

**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:)	September 14, 2007
)	
AmerGen Energy Company, LLC)	
)	Docket No. 50-219
(License Renewal for Oyster Creek Nuclear)	
Generating Station))	
)	

**AMERGEN ENERGY COMPANY, LLC
SURREBUTTAL STATEMENT OF POSITION**

I. INTRODUCTION

In accordance with 10 C.F.R. § 2.1207(a)(1) and the Atomic Safety and Licensing Board's ("Board") April 17, 2007, and August 9, 2007 Memoranda and Orders,¹ AmerGen Energy Company, LLC ("AmerGen") hereby submits its SurRebuttal Statement of Position ("SurRebuttal") in response to Citizens' Rebuttal.² AmerGen's SurRebuttal is supported by the attached six-part testimony and Exhibits 37 through 61.

Citizens once again rely solely upon Dr. Hausler to support their case. His testimony consists of two new memoranda (Exhibits 38 and 39) and answers to 24 questions. The vast majority of the information provided by Dr. Hausler repeats arguments from Citizens' Direct Testimony submittal of July 20, 2007. AmerGen is not providing new testimony from its experts to respond to those recycled arguments. However, AmerGen is providing testimony to respond

¹ (Prehearing Conference Call Summary, Case Management Directives, and Final Scheduling Order) (April 17, 2007) (unpublished); (Ruling on Motions in Limine and Motion for Clarification) (August 9, 2007) (unpublished).

² "Citizens' Rebuttal Regarding Relicensing of Oyster Creek Nuclear Generating Station, Rebuttal Statement, Exhibits (August 17, 2006); "Prefiled Rebuttal Written Testimony of Dr. Rudolf H. Hausler Regarding Citizens' Drywell Contention" (August 16, 2007).

to those few allegations that Dr. Hausler raises or clarifies for the first time on Rebuttal. As summarized below, and as demonstrated in the attached testimony, Citizens' arguments continue to deserve little consideration and should be given little if any weight.

By negating Citizens' arguments, this SurRebuttal continues to demonstrate that Citizens' contention is without merit, and that AmerGen's Aging Management Program ("AMP") for the sand bed region of the Oyster Creek Nuclear Generating Station ("OCNGS") drywell shell provides reasonable assurance that the drywell shell will continue to perform its intended functions throughout the period of extended operation in accordance with the current licensing basis ("CLB") as required by 10 C.F.R. § 54.29(a).

II. SUMMARY OF AMERGEN'S SURREBUTTAL TESTIMONY

The parties' testimony is serving its purpose of narrowing and clarifying the issues that remain to be resolved at the hearing, as discussed in the following discussion of acceptance criteria, available margin, sources of water, epoxy coating system, and future corrosion.

A. Acceptance Criteria

The testimony submitted to date shows that there is no dispute regarding the general buckling criterion (*i.e.*, uniform thickness of 0.736") or the pressure criterion (*i.e.*, 0.490" over an area that is 2.5" in diameter). The only dispute is over the local buckling criterion.

AmerGen has established, through the GE analyses performed in the early 1990s, a local buckling criterion consisting of the "tray" configuration shown in Applicants' Exhibit 11, "tak[ing] into account factors such as the location of the tray within the bay and configuration."³ The center square foot of the tray is 0.536", with a transition back to 0.736" on all sides.

As is clearly reflected in Part 2 of the attached SurRebuttal Testimony and referenced exhibits, this local buckling criterion is part of the OCNGS CLB. The NRC Staff concurs that

³ AmerGen Dir., Part 2, A.14.

this criterion is part of the CLB,⁴ and that its review of AmerGen’s License Renewal Application included “a very local criterion of 0.536 inch [as] discussed at SER pages 4-55 to 4-60.”⁵ As the federal regulator, the Staff’s opinion should govern over the opinion of an anti-nuclear group.⁶

What appears to be the cause of Citizens’ confusion is that instead of using this local buckling criterion, AmerGen has evaluated UT thickness data with more conservative, calculation-specific values such as 0.693” over a 6” x 6” area, etc.⁷ This is akin to using an administrative limit, which does not alter the CLB.⁸

