RAS 14183

Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Amergen Energy Company
Oyster Creek Evidentiary Hearing

Docket Number: 50-0219-LR; ASLBP No. 06-844-01-LR

Location: Toms River, New Jersey

Date: September 25, 2007

Work Order No.: NRC-1780 Pages 335-601

NEAL R. GROSS AND CO., INC.
Court Reporters and Transcribers
1323 Rhode Island Avenue, N.W.
Washington, D.C. 20005
(202) 234-4433

Template=SECY-032

SECY-02

UNITED STATES NUCLEAR REGULATORY COMMISSION

- - - -

ATOMIC SAFETY AND LICENSING BOARD

- - - -

EVIDENTIARY HEARING

IN THE MATTER OF:	
AMERGEN ENERGY COMPANY, LLC	Docket No.: 50-0219-LR
(License Renewal for Oyster Creek Nuclear Generating Station)	ASLBP No.: 06-844-01-LR

Ocean County Administrative Building

Room 119

101 Hooper Avenue

Toms River, New Jersey 08754

Tuesday,

September 25, 2007

The above-entitled matter came on for hearing, pursuant to notice at 8:04 a.m.

BEFORE:

THE HONORABLE E. ROY HAWKENS, Chairman

THE HONORABLE PAUL B. ABRAMSON

THE HONORABLE ANTHONY J. BARATTA

APPEARANCES:

On Behalf of the Amergen Energy Company, LLC:

DONALD J. SILVERMAN, ESQ.

ALEX POLONSKY, ESQ.

KATHRYN SUTTON, ESQ.

RAPHAEL P. KUYLER, ESQ.

Of: Morgan Lewis & Bockius, LLP

1111 Pennsylvania Avenue, NW

Washington, DC 20004

(202) 739-5502

On Behalf of the NRC:

MARY BATY, ESQ.

MITZI YOUNG, ESQ.

US Nuclear Regulatory Commission

Office of the General Counsel

Mail Stop - O-15 D21

Washington, DC 20555-0001

On Behalf of Citizens:

RICHARD WEBSTER, ESQ.

JULIA LEMENSE

Rutgers Environmental Law Clinic

123 Washington Street

Newark, NJ 07102-3094

(973) 353-5695

TABLE OF CONTENTS

EXHIBIT	IDENTIFIED	RECEIVED

P R O C E E D I N G S

8:03 A.M.

CHAIRMAN HAWKENS: Good morning. We are on the record. Welcome back again this morning. This is a hearing in the case of AmerGen Energy Company, Docket No. 50-0219-LR. For the benefit of those in the audience who were not with us yesterday, AmerGen in this case has applied to renew its operating license at Oyster Creek Nuclear Generating Plant for a 20-year period and AmerGen's application is opposed by six groups. They refer to themselves collectively as Citizens.

The issue that Citizens has raised is that they argue AmerGen's commitment to take ultrasonic testing measurements of the width of the drywell shell every four years during the renewal period is not sufficient to ensure an adequate safety margin in that shell.

My name is Roy Hawkens and I'm joined by Judge Tony Baratta, Judge Paul Abramson. We're members of the Atomic Safety and Licensing Board Panel, a judicial component of the Nuclear Regulatory Commission. It's our job to resolve the issued raise by Citizens.

I indicated yesterday that prior to the

commencement of the hearing, the Board had received three rounds of legal briefs from parties, three rounds of written testimony from their expert witnesses and numerous exhibits, over 125 exhibits were submitted into evidence.

Yesterday, we heard opening statements by parties' counsel. Following that we started questioning their expert witnesses. Each party has designated the identity and the number of their expert witnesses. AmerGen and the NRC staff have several expert witnesses. Citizens elected to go with a single expert witness, Mr. Hausler. We have six topics that the Board identified that it was interested in exploring. We got through two of those topics yesterday. Those two topics were the drywell physical structure, history, and the commitments by AmerGen. The second topic was the acceptance criteria. The third topic, we got to it in a very advanced stage of discussion was available margin, but we're going to finish up on that topic today and we have three additional topics to discuss. They are sources of water, the epoxy coating, and future corrosion.

Would counsel for the parties please identify themselves for the record?

MR. POLONSKY: This is Alex Polonsky with Morgan, Lewis & Bockius, counsel to AmerGen.

