UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
OFFICE OF THE SECRETARY

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:
E. Roy Hawkens, Chair
Dr. Paul B. Abramson
Dr. Anthony J. Baratta

| | | |
|---|---|---|
| In the Matter of | ) | |
| | ) | Docket No. 50-0219-LR |
| AMERGEN ENERGY COMPANY, LLC | ) | |
| | ) | ASLB No. 06-844-01-LR |
| (License Renewal for the Oyster Creek | ) | |
| Nuclear Generating Station) | ) | February 6, 2007 |
| | ) | |

**MOTION FOR LEAVE TO ADD A CONTENTION AND MOTION TO ADD A CONTENTION**

## PRELIMINARY STATEMENT

Nuclear Information and Resource Service, Inc., Jersey Shore Nuclear Watch, Inc., Grandmothers, Mothers and More for Energy Safety, New Jersey Public Interest Research Group, New Jersey Sierra Club, and the New Jersey Environmental Federation (collectively "Citizens") submit this Motion because a study by Sandia National Laboratories ("Sandia"), released to Citizens on January 15, 2007, has shown that the modeling by General Electric ("GE") upon which AmerGen Energy Co. LLC ("AmerGen") has relied was overly optimistic in the assumptions used. The new study shows that AmerGen's acceptance criterion for mean thicknesses in the sandbed region is set over 0.1 inches too low and the local wall thickness criterion for contiguous areas less than one square foot is set over 0.08 inches too low. If there is some existing margin, the errors in these criteria could allow the drywell shell to corrode to the point where it does not meet safety requirements during any period of extended operation. Thus, Citizens contend that these acceptance criteria must be corrected.

Highlighting the need for correct acceptance criteria, AmerGen's own analysis of the October 2006 ultrasonic ("UT") testing of wall thicknesses in the sandbed taken from the exterior shows that the sandbed is now 0.02 inches thinner than it was in 1992 on average and over 0.1 inches thinner in certain spots, indicating that ongoing corrosion may be occurring. Citizens seek to add a contention based on this highly material and significant new information. Citizens contend that the acceptance criteria for the mean wall thickness and local wall thickness in the sandbed region must be changed to ensure that the wall thicknesses in that region do not fall below those necessary to meet the safety requirements during any licensed period of extended operation. In contrast, AmerGen is proposing to use the current acceptance criteria to determine the acceptability of UT monitoring to be taken during any period of extended operation. This dispute about the acceptance criteria is material because it could affect safety during any extended licensing period.

Finally, although Citizens previously sought to contend that "the acceptance criteria are inadequate," they have not previously contended that the GE modeling, upon which the disputed acceptance criteria are based, used unjustified factors leading to systematic underestimation of the required average thicknesses and the required local area thickness by over 0.1 inches and over 0.08 inches, respectively.

## NEW INFORMATION AVAILABLE

The significant and material new information upon which this Motion is based is contained in: i) a report issued by Sandia, which first became available to Citizens on January 15, 2007; ii) comments made about the Sandia study at the January 18, 2007 meeting of a sub-committee of the Advisory Committee on Reactor Safeguards ("ACRS"); and iii) a statistical analysis of the results of the October 2006 exterior UT testing of the sandbed region, which first became available to Citizens on January 29, 2007.

## I. New Thickness Measurements

Prior to January 29, 2007, Citizens did not have the full results of the October 2006 exterior UT testing in the sandbed region. The most detailed information previously available was contained in a package submitted to the ACRS, which only gave results for points that were below 0.736 inches. AmerGen ACRS Information Package, Ex. ANC 2 at 6-12. That information showed that the thinnest point measured in 2006 was 0.602 inches versus 0.618 inches in 1992, and an apparent maximum thinning of 0.039 inches between 1992 and 2006. Id. Based on this preliminary information Citizens estimated that the wall thickness had reduced by an average of around 0.02 inches between 1992 and 2006.

The full information shows that, in fact, at the worst points the measurements of wall thickness have reduced by 0.118 inches. Extract From Statistical Analysis Prepared for Amergen, dated November 9, 2006, Ex. ANC 7 at 4. AmerGen's own statistical analysis of all of the results confirms that the 2006 measurements show a significant reduction from those taken in 1992. Id. at 3. AmerGen estimated the mean reduction to be 0.02 inches, with the 99% confidence interval ranging from 0.012 inches to 0.029 inches. Id. Because the wall thickness is now less than measured in 1992, it has become even more critical to accurately estimate how much any existing margin has been reduced.

## II. The Sandia Study

In an attempt to confirm that the GE modeling was acceptable for the purposes of license renewal, NRC Staff commissioned Sandia to carry out a modeling study. Jason P. Petti, Structural Integrity Analysis of the Degraded Drywell Containment at the Oyster Creek Nuclear Generating Station, 11, 15 (January 2007), available at ML070120395 ("Sandia Study"). The Sandia Study was designed to focus on the relative reduction in drywell strength rather than the absolute limits and Sandia cautioned that it could not form the basis of a decision on license renewal. Id. It assumed that the 1992 measurements taken from the outside of the sandbed were representative of the thicknesses in that region and that AmerGen had arrested corrosion in the sandbed since 1992. Id. at 12. Based on these assumptions, the Sandia Study predicted no *definitive* violations of ASME code requirements. Id. at 13 (emphasis added). Nonetheless the results of the Sandia Study showed that the GE modeling relied upon by AmerGen had some critical flaws. The rest of this Section summarizes the key findings of the Sandia Study in more detail.

### A. The Sandia Model

Sandia built a three dimensional model of the whole of the Oyster Creek drywell shell. Id. at 17. Sandia omitted the torus because the ventlines are connected to the torus via bellows, which Sandia assumed would prevent structural interaction. Id. at 18. The Sandia model for the refueling case omitted the head of the vessel for that case. Id. at 20. Sandia produced two versions of the model, one reflecting the as-built condition and one reflecting a degraded condition. Id. at 18-29, 46-49. In addition, Sandia used the model to find the uniform thickness of the sandbed that would exactly meet the safety requirements. Id. at 78-80.