In their Rebuttal, Citizens do not accept Applicants’ Exhibit 11 as the CLB local buckling criterion.⁹ They attack the *derivation* of that criterion,¹⁰ indirectly argue that it does not meet the ASME Code,¹¹ and because they cannot find a document to support that the criterion is part of the CLB,¹² they argue that it is not.¹³ Citizens then suggest that the more conservative calculation-specific values that AmerGen has used in the various revisions to the 24 Calc (*e.g.*, 0.636” over a 12” x 12” area) ought to govern.¹⁴ They have even asked the Board to set these more conservative values as the OCNCS CLB, something the Board does not have the authority

⁴ See *e.g.* NRC Staff Response To AmerGen’s Motion For Summary Disposition, Affidavit of Hansraj G. Ashar, ¶ 3 (Apr. 26, 2007) (“it is my opinion that AmerGen has developed three criteria related to acceptance of the shell thicknesses; . . . (2) a minimum locally thin thickness of 0.536 inch, in an area of one square foot, with a surrounding one foot transition area to 0.736 inch”); see also NRC Staff’s Direct Testimony, A.9.

⁵ NRC Staff’s Direct Testimony, A.9.

⁶ Since the start of this proceeding, Citizens have made their real intentions known by renaming themselves as “Stop the Relicensing of Oyster Creek” (STROC). See *e.g.* <http://www.nirs.org/press/09-26-2006/1> (visited August 30, 2007).

⁷ AmerGen Dir., Part 2, A.19.

⁸ *Id.*, A.20. By analogy, the OCNCS Technical Specifications may require the drywell atmosphere during operation to contain less than 4% oxygen, but the plant may have a lower administrative limit of 2%. A 2% administrative limit would not alter the fact that 4% is the CLB.

⁹ Citizens’ Rebuttal Statement at 8.

¹⁰ See *e.g.*, *id.* at 5-9.

¹¹ See *e.g.*, Dr. Hausler Rebuttal Testimony, A.6.

¹² Citizens’ Rebuttal Statement at 8.

¹³ *Id.*

¹⁴ Citizens’ “Motion to Cross-Examine Mr. Tamburro,” for example, is based on their insistence that 0.636” should be the appropriate local buckling criterion.

to do.¹⁵

AmerGen believes that the Board has prohibited Citizens from challenging the local buckling criterion (as well as the other established acceptance criteria) with the narrow exception that Citizens may present an argument that the “application of acceptance criteria and analytic methodology to the 2006 UT results was inconsistent with past practice.”¹⁶ Thus, at the hearing, the Board should address any of Citizens’ arguments that the “application of acceptance criteria . . . to the 2006 UT results was inconsistent with past practice” and then proceed to the evaluation of bounding available margin using the OCNGS CLB acceptance criteria.

B. Available Margin

Here too the issues have been clarified and narrowed. It is undisputed that buckling, due to the weight of the water and equipment on the drywell shell during an earthquake that only occurs during refueling outage conditions, is the bounding scenario for failure of the drywell shell in the sand bed region.¹⁷ AmerGen’s position is that the bounding available margin for buckling at the start of the extended period of operations is 0.064”.¹⁸ This is based on the thinnest average of the 49 UT thickness measurements from internal grid 19A, which *in 1992* was 0.800”, compared to the general buckling criterion of 0.736” (0.800”-0.736” = 0.064”).¹⁹

What first remains in dispute is whether the internal UT data represent the bounding

¹⁵ This criterion is part of the CLB, and that is not within the scope of the Board’s jurisdiction in this license renewal proceeding. *See Florida Power & Light Co.* (Turkey Point Nuclear Generating Plant, Units 3 & 4), CLI-01-17, 54 N.R.C. 3, 8-9 (2001) (“the Commission did not believe it necessary or appropriate to throw open the full gamut of provisions in a plant’s [CLB] to re-analysis during the license renewal review”).

¹⁶ Memorandum and Order (Denying AmerGen’s Motion for Summary Disposition) at 8 (June 19, 2007) (unpublished).

¹⁷ Failure of the drywell shell in the sand bed region due to internal pressure is not the bounding scenario. AmerGen Dir., Part 2, A.12. Dr. Hausler seems to not recognize this. *See e.g.* Citizens’ Exh. 38 at 6 (“structures do not fail by averages....[they] fail where the deepest pit is located”).