MR. SILVERMAN: Don Silverman, also with Morgan, Lewis & Bockius.

MS. SUTTON: Kathryn Sutton, Morgan, Lewis & Bockius.

MS. BATY: For the NRC staff, Mary Baty and Mitzi Young.

MR. WEBSTER: For Citizens, I'm Richard Webster, Eastern Environmental Law Center. I teach at Rutgers Environmental Law Clinic.

CHAIRMAN HAWKENS: Thank you. And is it true that the expert witnesses you brought to today's session are the same witnesses that were introduced yesterday?

MR. POLONSKY: This is Mr. Polonsky for AmerGen. For Panel 3 those witnesses have remained the same.

CHAIRMAN HAWKENS: The witnesses, I believe you introduced 14 yesterday. They remain the same?

MR. POLONSKY: Yes, actually it was 15 with the addition of Dr. Mehta from GE. Yes, those witnesses remain the same and they should all be present here right now and they were sworn yesterday.

CHAIRMAN HAWKENS: And we will introduce them as we go from topic to topic.

NRC staff, is that correct, you also have the same witnesses from yesterday?

MS. BATY: Yes.

CHAIRMAN HAWKENS: Thank you. I see Dr. Hausler. He is for Citizens.

Before paneling our expert witnesses, are there any evidentiary matters that need to be raised.

Amergen?

MR. POLONSKY: None, Your Honor.

CHAIRMAN HAWKENS: NRC staff?

MS. BATY: No.

MR. WEBSTER: Maybe I misunderstood. I had a discussion with AmerGen's counsel about the availability of written records for the UT scanning.

MR. POLONSKY: There was some question after Mr. Jon C. or Chris Hawkins gave his testimony yesterday about confirmatory UT measurements taken in the external sand bed region during the 2006 refueling outage. There was some question whether that follow up or confirmatory UT measurement thickness, measurement readings resulted in any additional documentation that would be in addition to what had already been previously disclosed to the parties.

We confirmed with Mr. Hawkins that no record, written record, was made of those confirmatory readings at the time and so it is AmerGen's position that the documentation that's already been produced and the exhibits already submitted accurately represent the documentation that was taken by Mr. Hawkins.

MR. WEBSTER: And Citizens is very happy to stipulate to that fact that the documents in the record reflect the records taken for the external UT measurements.

CHAIRMAN HAWKENS: Thank you. Are there any other evidentiary matters?

Mr. Webster?

MR. WEBSTER: Well, we're still awaiting confirmation on one document which we expect. AmerGen said they would get it to us today.

CHAIRMAN HAWKENS: All right, I note that two of the parties provided Ms. Wolf with additional proposed questions which she gave to the Board, the confidential questions NRC staff and Citizens. Did AmerGen provide any additional questions?

MR. POLONSKY: We did not provide any, Your Honor, and we don't believe any are necessary.

CHAIRMAN HAWKENS: All right, thank you.

Let's empanel the third panel please and would each party please introduce their expert witnesses on this panel?

MR. POLONSKY: This is Mr. Polonsky for AmerGen. For Panel 3 we have Mr. Fred Polaski, Mr. Peter Tamburro, Dr. David Gary Harlow, Mr. Martin McAllister and behind me, Mr. Julien Abramovici.

MS. BATY: For the NRC staff, we have Dr. Davis, Dr. Hartzman, Hansraj Ashar, Arthur Salomon, and Tim O'Hara.

MR. WEBSTER: And for Citizens, we have the ubiquitous Dr. Hausler.

CHAIRMAN HAWKENS: Thank you. The witnesses are reminded they were sworn yesterday and they do remain under oath or affirmation for the testimony they will provide today.

For the benefit of members of the audience who were not with us yesterday, and as a reminder to counsel, under the informal hearing procedures, it is the Judges who are tasked with doing the questioning. We've had the benefit of written suggested questions by the counsel and we do appreciate that. We've also had the benefit, as I indicated earlier, of the very thorough briefing and reams of documents and expert testimony already. So this is the Board's opportunity

really to pursue the line of questioning where issues remain in their own mind.