Sandia recognized the difficulty of assigning thickness to the degraded model because "UT measurements have only been taken at a linit[ed] number of locations throughout the shell."

Id. at 46. For the degraded model Sandia therefore used average thicknesses in various regions to represent the state of the drywell shell. Going from the top of the vessel, the cylinder, upper region, and middle sphere degraded thicknesses were based on minimum average thicknesses reported for any area in each region in 2004, less an allowance for observed ongoing corrosion to try to simulate conditions as they would be in 2029. Id. For the sandbed region, Sandia assigned the area from one ventline to the other an average thickness based on UT measurements taken from the exterior of the drywell in 1992. Id. at 47. In addition, Sandia added into the model two small 30 inch by 18 inch locally thin regions in the sandbed region in Bays 1 and 13. Id. Sandia located these regions directly under the ventlines. Id. Finally, for the embedded region Sandia assumed no corrosion has occurred. Id.

**B. Results From The Sandia Model**

Overall, the Sandia Study showed that the corrosion of the drywell shell has reduced safety margins by around 43% compared to the since 1969 when the plant first opened. Compare id. at Table 4-2 with id. at Table 4-4. Even without taking into account the additional thinning in the sandbed between 1992 and 2006, the Sandia model showed that the predicted factor of safety for buckling in the sandbed region during refueling was 2.15, compared to an ASME code requirement of 2.0. Id. at 72. Furthermore, the Sandia Study predicted that on a uniform thickness basis, the minimum average thickness of the sandbed region should be 0.844 inches and not 0.736 inches as GE had predicted. Id. at 83.

Turning to the local wall thickness criterion, the GE study showed that a uniform thickness of 0.736 inches in the sandbed region would result in a factor of safety of 2.0 during refueling, exactly meeting the requirement. Ex. ANC 2 at 6-9. However, when GE modeled an area of one square foot with a thickness of 0.536 inches, surrounded by a one foot transition zone back to 0.736 inches, it found that the safety factor decreased by 9.5%. AmerGen Internal

Report, dated March 3, 2006, Ex. ANC 8 at 2 ("AmerGen Admission"). AmerGen has failed to show that this reduction is allowed by the code. Id. Thus, the current local wall thickness criterion should not be used. Furthermore, even if AmerGen attempts to justify the use of the local wall thickness criterion based on the Sandia Study, the thinnest area modeled was 0.618 inches over a 30 inch by 18 inch section. Sandia Study at 49. Because the Sandia Study shows, at best, that current margins are razor-thin, it is not possible to use the new modeling to justify a small area acceptance criterion of less than 0.618 inches.

## ARGUMENT

### I. Specific Statement of the Contention

Petitioners must "provide a specific statement of the issue of law or fact to be raised or controverted." 10 C.F.R. § 2.309(f)(1)(i). The new contention is:

> The computer modeling undertaken by General Electric, upon which the disputed acceptance criteria are based, used unjustified factors leading to underestimation of the uniform required thickness by over 0.108 inches and of the small area required thickness by over 0.082 inches. For this reason, the acceptance criterion for the average thickness of each bay of the drywell shell should be increased to around 0.844 inches to ensure that the applicable ASME Code safety requirements are met or should be replaced with a set of criteria based on accurate and realistic three dimensional modeling of further degradation in the sandbed. For similar reasons, the acceptance criterion for small area thicknesses should be increased to at least 0.618 inches or integrated into the acceptance criteria derived from further three dimensional modeling.

### II. Explanation of Basis

#### A. Legal Requirements

At this preliminary stage, Citizens do not have to submit admissible evidence to support their contention, rather they have to "[p]rovide a brief explanation of the basis for the contention," 10 C.F.R. § 2.309(f)(1)(ii), and "a concise statement of the alleged facts or expert opinions which support the ... petitioner's position." 10 C.F.R. § 2.309(f)(1)(v). This rule ensures that "full adjudicatory hearings are triggered only by those able to proffer ... minimal factual and legal foundation in support of their contentions." In the Matter of Duke Energy Corp. (Oconee Nuclear Station, Units 1, 2, and 3), CLI-99-11, 49 N.R.C. 328, 334 (1999) (emphasis added). Thus, the Commission has indicated that where petitioners make technically meritorious contentions based upon diligent research and supported by valid information, the requirement for an adequate basis is more than satisfied. Citizens have satisfied this legal requirement.

**B. Issues Beyond Dispute**

As recognized by the Atomic Safety and Licensing Board ("ASLB") in its decisions admitting the initial contention, Citizens have ample basis for the following points, which are also included in the basis for the new contention:

i) the drywell shell is a safety structure, LBP-06-07 at 26;
ii) water intruded into the sandbed region in the past causing severe corrosion; id. at 33.
iii) water either is intruding, or could intrude in the future, leading to corrosive conditions on the outside of the drywell shell in the sandbed region, id. at 36; and
iv) Citizens have adequately demonstrated representational standing. Id at 3-6.

**C. Basis of the Contention**

This contention is based squarely upon the Sandia Study, comments on the Sandia Study made at the January 18, 2007 meeting of the ACRS, and the latest UT results. The Sandia Study reaches a very different result from the GE modeling upon which AmerGen is relying to justify its acceptance criteria. This is primarily because the GE study assumed that a factor used to correct for imperfections in the shape of the sphere, called the capacity reduction factor, should be 0.34, whereas Sandia used a value of around 0.2. ACRS Transcript of January 18, 2006 Meeting ("T1.") at 283:21-284:8. Sandia considered using the higher factor, but rejected that approach stating "Article 1500 of ASME N-284 clearly states that an increased capacity reduction factor may be justified if an internal pressure loading is present and causes tensile stress in the circumferential direction. . . . The lack of an internal pressure load for the refueling case prevents the justified use of an increased capacity reduction factor." Sandia Study at 77.