¹⁸ AmerGen Dir., Part 3, A.5.

¹⁹ AmerGen Reb., Part 3, A.26. The fact that external corrosion has been arrested is demonstrated by the averages from grid 19A that have varied little over time: 0.800” (1992), 0.806” (1994), 0.815” (1996) and 0.807” (2006). *Id.* at A.26.

conditions. Citizens argue they do not,²⁰ but do so by ignoring data that would disprove their case.²¹ Part 3 of AmerGen’s SurRebuttal Testimony supplements the record on this issue.

What also remains in dispute is the level of “confidence” in the internal data required by the ASME Code. AmerGen uses the average of these UT grid data (*i.e.*, the “sample average”). It does so because the sample average is what is important from a buckling perspective, not the extreme values.²² Moreover, the nuclear industry standard is to use the average.²³

Citizens argue that the level of confidence must be 95%. It is not clear what Citizens mean by 95%, as they define it in two, significantly different ways in their Rebuttal.²⁴ Dr. Hausler admits that 95% (whatever its definition) is not the industry standard; rather he believes that it *ought to be*.²⁵ Citizens provide no evidence that applicable nuclear industry Codes, guidance, or regulations require something other than the average.

The amount of uncertainty (*i.e.*, systematic error) that should be taken into account is also in dispute. AmerGen does not subtract anything from the averages of the internal UT grid data to take into account systematic error because “[it] is negligible for sufficiently large numbers of measurements collected over time. . . . [T]he more measurements you have . . . and the more times you collect those measurements, the less significant systematic error becomes.”²⁶

Citizens want to subtract 0.010” from the average of the internal UT data to account for

²⁰ Citizens’ Exhibit 12, at 3-4 (ignoring Bay 17 grid data); Citizens’ Rebuttal, Exh. 39, at 14-15 (ignoring Bay 13 (Figures 1 and 2) and Bay 1 data (Figures 3 and 4)).

²¹ See AmerGen SurReb., Part 3, A.5; AmerGen Reb., Part 3, A.25-29, A.32-33.

²² AmerGen Reb., Part, A.2 (“[B]uckling is not a phenomenon that is dependent on very local thickness, but instead on the average thickness over a larger area. Thus, the averages of these data, not the thinnest extremes, are representative of each grid.”).

²³ *Id.* at A.54 (discussing average readings used for evaluating Degraded Piping, Erosion-Corrosion (FAC) Prone Piping, Pressure Vessel Shells, and Tanks).

²⁴ AmerGen SurReb., Part 3, A.3-4.

²⁵ See *e.g.* Citizens’ Exh. 38, at 8 (“there are currently no standards with respect to the certainty required”).

²⁶ AmerGen Reb., Part 3, A.7.

systematic error.²⁷ They appear to ignore, among other things, the fact that instrument uncertainty is not in one direction, but is +/- . Therefore, averaging the data over 49 measurements makes the instrument uncertainty of +/- 0.010” insignificant.²⁸

As for the external UT data, these were last collected in 2006 as single points from 106, mostly small (2” diameter) areas, most of which had been ground smooth to allow UT readings from the otherwise uneven, historically corroded exterior.²⁹ These points are biased thin compared to the rest of the drywell shell in the sand bed region as demonstrated by comparison to the internal UT grids³⁰ and by Dr. Hausler’s own analysis.³¹

Any points that are thinner than 0.736” are compared to the local buckling criterion. Because this criterion is volumetric, it “is not exceeded when localized corrosion removes a couple or even tens of cubic inches from the tray. The entire tray, on average, needs to corrode away for that loss of metal to be significant from a buckling perspective . . .”³² Also, the external single-point UT measurements “can tell you that you meet the applicable ASME Code, but not by how much. This is the case because there are an insufficient number of UT measurements over large areas to evaluate a representative average thickness over each area.”³³

Citizens evaluate these 106 external points using *extreme value* statistics.³⁴ There is no precedent for this other than Dr. Hausler’s desire for it.³⁵ Again, the nuclear industry standard is

²⁷ Citizens’ Rebuttal Statement at 12 (“Subtracting an allowance of 0.01 inches for systematic error . . .”).