And regulations do provide that no party may submit proposed questions to the Board except upon request by and at its sole discretion of the Board. So they're reminded that interjections should be few. To the extent counsel does raise a question and is not interrupted by a Judge and requested to refrain from questioning, the other counsel may assume, by inference, that the Board is permitting that individual, that counsel to raise a question. So I would expect questioning to be rare and objections to be even rarer. With that in mind, let's proceed.

JUDGE BARATTA: In response to the Board's questions, there was a statement or there was a question concerning providing a table which showed the 95 percent confidence interval for all the data. AmerGen, I believe, responded that they had not only calculated that interval for the 2006 data, however, in the discussion yesterday, it was mention of projections to determine the thickness in the future. That's how you came up with that .736 thickness and that was based on a 95 percent confidence estimate. I wasn't sure what the 95 percent referred to.

Could somebody respond to that as the --

were there other data, earlier data like the 1980s data that was analyzed to obtain a confidence interval?

MR. TAMBURRO: This is Peter Tamburro. Prior to 1992, when we removed the sand, we did apply a 95 percent confidence interval on the curve fit of the mean over time. The averages of each grids were trended over time. We then established a curve fit of those averages over time. We performed statistical tests on the curve fit to ensure that the curve meets the data with 95 percent confidence. Then we calculated a lower, 95 percent confidence interval. This is a curve that bounds the original curve fit with 95 percent confidence, Your Honor.

JUDGE BARATTA: And is that provided any place in any of the exhibits?

MR. TAMBURRO: In the ACRS testimony there is a --

JUDGE BARATTA: It's Exhibit 40, I think, is that correct?

(Pause.)

MR. WEBSTER: I think page 79 gives a schematic.

MR. TAMBURRO: That's AmerGen Exhibit 40 which is the January 18th ACR presentation. Starting

at page 77, Your Honor.

JUDGE BARATTA: Seventy-seven?

MR. TAMBURRO: Page 77 provides a schematic on the trending. The points represent the average of the grids and the Y axis is the thickness. If you go to page 78.

MR. POLONSKY: Mr. Tamburro, hang on. Just a clarification.

Judge Baratta, are you looking for how 95 percent confidence interval was applied prior to 1992?

JUDGE BARATTA: Well, I was curious as to -- in response to the Board's questions, there was a statement made that the confidence interval was not calculated. And it appears that that was done, taking this curve, at least, that that's what I'm trying to get at is was it or was it not calculated and if so, what did it show?

MR. POLONSKY: And I was just trying to clarify so that you get an answer in the proper time frame of what you're looking for, that's all.

MR. TAMBURRO: Prior to 1992, we calculated confidence intervals on the corrosion rate because there was a large corrosion rate. After 1992, with respect to the corrosion rate, we did not calculate the confidence interval because we could not

establish corrosion rate.

JUDGE BARATTA: To obtain that 95, specifically, how was the confidence interval calculated and what was it calculated on? Could you go through the details of that?

MR. TAMBURRO: I would like to. I was going to, if I could continue with the --

JUDGE BARATTA: Sure, yes. Please. I thought you were done, sorry. Didn't mean to cut you off.

MR. TAMBURRO: Again, I apologize. Again, on page 78 of Exhibit 40, it's a schematic. The round circles are the mean. The squares around the round circles are the standard error and then the line is a curve fit using least squares fit. We then performed a test on that curve fit using the f-test to 95 percent confidence. If the curve fit met the data with 95 percent confidence, prior to 1992, the staff -- we then concluded that the slope of that curve was the corrosion rate.

Once that slope was established as being indicative of corrosion, we went, if you look at page 79, we calculated the lower 95 percent confidence interval on the curve fit. That confidence interval takes into account how many data points, how many

means the standard error and the duration that the data was collected.

The projections prior to 1992 when we had corrosion were then the intersect of the 95 percent confidence interval with the time of interest or the minimum thickness.

JUDGE BARATTA: The more recent data that you've obtained, have you done a detailed analysis of variance to see whether or not the means are in fact the same. In other words, there's no corrosion rate occurring?

MR. TAMBURRO: Yes, sir.

JUDGE BARATTA: Where is that document?

MR. TAMBURRO: Exhibit 20, AmerGen Exhibit 20 is a calculation which evaluated all of the internal grids.

JUDGE BARATTA: Do you have any comments that you want to make about it?