At the ACRS meeting, one of the ACRS members, Dr. Abdel-Khalik, pointed out that the thickness of 0.736 inches would yield a factor of safety of 1.27 if the GE model were used without the increased capacity reduction factor. T1 at 292:25:-293-9. Under questioning from Dr. Abdel-Khalik, Sandia staff acknowledged that the 0.844 inches uniform thickness in the Sandia Study corresponded to 0.736 inches in the GE study. Id. at 286:17-22. Sandia staff also acknowledged that all of AmerGen's margin calculations are based on the 0.736 inches thickness calculated by GE. Id. at 286:23-25. NRC staff then acknowledged that if 0.844 inches were substituted for 0.736 inches, the margins of safety would be considerably lower than those reported by AmerGen. Id. at 286:23-287:8.

The thinnest average thickness observed from the exterior for mean thickness in 1992 was estimated at 0.800 inches in Bay 13. Ex. NC 3 at 27. The latest results show an average thinning of 0.02 inches. Ex. ANC 7 at 3. Thus, the margin above the existing acceptance criterion for average thickness has now declined from 0.064 inches to around 0.044 inches. Furthermore, if AmerGen simply substituted 0.844 inches into the acceptance criterion for mean thickness, Bay 13 would not be accepted as suitable for service.

However, the Sandia Study suggests that there might be some minimal margin available even if the additional 0.02 of thinning were included in the model. In addition, the scope of this proceeding assumes that current safety will not be compromised before the existing license expires. Thus, the Sandia Study and the comments made upon it by Sandia and NRC staff at the ACRS meeting provide a basis for Citizens contention that the uniform thickness acceptance criterion should be increased to around 0.844 inches or should be scrapped in favor of new criteria derived from more realistic modeling of the drywell shell in a slightly more degraded state than it is at present.

The second part of the contention has a similar basis. The AmerGen Admission acknowledges AmerGen's failure to show that the local wall thickness acceptance criterion would maintain ASME Code requirements. AmerGen Admission at 2. The Sandia Study used as inputs to its degraded model a small area of one bay at 0.618 inches wall thickness and another small area of another bay at wall thickness 0.705 inches. Sandia Study at 49. The degraded model showed that sandbed region of the shell barely met safety requirements with a factor of safety of 2.15. Id. at 72. Thus, the Sandia Study suggests that the local wall thickness criterion should be set at around 0.618 inches. It also suggests that the current 0.536 inch local wall thickness criterion is set far too low to ensure compliance with the safety requirements. The thinnest measured small area to date is 0.602 inches thick. Ex. ANC 2 at 6-12. Therefore, if the local area acceptance criterion were amended to 0.618 inches, as the Sandia Study suggests, this result would also be unsatisfactory.

Once again, the Sandia Study suggests that there might be some minimal margin available even if the additional 0.02 of thinning were included in the model. In addition, the scope of this proceeding assumes that current safety will not be compromised before the existing license expires. Thus, Citizens contend that the Sandia Study shows that AmerGen needs to develop revised local area acceptance criteria by using a more accurate and realistic version of the Sandia model to determine how much more local area corrosion beyond the existing amount could occur without violating the ASME code requirements.

## III. The Scope of License Renewal Includes Corrosion of the Drywell Liner

Petitioners are required to demonstrate that the issues raised in their contentions are within the scope of the proceeding, 10 C.F.R. § 2.309(f)(1)(iii). After extensive briefing of this issue, the ASLB concluded that corrosion of the drywell shell is within the scope of license renewal proceedings. In the Matter of AmerGen Energy Company (License Renewal for Oyster Creek Nuclear Generating Station), LBP-06-07 (slip op. at 39-40) (February, 26, 2006). That finding directly applies to the current contention, because it also concerns corrosion of the drywell shell. Thus, the issue of scope is currently res judicata in this proceeding and is not subject to further dispute.

## IV. The New Contention Raises A Material Dispute

The regulations require petitioners to "[d]emonstrate that the issue raised in the contention is material to the findings the N.R.C. must make to support the action that is involved in the proceeding." 10 C.F.R. § 2.309(f)(1)(iv). A showing of materiality is not an onerous requirement, because all that is needed is a "minimal showing that material facts are in dispute, indicating that a further inquiry is appropriate." Georgia Institute of Technology, CLI-95-12, 42 N.R.C. 111, 118 (1995); Final Rule, Rules of Practice for Domestic Licensing Proceedings – Procedural Changes in the Hearing Process, 54 Fed. Reg. 33,171 ( Aug. 11, 1989).

During this proceeding AmerGen has made many concessions regarding the need to do additional UT monitoring in the sandbed region. However, that monitoring is not useful unless AmerGen has appropriate acceptance criteria that ensure that the applicable safety requirements are met. Citizens contend that the age management program currently proposed by AmerGen for the sandbed region suffers from precisely this defect, whereas AmerGen has continued to use the acceptance criteria derived from the GE modeling. Based on the 0.736 uniform thickness prediction by GE, AmerGen has asserted it currently has a margin of 0.064 inches (64 mils). ANC 2 at Figure 21. In contrast, Citizens assert that 0.844 inches should be substituted for 0.736 inches, based on the uniform thickness prediction by Sandia. Because this would not yield any margin, the current approach to acceptance is now obsolete and must be revised to use criteria that are based on accurate and realistic modeling of the drywell shell. Furthermore, the AmerGen Admission, the Sandia Study, and the 2006 exterior UT results undercut AmerGen's belief that the proposed aging management program for the sandbed region will provide reasonable assurance that loss of intended function would be detected before safety requirements are violated during any period of extended operation. See AmerGen Ans., dated January 16, 2007 at 26.