²⁸ AmerGen Reb., Part 3, A.6-7.

²⁹ AmerGen Dir., Part 3, A.20 and A.41.

³⁰ AmerGen Reb., Part, A.42.

³¹ Citizens’ Exh. 12, at 4 (Dr. Hausler states that “the average outside measurements are significantly lower at comparable elevations [than the interior measurements]. This is probably because the choice of location for the external measurements was deliberately biased towards thin spots.”).

³² AmerGen Dir., Part 2, A.15.

³³ AmerGen Reb., Part 3, A.38.

³⁴ See generally, Citizens’ Exh. 38 at 6-9.

³⁵ *Id.* at 8.

to use the average of the data from UT grids, not extreme value statistics on single points.³⁶

Thus, the Board need only confirm that AmerGen's use of the average of the internal UT grid data, with no corrections for systematic error, is appropriate under the ASME Code. The Board need not delve into Dr. Hausler's computer modeling or other treatment of the UT data.

C. Sources Of Water

The sources and timing of water potentially coming into contact with the external surface of the drywell shell in the sand bed region during the period of extended operation have also been clarified and narrowed for both outages and normal operation.

During outages, water can only come into contact with the external surface if: (a) the use of chillers inside the drywell cools the shell below the dew point temperature of the exterior air (causing condensation), or (b) the reactor cavity contains water and leakage exceeds the trough drain capacity, or the trough drain is blocked, and the water flows down to the sand bed region.

Condensation, while theoretically possible, was not observed during the most recent refueling outage. So, as explained below, condensation remains speculative. AmerGen's inspection of the trough drain³⁷ and sand bed drains³⁸ during each outage when the reactor cavity is filled would identify any water. Although the chance of water on the exterior drywell shell during such outages is low,³⁹ the Board could assume the presence of such water in order to streamline its inquiry at the hearing.⁴⁰

³⁶ Citizens also challenge the "Evaluation Thickness" mentioned in all of the revisions of the 24 Calc. (AmerGen's Exhibits 16 through 18). See e.g. Citizens' Exh. 13, at 6-7. AmerGen addressed Citizens' misunderstanding on this issue in its Rebuttal Testimony, Part 3, A.50 through A. 52 which Citizens could not have reviewed before they filed new testimony. Citizens' Exh. 39, at 15-16 (Dr. Hausler's rebuttal).

³⁷ Applicants' Exh. 10, at 9 (Item #13).

³⁸ AmerGen Reb., Part 4, A.19.

³⁹ Refueling outages occur every other year for up to 30 days. Forced outages when the reactor cavity must be filled with water are rare. AmerGen Dir., Part 1, A.17.

⁴⁰ See AmerGen Dir., Part 6, Q&A.14, which *assumes*, as a conservative analysis, that water—regardless of its source—is on the exterior surface of an *uncoated* drywell shell for 30 days, every other year.

The Board should conclude, however, that there is no water on the exterior drywell shell during normal plant operation. Condensation is physically impossible because the metal shell is hotter than the ambient air.⁴¹ And there is no other known source of water other than the reactor cavity during outages. Citizens provide only speculation that other sources exist. AmerGen supplements the record on this issue in Part 4 of its SurRebuttal testimony.

D. Epoxy Coating System

Of all the issues, this one has been clarified the most. AmerGen has provided testimony, by an eminently-qualified expert,⁴² that the multi-layered epoxy coating was properly applied, is in good condition, and can serve its protective function through the period of extended operation. When the coating does begin to degrade, it will do so gradually, showing initial signs of degradation over a period of years. Moreover, these signs will be obvious to an ASME-qualified inspector. ASME Section XI, Subsection IWE, which is mandated by 10 C.F.R. § 50.55a, “recognizes that containments are coated and requires a visual inspection of the coating to identify ongoing corrosion of the containment vessel under the coating. NRC has endorsed these practices in the GALL Report (NUREG-1801, Vol. 2, Appendix xi.S8).”⁴³

Citizens’ proffered expert, whose has little or no experience with epoxy coating systems like the one covering the exterior drywell shell, has suggested that the coating could fail any at any time, would do so quickly, and that such failure would not be visible to an ASME-qualified inspector. This flies in the face of NRC regulations and guidance, and is based on an inappropriate analogy to “oil field experience” of “pressure drops,” high temperatures, and

⁴¹ AmerGen Dir., Part 4, A.17.