MR. TAMBURRO: Yes, sir. The exhibit, this calculation concludes that there is no statistical observable corrosion. We only had four data points since 1992. Although the data is fairly well behaved, the variance on the data is large enough to where we cannot pick up the corrosion rates we would have expected, which would be less than the mil

per year, if any. Therefore, we did not have enough data to confirm an observable corrosion rate.

JUDGE BARATTA: Did you get an estimate of what the minimum observable corrosion rate would be based upon the variance, did you not?

MR. TAMBURRO: Yes, sir. We performed a study based on a Monte Carlo simulation using the bounding area, grid 19A, using the mean of that bounding area, 1992, and the variance as measured by the standard area. That simulation told us that a rate of 6.9 mils per year would have been observable with only four observations from 1992 to 2006. Any rate less than 6.9 mils per year would have not be observed and would have been within the scatter of the data.

Therefore, we have based our next inspection based on that 6.9 mils per year as if this hypothetical rate, as if it were really there and we are inspecting prior to any hypothetical degradation in the dry well. We will inspect prior to that time.

JUDGE BARATTA: Now how did you obtain the four year? You say it was based on the hypothetical rate of 6.9 mils? How was the four year obtained, the four year interval obtained?

MR. POLONSKY: I think maybe there's some

confusion, Your Honor. The four year UT frequency is for the license renewal period. Mr. Tamburro I think is talking about the next inspection in 2008, which would have been two years later.

MR. TAMBURRO: Independent of our commitments, this calculation was performed and at the limiting location with this highly conservative corrosion rate, we would have not violated 736 criteria until, I believe, 2014. I need to review this to give you a better date.

JUDGE BARATTA: Go ahead. Feel free to go ahead and do that. Let me just ask while you're doing that Dr. Hausler, do you have any comments on what you heard?

DR. HAUSLER: I have a question. I have a question. I was wondering if in the correlation calculation of the old data, the means were used for the correlation or the means of the individual averages or the lower 95 percent confidence limit?

JUDGE ABRAMSON: Before we go too far down that path and spend a lot of time, let's all remember that those calculations were only used to develop the .736 criteria, that they have no other meaning. Is that right, Mr. Tamburro? That slope was used to come up with a .736, which was your estimate of where you

would be in the worst case?

MR. TAMBURRO: Yes, sir. And that was the lower curve, the lower 95 percent confidence, so not the curve fit.

JUDGE ABRAMSON: And that has no significance here other than it is the number that they use to come up with a guidance to General Electric, tell them what to use for a fully, a uniformly degraded shell. So while it is nice to have this academic discussion, we're spinning wheels.

MR. WEBSTER: Judge Abramson, I think it was, maybe I'm wrong, but I thought it was also used to calculate the measurement interval.

MR. POLASKI: This is Fred Polaski. I think we need to be clear, like Judge Abramson is saying, is what went on before 1992 is totally different than what happened after 1992. Before 1992, there was corrosion occurring and the previous owner was doing calculations of projecting corrosion rates based on actual data and things that were going on and that's how they projected with the lower 95 percent confidence of 736 mils.

After 1992, the data radically changes because there is no corrosion occurring and so the analysis takes on a totally different approach because

you're getting essentially zero corrosion rate when you look at the actual measurement data that was taken. But AmerGen does do conservative calculations to project forward a, you know, 95 percent lower corrosion rate that could occur to look at what would the interval be that we could go to before we would exceed 736 if corrosion was occurring.

JUDGE ABRAMSON: And that was the Monte Carlo calculations and the statistics had indicated that you couldn't detect anything less than 6.9 mils, do you just used the worst case scenario assuming it would be as bad as you could not detect. Is that --

MR. TAMBURRO: Yes.

MR. POLASKI: That's correct.

MR. TAMBURRO: Exhibit 40, page 86, provides, which was the ACRS presentation, provides the results of that study. And in the most limiting locations were 19A and 17D. If one were to project forward that this very high, hypothetical, unrealistic corrosion rate from 2006, we would not reach the minimum required thickness of .736 until 2016.

JUDGE BARATTA: The technique that was used there was a Monte Carlo sampling from the distributions of the mean of each data point.

MR. TAMBURRO: Yes, sir.

JUDGE BARATTA: That's how you did that as opposed to just a curve fit like you did previously, correct?

MR. TAMBURRO: Yes, sir.