Thus, the new contention raises a number of disputes. These disputes are material because they cut to the heart of relicensing proceedings, which are designed to ensure that applicants demonstrate that their age management regimes can maintain adequate safety margins during any period of extended operation.

## V. This Request Is Timely

Petitioners may add new contentions after filing their initial petition, so long as they act in accordance with 10 C.F.R. § 2.309(f)(2). Entergy Nuclear Vermont Yankee, L.L.C. (Vermont Yankee Nuclear Power Station), LBP-05-32, 62 NRC 813 (2005). The Commission's regulations allow for a "new contention" to be filed upon a showing that:

> (i) The information upon which the amended or new contention is based was not previously available;
> (ii) The information upon which the amended or new contention is based is materially different than information previously available; and
> (iii) The amended or new contention has been submitted in a timely fashion based on the availability of the subsequent information.

10 C.F.R. § 2.309(f)(2)(i)-(iii).

When the ASLB found that AmerGen's new commitment to increase the frequency of monitoring mooted Citizens' initial contention regarding the inadequacy of the proposed UT monitoring for the sandbed, the ASLB allowed Citizens to file a new contention, but required the new contention to be timely in accordance with 10 C.F.R. § 2.309(f). In the Matter of AmerGen Energy Company (License Renewal for Oyster Creek Nuclear Generating Station), LBP-06-16 (slip op. at 8-10), (June 6, 2006). Subsequently, the ASLB found that Citizens had made a timely new contention that the frequency of the UT monitoring was inadequate, because Citizens based their new contention on the new commitment. In the Matter of AmerGen Energy Company (License Renewal for Oyster Creek Nuclear Generating Station), LBP-06-22 (slip op. at 14-20, 28-30) (October 10, 2006).

Further clarifying the law on timeliness, on a motion for reconsideration regarding the rejection of a previous contention about the spatial scope of the UT measurements in the sandbed, the ASLB commented that "the appropriate time for a challenge by Citizens to the spatial scope of AmerGen's UT measurements was promptly after AmerGen had docketed its December commitment [to take UT measurements from the inside of the drywell in the sandbed region]." In the Matter of AmerGen Energy Company (License Renewal for Oyster Creek Nuclear Generating Station), LBP-06-844 (slip op. at 5-6) (November 20, 2006).

Here, the Sandia Study was not available to Citizens until January 15, 2007 and the full results of the external UT testing done in October 2006 did not become available until January 29, 2007. Before the Sandia Study became available, Citizens knew that the acceptance criteria were derived from a GE model using a number of standard factors, including the capacity reduction factor. However, Citizens did not know that, in the opinion of a highly respected national laboratory, the enhancement of the capacity reduction factor used by GE is not justified. In addition, until the full results of the UT testing became available it was unclear whether systematic thinning had been observed in the sandbed. The full results also revealed that the worst case reduction observed was 0.118 inches, casting doubt upon AmerGen's claim that the reduction can be explained solely by a difference in measurement techniques. T1. at 187:4-188:20.

Thus, like Vermont Yankee and in accordance with its rulings in this proceeding, the ASLB should now find that the new contention meets the requirements of 10 C.F.R. § 2.309(f)(2)(i) and (ii) because it is based upon new information that was "not previously available," and is "materially different than information previously available."

Turning to the last element, the Commission interprets the "timely fashion" requirement of 10 C.F.R. § 2.309(f)(2)(iii) as being anywhere from twenty to thirty days from the availability of the new information upon which the new contention is based. In the Matter of Louisiana Energy Services, L.P., LBP 04-826 (June 30, 2005). Because this motion is based on information that became available 21 days ago, it meets the 20 to 30 day requirement of 10 C.F.R. § 2.309(f)(2)(iii).

Finally, NRC Staff and AmerGen may argue that this is a late-field contention, which should meet the requirements of 10 C.F.R. § 2.309(c). This is incorrect, as the ASLB recognized when it stated that when basing new contentions on new commitments "the parties need not address the requirements under 10 C.F.R. § 2.309(c), which apply to 'nontimely filings.' See Entergy Nuclear Vermont Yankee L.L.C. (Vermont Yankee Nuclear Power Station), LBP-06-14, 63 NRC __, __-__ & n.14 (slip op. at 3-7 & n.14) (May 25, 2006)." LBP-06-16, slip op. at n. 12. This is hardly surprising because a contention based on information that was first revealed 20 to 30 days prior to filing is simply not "late-filed." The late-filed standards actually apply to situations where parties attempt to add contentions outside the 20 to 30 day period after material new information emerges.

In addition, even if the 10 C.F.R. § 2.309(c)(1) standard applies, Citizens meet that standard. Most importantly, Citizens have good cause, because they could not have filed the contention before the Sandia Study was published. Second, Citizens are already parties in this proceeding and the request will not delay the proceeding because one contention has already been admitted and new contention is closely related to the admitted contention. Third, Citizens include individuals who live close to the plant and have intense interest in its ongoing safety. Fourth, Citizens comments at the ACRS hearing have already assisted the NRC to develop a fuller record. Finally, the ASLB process is the best way of addressing the issues raised by the proposed contention because it allows for discovery and other NRC processes are now beyond the stage where Citizens input could significantly affect NRC's decisions regarding relicensing.

## CONCLUSION

For the forgoing reasons, the ASLB should grant leave for Citizens to add the proposed new contention and admit the new contention into this proceeding.

