, 249-51 (2006)); Licensing Board Memorandum and Order (Denying Citizens’ Motion for Leave to Add Contentions and Motion to Add Contention) at 7-19 (Feb. 9, 2007) (unpublished).

representative of the thinnest locations in each bay and because some metal was removed to prepare the surface for UT measurements.³⁸

C. AmerGen Will Provide a Detailed Summary of the Results of the Structural Analysis Prior to the Period of Extended Operation

In accordance with AmerGen's Commitment Clarification Letter, "[a]fter the 3D structural analysis is finalized . . . AmerGen will submit to the NRC Staff a summary of the 3D analysis. This will confirm AmerGen's completion of the 3D analysis."³⁹ As explained at oral argument, this "summary" will be hundreds of pages long.⁴⁰ The summary will identify the inputs, assumptions, and methods that AmerGen used to conduct the 3-D structural analysis, and will therefore be sufficiently detailed such that a qualified structural engineer could perform an in-depth review of the results.⁴¹ The summary will also contain no proprietary information, and will be available to the public through the NRC's Agencywide Documents Access and Management System (ADAMS).

Finally, the Staff will be conducting an inspection as part of the license renewal process to insure the completion of various commitments, including license conditions that will include the details of the 3-D analysis.⁴² AmerGen anticipates that the Staff will also review the voluminous summary report of the 3-D analysis. And even before AmerGen submits a summary report, as the commitment states, "[i]f the analysis determines that the drywell shell does not

³⁸ Compare Oral Argument Tr. at 981-82 with LBP-07-17, 66 NRC at 349 n. 30 (finding that the external points "are thus not representative of the overall shell thickness and do not provide a basis for determining available buckling margin").

³⁹ Commitment Clarification Letter at 2.

⁴⁰ Oral Argument Tr. at 1026-27.

⁴¹ See *id.* at 1027.

⁴² *Id.* at 1041.

meet Code-specified safety factors (i.e., 2.0 for the refueling load case and 1.67 for the post-accident load case), the NRC will be notified in accordance with 10 CFR 50 requirements.⁴³

Accordingly, the results of the 3-D analysis will receive an in-depth review.⁴⁴

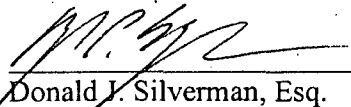
⁴³ Commitment Clarification Letter, Encl.

⁴⁴ The commitment to conduct the 3-D structural analysis, moreover, is a license condition that must be fulfilled prior to entering into the period of extended operation, *not* a precondition for issuance of the renewed operating license. See LBP-07-17, 66 NRC at 367 n.55.

II. CONCLUSION

The Board should inform the Commission that AmerGen's 3-D structural analysis, as reflected in the Staff's proposed license condition, matches or bounds the sensitivity analyses that Judge Baratta would impose, and that no additional analysis is necessary.

Respectfully submitted,



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Dated in Washington, D.C.
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NUCLEAR REGULATORY COMMISSION
ATOMIC SAFETY AND LICENSING BOARD**

**Before Administrative Judges:
E. Roy Hawkens, Chair
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In the Matter of:)	October 1, 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 SUPPLEMENTAL BRIEF FOLLOWING ORAL ARGUMENT" were served this day upon the persons listed below, by e-mail and first class mail.

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