MR. POLASKI: I'd also like to point out that that in that analysis when we did that, we did that for 19A, is that the correct one, Pete?

MR. TAMBURRO: We did them for all. The two bounding grids are 19A and 17D.

MR. POLASKI: 17D. But when you look at the overall data, I mean this is very hypothetical. Is that corrosion would be going on on only that location and not show up. You've got 19 locations we're monitoring and we're not seeing any corrosion on any of those locations in the sand bed region. That's why we believe, you know, as Mr. Tamburro said, this is hypothetical and it's very conservative bounding type analysis.

JUDGE BARATTA: Would you say -- I think you said already that if you, in fact, do statistical tests on the means, there is no statistically significant difference between those, is that correct?

MR. TAMBURRO: Yes, sir.

JUDGE BARATTA: So that basically backs up what you've said.

MR. TAMBURRO: Yes, that's correct.

JUDGE BARATTA: Dr. Hausler, do you have any comments on that?

DR. HAUSLER: I would just like to add that these data and the 6.6 NPY actually refer to the grid measurements. And I believe we have established yesterday that that is not likely the place where the most corrosion will occur in the future.

JUDGE ABRAMSON: I have three. Actually, my first question is in the nature of a request of Citizens. Yesterday, Dr. Hausler mentioned briefly and I think, you, Mr. Webster, supported it, that Citizens has raised an issue of how much remaining margin there is for the pressure failure. Would you -- can you provide for us where in the testimony you have raised this? You don't need to do it right away, just give it to us by noon today or something like that. We would just like to know where in the prefiled testimony you've raised this so we can take a closer look at it.

MR. WEBSTER: Certainly. I think it was in response to the Board's request on extreme value statistics.

JUDGE ABRAMSON: Thank you. That's my first request. My second request is Dr. Mehta, once

again, would you come up, please?

Dr. Mehta, we heard yesterday a lot about the GE calculations. As I understand it, so the record is perfectly clear, GE did two types of calculations, one assuming that the entire drywell shell was degraded to .736 and looked to see what safety margin that would provide. Is that correct?

DR. MEHTA: Yes, Your Honor.

JUDGE ABRAMSON: And the other was that and superimposed on top of that this tray of additional erosion at the midpoint between the downcomers. Is that correct?

DR. MEHTA: Yes, Your Honor.

JUDGE ABRAMSON: Okay, and those are the only calculations you've done. You have not, GE has not been asked to analyze anything that looks like -- -- estimates the current configuration, i.e., one inch, 1.15 inch most everywhere with degradation as measured. Is that correct?

DR. MEHTA: That is correct, sir.

JUDGE ABRAMSON: You've calculated for the uniform degradation of .736 that the safety margin would be 2.0. And I think you said yesterday you would expect if you did the as measured or current configuration, you'd get -- you would get a higher

safety margin. Am I accurately remembering that?

DR. MEHTA: Yes, sir. That is my engineering judgment. That's what I stated.

JUDGE ABRAMSON: Well, you're the only one here who's done this sort of work, so we're sort of stuck asking you or stuck -- we're happy to have you here to answer the question.

But okay, that's -- I just wanted to make sure we were all on the same page, that in fact, you've done two very hypothetical calculations which are being used by the Applicant and the staff as bounds for when this shell would reach certain criteria that are called the current licensing basis. But we've never analyzed, nobody has analyzed what the buckling safety factor would be for the actual configuration. Is that correct?

DR. MEHTA: That is correct, sir.

JUDGE ABRAMSON: Thank you. The next one is for Dr. Harlow who is not related to the famous Harlow from Los Alamos National Lab, I'm told.

Dr. Harlow, we heard a lot of testimony yesterday about the sparseness of this data. And yet we're using this data, the Agency is using the data to try to confirm and the Applicant is using the data to establish that this drywell shell is not approaching

either of these failure criteria.

Can you just take a few minutes and give us your view on how statistically one can or should use this data and whether the approach taken by the Applicant of looking at a few points and seeing whether they fit under the tray. Is there a rational approach when there's a limited amount of data?

DR. HARLOW: So I'm assuming you're talking about the external data or the internal or both?

JUDGE ABRAMSON: Let's talk about -- well, first of all, the internal data is what -- let me come back to Mr. Tamburro.

Which data is being used to determine whether you're approaching the -- either of these buckling criteria?