Respectfully submitted

Richard Webster, Esq
RUTGERS ENVIRONMENTAL LAW CLINIC
Attorneys for Citizens

Dated: February 6, 2006

**Exhibit ANC 7**

November 9, 2006

To: OC-12 Files

From: George Licina

Subject: Statistical Analysis of Oyster Creek Drywell Thickness Data

**Background**

In 1988, Oyster Creek experienced a problem with corrosion of the exterior of their drywell at the "sand cushion". The problem at that time was the sand cushion got wet and stayed wet, and the painted carbon steel drywell began to corrode. They removed all of the sand, did an enormous amount of calculation to prove they didn't need the sand cushion to disperse the loads from the drywell to the ground, sealed off the steel-concrete interface on the exterior of the drywell to make sure it stayed dry, jack-hammered several trenches in the concrete inside the drywell to permit them to do UT thickness measurements of the steel from the inside, etc. etc. Now that they are applying for license renewal, the issue of the condition of the drywell steel has been reopened. At the most recent the refueling outage (October 2006), they found that the concrete in the trenches was wet (one had 5" of standing water) so the question of the condition of the steel embedded in the concrete comes up once again.

The drywell (see Figure) is a huge (30' diameter or more where it intersects the concrete) but thin steel structure. The portion that is embedded in concrete (much of it has concrete on its interior as well) is basically a hemisphere. The drywell structure itself is shaped like a light bulb (upside down) with the reactor vessel, pumps, piping, etc. inside. The drywell is the secondary or tertiary containment structure for radionuclides (fuel cladding, then the reactor vessel, then the containment). Obviously, the containment and drywell get lots of regulatory scrutiny and attention from the public.

Discussions with Don Warfel, and later with Wayne Choromanski from Exelon indicated that a thorough and statistically based look at the data is required. For example, the UT thickness methods applied in 1986, 1992, and 2006 are all different; the prior examinations (1986 and 1992) were done on bare steel while the 2006 examination was done with a different technique and was done through the coating, plus the questions that always come up regarding whether the exact locations were examined at the different points in time. Further, the limited data from Zone 4 (above the 12'4" elevation; should never have been wet) appears to exhibit a thinning between the 1992 and 2006 inspections. A specific question asked by Don Warfel was whether a bias, based upon the apparent delta ($t_{2006} - t_{1992}$) in that zone, can reasonably be subtracted from all of the deltas to account for the technique differences.

I also reviewed a Tech Eval prepared by Oyster Creek and reviewed by Steve Leshnoff. That Tech Eval includes data in various forms from 1986, 1992, and 2006. It focuses on present thickness with a lesser emphasis on the trends. Most of the evaluation is for data collected for Bays 5 and 17, where the trenches are. The tech Eval concludes that "the Drywell Vessel in the region below the concrete floor at elevation 10'3" may have been corroding at a rate of .002 to .003 inches per year between 1986 and 2006. UT readings below the concrete floor at Elevation 10'3" confirm that all locations meet the required thickness criteria."

I looked at the data as many ways as I could think of to sort out anything systematic (e.g., a bias) between measurements, differences among zones, among bays, and any oddities or obvious outliers. I also developed fits of the data to test for the most appropriate distribution to use and to determine coefficients that would enable quantitative analysis of the statistics.

All data are included in multi-page spreadsheet OC Data-1991-2006-GJL-R1.xls. That spreadsheet processed data assembled and checked by Wayne Choromanski. The second version of the data submittal from Wayne was used. The second version was more complete and also corrected some errors in the reported elevation (Zone) that were included in the initial transmittal.

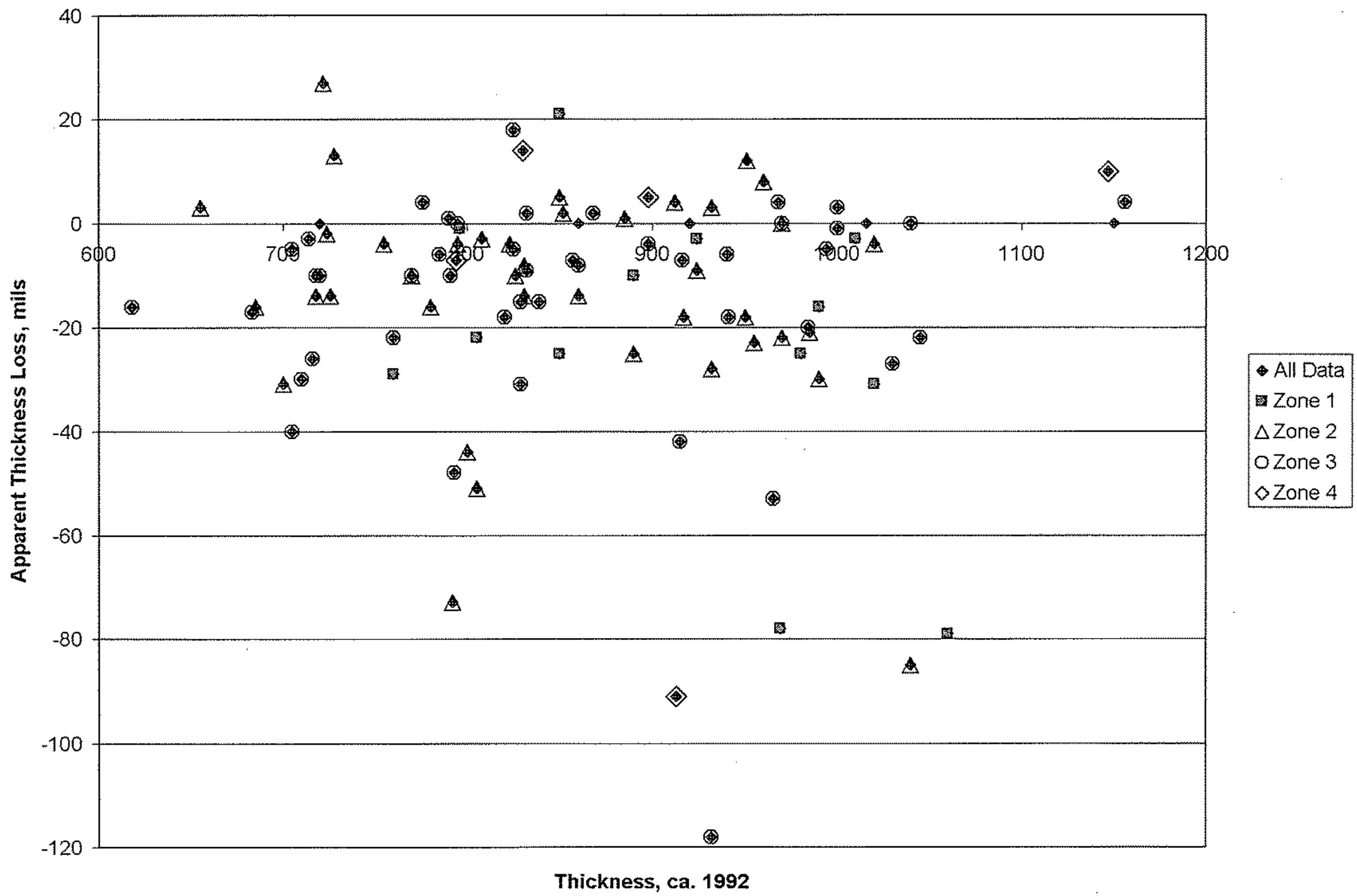
My original focus was on the deltas. I looked at all deltas as a function of "original" (1992) plate thickness and by zone. If the UT technique had a bias, I would have suspected that different absolute values of thickness would show different effects. I also looked at the distribution of delta by zone and by bay. One thing that was clear was the mean delta varied by bay and by zone and that the distribution of deltas looked very much like a normal distribution centered at a small negative value (small metal loss).