⁴² Mr. Jon Cavallo is, among other things, Chairman of the ASTM Committee D-33 (Protective Coating and Lining Work for Power Generation Facilities) and Chairman of the New England Chapter of the Society for Protective Coatings. See AmerGen Dir., Part 5, A.3.

⁴³ AmerGen Reb., Part 5, A.6

diffusion of corrosive gasses.⁴⁴ AmerGen's SurRebuttal in Part 5 supplements the record on these issues.

E. Future Corrosion

This aspect of Citizens' case, in reality, remains the most speculative. In order to evaluate future corrosion of the exterior surface of the drywell shell in the sand bed region, one must first assume degradation of the epoxy coating system over a large enough area to implicate buckling,⁴⁵ and you need water in contact with that same large area for a significant period of time, without the water being detected.⁴⁶ Accordingly, AmerGen believes that future corrosion of a magnitude sufficient to remove 0.064" of metal from the entire shell, or in the precise grid location (grid 19A) where 0.064" remains, in the period between AmerGen's planned UT inspections, is entirely speculative. The conditions that supported high rates of corrosion no longer exist. AmerGen offered worst case and unrealistic corrosion rates of 0.039" and 0.017" for refueling outages to demonstrate that UT inspections every four years are adequate.

Similarly, Citizens have offered no corrosion rate that is realistic or expected for the external surface of the drywell in the sand bed region.⁴⁷ They argue that any future corrosion would occur at an exponential rate, but they do so with no legitimate support.⁴⁸

As for the interior surface, it is either coated (above the concrete curb) or embedded in concrete (below the curb). Citizens have only challenged the embedded portion.

Citizens first alleged that 0.002" was an appropriate annual corrosion rate for this surface,

⁴⁴ Citizens' Exh. 39, at 17-18.

⁴⁵ Localized coating degradation would implicate the pressure criterion (0.490") for which significantly more than 0.064" of margin remains at any UT location. AmerGen Dir., Part 3, A.32.

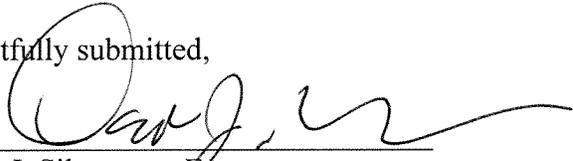
⁴⁶ Even Dr. Hausler agrees that you need the confluence of "aerated aggressive water[,] . . . the coating has to have failed in some manner at the location where water is present [and] . . . the corrosion has to occur at a location where the drywell has already been damaged." Citizens' Exh. 39, at 20.

⁴⁷ See e.g., Citizens' Rebuttal Statement at 23-24.

⁴⁸ See AmerGen Reb., Part 6, A.5 through A.8 (confirming that Dr. Hausler is confusing "pitting" corrosion with "general" corrosion, and oil field conditions with exterior benign sand bed region conditions).

but in rebuttal state that it is as high as 0.010". Yet basic corrosion science,⁴⁹ and the observations of those engineers who looked at a recently exposed portion of the interior shell, demonstrate that only insignificant corrosion has occurred on this internal surface.⁵⁰ The water in contact with the interior shell is non-corrosive and is expected to remain so during the period of extended operation⁵¹ Accordingly, the corrosion determined to have occurred between the UT readings taken in 1986 and 2006 must have resulted from historic corrosion of the *exterior* between 1986 and 1992. Part 6 of AmerGen's SurRebuttal Testimony supplements the record on this issue.

Respectfully submitted,



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⁴⁹ *Id.* at A.10.

⁵⁰ *Id.* at A.13.

⁵¹ *Id.* at A.10 ("Water samples collected from the inside of the drywell shell during the 2006 outage were measured to have a pH of approximately 8.4 to 10.2 and low levels of chloride and sulfate, which is consistent with NRC [GALL] Report (Vol. 2, Rev. 1, at II A.1 through 5) and EPRI embedded steel guidelines for an environment that poses no aging management concerns.").