MR. TAMBURRO: The internal data is being used for comparison to the uniform thickness.

JUDGE ABRAMSON: Okay.

MR. TAMBURRO: And is being used to demonstrate margin.

JUDGE ABRAMSON: It's being used to demonstrate margin vis-a-vis the uniform degradation?

MR. TAMBURRO: Yes, sir.

JUDGE ABRAMSON: And what data is being

used to demonstrate compliance?

MR. TAMBURRO: The external data was used to demonstrate compliance with the local buckling criteria.

JUDGE ABRAMSON: So let's focus on the external data because I think we understand that it is not uniformly degraded, the .736. There's what, 90 percent, 95 percent of this shell is not degraded at all? Give me a ballpark estimate, Mr. Tamburro. What percentage is not corroded?

MR. TAMBURRO: A large percentage, Your Honor, greater than 80 percent.

MR. WEBSTER: Not corroded? Does that mean not corroded at all, no wall thickness loss whatsoever?

JUDGE ABRAMSON: We've taken -- you've taken measurements in some areas, right?

MR. TAMBURRO: Yes, sir.

JUDGE ABRAMSON: And in those areas where in the sand bed region you observed material corrosion?

MR. TAMBURRO: Yes, sir.

JUDGE ABRAMSON: Perhaps I can rephrase this question. What percentage of the shell does not show material degradation? What percentage is still

over an inch thick, let's say?

MR. TAMBURRO: In my estimation, over 80 percent.

MR. WEBSTER: Judge, could we clarify that within the sand bed region?

JUDGE ABRAMSON: No, no. The entire shell.

MR. WEBSTER: Okay.

JUDGE ABRAMSON: And the reason I'm interested is because the uniform degradation calculation, as soon as the entire shell is thinned. I'm just trying to get a handle on it.

MR. TAMBURRO: Your Honor, I misunderstood the question. I thought you were only talking about the sand bed.

JUDGE ABRAMSON: No.

MR. TAMBURRO: If you're talking about the entire drywell, then 95 percent would be more appropriate in my opinion, a more appropriate --

MR. WEBSTER: Judge, I think maybe there is also some misunderstanding. I think the GE analysis does it, assumes .736 in the sand bed region, not over the whole shell.

JUDGE ABRAMSON: Dr. Mehta, which way is it?

DR. MEHTA: Your Honor, in the sand bed region, we used 736 mils. The rest of the other areas were different thicknesses.

JUDGE ABRAMSON: Okay, I'm glad we got that clarified. So the uniform degradation is not the whole shell, it's just in the sand bed region.

DR. MEHTA: That is correct, sir.

JUDGE ABRAMSON: So in any case, so let's come back and let's address what you think is the situation of degradation in the sand bed region. What percent, and now I can see why Mr. Webster said wait a minute, it's not such a big number. What percentage of the sand bed region does the Applicant estimate is not materially degraded, say still remains greater than an inch?

MR. TAMBURRO: Okay, my previous 80 percent. I was assuming that you were talking about within the 800 to 900 hundred mil range. If you're saying what percentage of the sand bed is still at its nominal thickness --

JUDGE ABRAMSON: Or near.

MR. TAMBURRO: Or near its nominal thickness then there are four bays which have evidence of no wastage at all. So 50 percent would have no wastage.

JUDGE ABRAMSON: And other bays have a variation of ways of degradation, and we've heard about that.

MR. TAMBURRO: Yes, sir. That's why I originally said 80 percent.

JUDGE ABRAMSON: So anyway, the point I would like to clarify for the record is I don't, it seems to me that nobody, and I thought I heard Citizens say this, nobody argues we're really approaching the uniform degradation barrier at this point. Is that correct?

MR. WEBSTER: We have in pre-trial testimony, we have actually put in testimony that shows for the external data, the 95 percent confidence limits do approach or in some cases go below the uniform.

JUDGE ABRAMSON: Based on the external data?

MR. WEBSTER: Based on the 95 percent confidence limits, the lower 95 percent confidence limits.

JUDGE ABRAMSON: From the external?

MR. WEBSTER: For the external, that would be, yes.

JUDGE ABRAMSON: And your calculations are

based on the internal data. Is that correct, Mr. Tamburro?

MR. TAMBURRO: Yes.