I also looked at thickness, primarily at the thickness in 2006. The main thing that I found was that thickness was a strong function of the bay and much less a function of zone.

Finally, I tried to evaluate the statistical distribution. To do that, I ordered the deltas from smallest to largest, and applied a look-up table to assign a parameter PHI. PHI is related to where in a normal distribution the point lies, based on the point's rank. For example, the point that is in the exact middle of the distribution (F = 0.50000; see the CDF tab of the attached spreadsheet) is at the mean (i.e., PHI = 0; which means 0 standard deviations from the mean). The first (lowest value) point defines the extreme of the data we have and will be in the lower tail of the distribution (PHI will be a relatively large negative number). Similarly, the largest value will correspond to a relatively large positive PHI. When the data are plotted as PHI vs. delta, the data generate a reasonably straight line. The better the straight line, the better the fit to the normal distribution. The mean of the distribution is where PHI = 0 and the breadth of the distribution (i.e., how large the standard deviation is) can be determined by how horizontal the curve is. For example, if all of the values were at exactly the same value, that value would obviously be the mean and the standard deviation would be zero (no variation in the data). The CDF plot for the deltas produced a very nice straight line over much of the population, however, the larger negative deltas were the values that destroyed the fit. The best fit line had an $R^2$ value (a perfect fit has $R^2 = 1.000$) was 0.83; not bad but not great. I also drew in my eyeball fit to the well behave data.

When I took the same approach to check whether the 2006 plate thickness data were described by a normal distribution, I got a very nice straight line ($R^2 = 0.98$). The 1992 thickness data also gave a similarly good straight line and that fit showed that the 1992 measurements were thicker at all values of PHI than those from 2006 (i.e., the drywell apparently lost thickness between 1992 and 2006 as would be expected). At the mean (PHI = 0), that difference was about 20 mils of thinning. At PHI = 3 (3 standard deviations from the mean, approximately the 99$^{th}$ percentile, the thickness difference was about -29 mils. At PHI = -3, approximately the 1$^{st}$ percentile, the difference was about 12 mils. That latter observation suggests that the measurements made in 2006 were systematically lower than the those in 1992 by about 12 mils. It can probably be argued that the actual thickness differences based upon subtracting the 2006 thickness from the 1992 thickness actually average 12 mils less than the values reported.

Note that this analysis doesn't say whether the 1992 measurements are better than the 2006 measurements or vice versa; only that the difference between the two has a bias in it.




OCLR00015481

# Exhibit ANC 8

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# AR 00461639 Report

| | | | | | |
|---|---|---|---|---|---|
| **Aff Fac:** | Oyster Creek | **AR Type:** | CR | **Status:** | APPROVED |
| **Aff Unit:** | 01 | **Owed To:** | A5352CAP | **Due Date:** | 06/30/2006 |
| **Aff System:** | 187 | | | **Event Date:** | 03/03/2006 |
| **CR Level/Class:** | 4/D | | | **Disc Date:** | 03/03/2006 |
| **How Discovered:** | H02 | | | **Orig Date:** | 03/03/2006 |
| **WR/PIMS AR:** | | **Component #:** | | | |

## Action Request Details

**Subject:** CALC C-1302-187-5320-024 IS NOT CLEARLY DOCUMENTED

**Description:** Originator: PETER TAMBURRO Supv Contacted: Howie Ray

Condition Description:
Operability Evaluation.
The Oyster Creek Drywell Vessel is capable of performing all it design basis functions. The deficiency raises concerns with the clarity of the calculation and not with its conclusions.

Calculation C-1302-187-5320-024 is the Only Safety Related calculation that demonstrates that the 1992 as left Drywell Vessel thicknesses in the former Sandbed region meets design basis. Drywell Vessel Thickness was measured by visual, mechanical and UT inspection after sand and corrosion byproducts were removed but prior to coating application.

In general this calculation does not meet the requirements of CC-AA-309-1001 Section 4.1.3 which has the following requirements:

Provide analysis sufficiently detailed as to purpose, method, assumptions, design input, references and units, such that a person technically qualified in the subject can review and understand the analysis and verify the adequacy of the results without recourse to the originator.

Please note this calculation was generated under the GPUN Calculation Procedure EP-006. However this GPUN procedure contained the same requirement.

For example; four qualified Engineers with at least 15 years experience reviewed this calculation. None could clearly understand how the calculation methodology and acceptance criteria demonstrate the conclusions of the calculations.