JUDGE ABRAMSON: Okay, I think I understand that. So now to come back to what I want to hear from Dr. Harlow. The big focus yesterday was on the, why can I never remember this, the small area criteria.

MR. POLONSKY: Local buckling criteria.

JUDGE ABRAMSON: The local buckling criteria, which is being computed on a basis of the external data. So talk to us for a few minutes about the statistical significance, the fact that there is limited data and how that should affect our interpretation of the meaningfulness of that data.

DR. HARLOW: Well, it's my understanding --

JUDGE ABRAMSON: Get a little closer to the mic, please?

DR. HARLOW: It's my understanding that all of that data, the way it is being used by AmerGen is to look at each point individually. So as a result, you're looking at the pressure criterion or membrane criterion, or you're using this local buckling criterion. So as a result, statistics, the

way you normally think of it doesn't really come into play.

However, if you were to assume that the 106 data points were representative of thin areas, so they're biased thin, you could do statistics on that amount of data and 106 data points is a reasonably fair number of points. But again, the distribution and the statistics that you would do would be a conditional distribution, conditioned on the fact that you're looking at thin areas. It is not representative of the whole region or any bay or the whole sand bed region. So you would have to keep that caveat there.

JUDGE ABRAMSON: Okay, but I am particularly struck by your first comment that we're looking at it point by point and we're using the, each particular measurement to make a comparison to the local buckling criteria or to the pressure criteria.

Is there any information that you can gain from the fact that there are 106 instances of that measurement that helps you understand the accuracy of any one measurement?

DR. HARLOW: I actually did sort of to satisfy my own curiosity, I did do statistical analysis on those data comparing the 1992 measurements

with the 2006 measurements. Turns out that you have a couple of options. You can use a Gaussian or normal distribution, and it represents that data quite well. Or you can actually use extreme value statistics to characterize that data.

In both cases, if you do that, just looking again at these conditioned on being thin data, you really are not close to the 736 or the 490 for the pressure criterion.

JUDGE ABRAMSON: 530? What's a -- oh, the pressure criterion. Okay.

(Pause.)

MR. WEBSTER: Just as a point. If that analysis hasn't been disclosed, we would like disclosure of that analysis.

JUDGE ABRAMSON: Well, I am asking, I'm asking Dr. Harlow to describe what one could learn from this so if there is any written -- is there a written product anywhere?

DR. HARLOW: Not with me.

MR. WEBSTER: Sorry, but is there written product at your office?

DR. HARLOW: Yes.

JUDGE ABRAMSON: Is it written in a way that it can be usefully understood by us or is it a

set of notes?

DR. HARLOW: It is primarily a set of notes and it is a figure. It is a graph.

JUDGE ABRAMSON: I think what I'm trying to understand is we had a lot of arguments yesterday about whether this external data is accurate. Can you tell us, if I looked at one particular, let's take one particular point. Let's say we took the point where this was closest to the local buckling criteria and we took that measurement. Does the fact that you have all these other measurements give you some idea of the uncertainty in that particular local measurement, which is what I thought I heard. I'm not sure what I heard now.

Your first answer was, well, you're looking at each point locally and so you can't tell much from the fact that there are other measurements. Maybe what I should ask is this: do you have any information that tells you about what uncertainties associated with each individual measurement?

Obviously, this is what we're worried about, right? They measure one point. They're using that to compare it to a certain criteria. What can we tell?

From one measurement, there is whatever is

the instrument of uncertainty and what they did by noodling around with where the probe was.

DR. HARLOW: Yes, so as a result if you are only looking at one exterior point, I don't think you would be able to hone in on that very well. However, because again, it is my limited understanding, the way that they do the measurements internally, there are roughly 49 measurements in a small grid, you can better assess what that uncertainty is and for internal measurements on those grids, the amount of scatter is relatively small so --

JUDGE ABRAMSON: The internal measurements are fine. But if the calculations for whether we're approaching, what this panel is all about is how much margin do we have left before we get to the local buckling criteria, because that's going to be used in combination with a corrosion rate, whatever that is, to compute what's an appropriate frequency of measurement.

So we need to have this first value tied down reasonably well. It is our starting point, and the starting point is current condition which is based on these measurements and as I understand it, Mr. Tamburro, correct me if I've got this wrong, but as I understand it, our starting point for local buckling

criteria is these external data point measurements only. Is that right?