Given that this calculation provides design basis for Drywell Vessel thickness in the former Sandbed region it is recommended Engineering revise this calculation so that it can be clearly understood.

The following are specific deficiencies with this calculation

Item 1 -
The measured Drywell Vessel thickness inputs for this calculation are not properly documented and traceable to the original NDE Data Sheets. The thickness values are reproduced in the calculation but there is no reference to the original data sheets, which documented the inspection results. This deficiency does not meet CC-AA-309 Step 4.3.1 and CC-AA-309-1001 and CC-AA-309-1001 Sections: 4.1.3 and 4.3.7. Please note this calculation was generated under the GPUN Calculation Procedure EP-006. However this GPUN procedure contained the same requirement.

Item 2 -

The calculation does not provide a methodology section that documents how the calculation is performed. The methodology is barely described in the calculation section. This deficiency does not meet CC-AA-309 Step 4.3.1 and CC-AA-309-1001 Sections: 4.1.3 and 4.3.7. Please note this calculation was generated under the GPUN Calculation Procedure EP-006. However this GPUN procedure contained the same requirement.

Item 3 -
The calculation develops a term called evaluation thickness based on actual measured thicknesses. This value is then compared to the design basis minimum required uniform thickness for the sandbed region of 0.736. The method in which evaluation thickness is developed is poorly explained. In addition the justification as to why it is acceptable to compare the evaluation thickness to the design basis required minimum uniform thickness of 0.736 is not documented in the calculation nor is there a reference to an industry standard.

Item 4 -
The calculation uses a Local Wall Acceptance Criteria. This criteria was developed by GE and is referenced in the calculation. The criteria can be applied to a small area (less than 12 by 12), which are less than 0.736 thick so long as the small area is at least 0.536 thick. In developing the criteria GE developed an ANSYS model of the Drywell Vessel. The model included a 12 by 12 area that was 0.536 thick at the weakest location (with respect to buckling) of the drywell. The 12 by 12 area was then surrounded by a larger 24 by 24area that transitioned from 0.536 to 0.736. The remaining thickness of the Drywell Vessel was then modeled at a uniform thickness of 0.736.

Both the GE referenced report and calculation C-1302-187-5320-024 state that in this case the ultimate theoretical buckling capacity of the drywell vessel shell is reduced by 9.5%. Calculation C-1302-187-5320-024 contains no statement or justification that a 9.5% reduction in buckling load still meets code allowables.

Item 5 -
The calculation uses a Local Wall Acceptance Criteria. This criteria can be applied to small areas (less than 12 by 12), which are less than 0.736 thick so long as the small 12 by 12 area is at least 0.536. However the calculation does not provide additional criteria as to the acceptable distance between multiple small areas. For example, what is the minimum required linear distances between a 12 by 12 area thinner than 0.736 but thicker than 0.536 and another 12 by 12 area thinner than 0.736 but thicker than 0.536.

The actual data for two bays (13 and 1) shows that there are more than one 12 by 12 areas thinner than 0.736 but thicker than 0.536.

Item 6 -
The calculation uses a Very Local Wall Acceptance Criteria. This criteria can be applied to small areas (less than 2 1/2 in diameter), which are less than 0.736 thick so long as the very small area is at least 0.49 thick and remaining area surrounding the very small area has a uniform thickness of greater than 0.736. However the calculation does not provide additional criteria as to the acceptable distance between multiple very small areas. For example what is the minimum required linear distances between a 2 diameter area thinner than 0.736 but thicker than 0.49 and another 2 diameter area thinner than 0.736 but thicker than 0.49.

The actual data for two bay (13 and 1) shows that there are more than one 2 diameter areas thinner than 0.736 but thicker than 0.490.

Item 7 -
The calculation uses a Very Local Wall Acceptance Criteria. This criteria can be applied to small areas (less than 2 1/2 in diameter), which are thinner than 0.736 thick so long as the very small area is at least 0.49 thick and remaining area surrounding the very small area has a uniform

thickness of greater than 0.736.

The criteria was obtained from a second calculation (C-1302-24-5320-071), which is referenced. However C-1302-24-5320-071 does a poor job of developing the basis of the criteria and does not state whether the 0.49 criteria is acceptable for buckling loads.

Item 8 -
Calculation Section 5 Sub Section Bay 1 documents that there are 8 small areas in Bay 1 all less than 2 1/2 diameter, thinner than 0.736 but thicker than 0.536. These 8 small areas are scattered in a larger area, which is approximately 25 wide and 50 long. The calculation then selects 2 of the small areas that are closest together and combines these into a 4 by 4 area. The thickness of this 4 by 4 area is then compared to the Local Wall Acceptance Criteria, which is applicable for area up to 12 by 12. The small 4 by 4 area then is judged to be the bounding area for the larger 25 by 50 area. This is then used as justification that the larger 25 by 50 area is acceptable.

However, the calculation does not reconcile between the established criteria, for a 12 by 12 area, and the actual data, which has areas thinner than 0.736 scattered over a 25 by 50 area.

Item 9 -
Calculation Section 5 Sub Section Bay 1 documents that there are 8 small areas in Bay 1 all less than 2 1/2 diameter, thinner than 0.736 but thicker than 0.536. These 8 small areas are scattered in a larger area that is approximately 25 wide and 50 long. The calculation then states that the surrounding area around the 25 by 50 area has a uniform thickness of at least 0.800 inches. However the calculation provides no reference or assumption that justifies this input. The NDE datasheets of Bay 1 do not clearly substantiate this design input.

Item 10 -
Calculation Section 5 Sub Section Bay 13 documents that there are 9 small areas in Bay 13 all less than 2 1/2 diameter, thinner than 0.736 but thicker than 0.536. These small areas are scattered in a larger area, which is approximately 25 wide and 50 long. The calculation then selects a 6 by 6 area within this region that is 0.677. This area is then compared to the Local Wall Acceptance Criteria, which is applicable for area up to 12 by 12. The smaller 6 by 6 area then is judged to be the bounding area for the larger 25 by 50 area. This is then used as justification that the large 25 by 50 area is acceptable.

However, the calculation does not reconcile between the established criteria, for a 12 by 12 area, and the actual data, which has areas thinner than 0.736 scattered over a 25 by 50 area.

Item 11 -
Calculation Section 5 Sub Section Bay 13 documents that there are 9 small areas in Bay 13 all less than 2 1/2 diameter, thinner than 0.736 but thicker than 0.536. These 9 small areas are scattered in a larger area that is approximately 25 wide and 50 long. The calculation then states that the surrounding area has a uniform thickness of at least 0.800 inches. However he calculation provides no reference or assumption that justifies this input. The NDE datasheets of Bay 13 do not clearly substantiate this design input.

Immediate actions taken:
Informed my Supervisor

Recommended Actions:
Listed below are recommendations for the calculation revision:

1) The calculation should be revised to properly reference the NDE data sheets. Critical data sheets should be attached to the calculation.

2) The calculation should have a methodology section that documents how the data is treated. Specifically, how the evaluation thickness is developed and why it s acceptable to compare the evaluation thickness to the criteria of 0.736. It would be very helpful to site an industry standard that prescribes and justifies this methodology.

3) The calculation uses a Local Wall Acceptance Criteria. The basis states that the criteria is associated with a 9.5% reduction is the ultimate theoretical buckling capacity of the drywell vessel shell. Revise calculation C-1302-187-5320-024 to state that a 9.5% reduction in buckling load still meets code allowables.

4) The calculation uses a Local Wall Acceptance Criteria. This criteria can be applied to small areas less than 12 by 12. Revise the calculation with additional criteria that defines the minimum acceptance distance between multiple local thin areas in which the Local Wall Acceptance Criteria can be applied.

5) The calculation uses a Very Local Wall Acceptance Criteria. This criteria can be applied to small areas less than 2 1/2 in diameter. Revise the calculation with additional criteria that defines the minimum acceptance distance between multiple local thin areas in which the Local Wall Acceptance Criteria can be applied.

6) The calculation uses a Very Local Wall Acceptance Criteria. This criteria can be applied to small areas less than 2 1/2 in diameter. Revise the calculation to justify that this criteria is applicable to the buckling loads.

7) The calculation documents that there are 8 small areas in Bay 1 and 9 small areas in bay 13, all less than 2 1/2 diameter, thinner than 0.736 but thicker than 0.536. In both bays the small areas are scattered in an area approximately 25 wide and 50 long. Revise the calculation to clearly demonstrate that these two areas meet design basis. The revision should clearly outline the methodology that is applied and the acceptance criteria.

What activities, processes, or procedures were involved?
License Renewal Review of the Calculation

What are the consequences?
Poor Design Basis Documentation

Were any procedural requirements impacted?
Yes - CC-AA-309-1001

Were there any adverse physical conditions?
None

List of knowledgeable individuals:
Howie Ray and Tom Quintenz

Operable Basis:

Reportable Basis:

SOC Reviewed by: RALPH C LARZO 03/06/2006 19:50:06 CST
SOC Comments:
3/6/2006 RCL: ACIT assigned to revise calculation C-1302-187-5320-024. Close to ACIT.

## Trend Codes

| TC1 | TC2 | TC3 | Proc | Org | Rank |
|---|---|---|---|---|---|
| PWP | WPST | 3P | CC102 | ENDE | H |
| HP | I | T | CC102 | ENDE | |
| F-ENG | E-TR | * | CC102 | ENDE | |

## Assignments

| | | | | | |
|---|---|---|---|---|---|
| **Assign #:** | 01 | **Assigned To:** | | **Status:** | COMPLETE |
| **Aff Fac:** | Oyster Creek | **Prim Grp:** | ACAPALL | **Due Date:** | 03/08/2006 |
| **Assign Type:** | TRKG | **Sec Grp:** | | **Orig Due Date:** | µµ/µµ/µµµµ |
| **Priority:** | | | | | |
| **Schedule Ref:** | | | | | |
| **Unit Condition:** | | | | | |
| **Subject/Description:** | CALC C-1302-187-5320-024 IS NOT CLEARLY DOCUMENTED | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Assign #:** | 02 | **Assigned To:** | U777P0T | **Status:** | ACC/ASG |
| **Aff Fac:** | Oyster Creek | **Prim Grp:** | A5352NESDM | **Due Date:** | 06/30/2006 |
| **Assign Type:** | ACIT | **Sec Grp:** | | **Orig Due Date:** | 06/30/2006 |
| **Priority:** | | | | | |
| **Schedule Ref:** | | | | | |
| **Unit Condition:** | | | | | |
| **Subject/Description:** | Revise calculation C-1302-187-5320-024 to address issues identified in this IR. | | | | |

UNITED STATES OF AMERICA
BEFORE THE NUCLEAR REGULATORY COMMISSION
OFFICE OF THE SECRETARY

| | | |
|---|---|---|
| In the Matter of | ) | |
| | ) | Docket No. 50-0219-LR |
| AMERGEN ENERGY COMPANY, LLC | ) | |
| | ) | ASLB No. 06-844-01-LR |
| (License Renewal for the Oyster Creek | ) | |
| Nuclear Generating Station) | ) | February 6, 2007 |
| | ) | |

CERTIFICATE OF SERVICE

I hereby certify that I caused the foregoing motion for leave to add a contention and motion to add a contention together with two exhibits to be sent this 6th day of February, 2007 via email and U.S. Postal Service, as designated below, to each of the following:

Secretary of the Commission (Email and original and 2 copies via U.S Postal Service)
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Signed: Richard Webster
Richard Webster

Dated: February 6, 2007