MR. TAMBURRO: And their spatial relationship where they are located, where they are located from each other.

JUDGE ABRAMSON: Right, because you used several sometimes to determine. Okay, we understand that part pretty well.

So what information do we have? Is it each of these points is in a different location and each of these points, we don't, yes, you said if you make the assumption they're in locally thinned areas and they were all ground down to be able to put the, is that right? These were all ground down, the surface was ground to be able to put the probe in and that creates, what's the right word, it biases the data toward a thin site because you took some material off, but it also, Mr. Tamburro, is there any way to, do we know whether the grinding is uniform from spot to spot?

MR. TAMBURRO: No, sir.

JUDGE ABRAMSON: So there is a huge variation in the grinding which could account for variation in the data from point to point. So if we tried to use these data, these thickness measurements

from point to point, what information would we be gaining about any individual point when we don't know how much was ground off to begin with?

DR. HARLOW: I think you would have to trust the UT measurement and the operator to try to estimate how much variability there is in the true measurement. And like I said, the only way that I know to check that would be to compare it with internal measurements where you have a sufficiently large number to hone in on that.

JUDGE ABRAMSON: So what you're suggesting is that for an individual measurement, we can get some information about how accurate that is by looking at how accurate the external thickness measurement was by looking at the internal measurements where there were a lot of points close together, so we can estimate what actually was going on in a measurement itself.

DR. HARLOW: Yes, sir.

JUDGE ABRAMSON: So that leaves us now with 106 external points, each measured in area that was ground down and ground in a way that we don't know how much material was taken off in any point. And we're talking mils here, so I think I heard yesterday that the grinding was somewhere between 100 and 200 mils based on testimony from Mr. Hawkens or somebody

who had done the measurements. Is that correct?

MR. TAMBURRO: That was my testimony.

JUDGE ABRAMSON: Your testimony?

MR. TAMBURRO: Yes, sir.

MR. WEBSTER: Judge, could just clarify. The foundation of the testimony was from measurements taken around the grinding spot, but I don't think it shows that the thinnest spot was ground by one to two hundred mils.

JUDGE ABRAMSON: No, it doesn't. What I'm trying to get a handle on is how much variation is there in the amount of grinding from point to point, because we're trying to get some statistical information out of 106 measurements which are trying to measure the thickness of something down to mils and we've got a variation of something like a 100 mils in the amount of grinding.

If I told you I had 100 points and I didn't know any of them to within a 100 mils, Mr. Harlow, what would it tell you about the statistics that I could gather from that? I would have to put in 100 mils uncertainty on each point. Isn't that right?

DR. HARLOW: Yes, if you were trying to compare the thickness to the original thickness.

JUDGE ABRAMSON: Or if I'm trying to get statistical information about the actual thickness of the nearby unground material, which is what this is being used for. Right? We're trying to estimate the actual remaining thickness of the liner, and it is not what's been, it's not what's left after you grind 100 mils off or 200 mils off. It's what is there. They had to grind it to get this. So now we're being told that you get 100 points and they ground off between 100 and 200 mils to get the surface flat enough to make a measurement.

MR. WEBSTER: Judge, could I just clarify? I don't think that's, maybe you can clarify. I don't think the testimony is that they grind the thinnest point thinner by 100 to 200 mils.

JUDGE ABRAMSON: The testimony is that they don't know how much they ground off at any point. Is that --

MR. POLONSKY: I think that's correct, Your Honor. I just want to make sure we're all clear, because I think you just mentioned it. But the Carbon UT measurements were taken after the grinding, so the measurements currently taking already take into account the removal of whatever metal was removed, even though we don't know the amount at each spot that

was removed.

JUDGE ABRAMSON: Yes, that's the point. The point I'm making is we've got 106 measurements and they vary, they vary from each other because the thicknesses, the original thickness varied and because there was 100 to 200 mils ground off and we don't know how much.

MR. WEBSTER: Judge, I guess I would characterize the testimony that it is between 0 and 100 mils ground off.

JUDGE ABRAMSON: I think it may be between 0 and 200.

MR. WEBSTER: Well, okay.

MR. POLASKI: Your Honor, just to try to elucidate on this a little more. In 1992, when they took the original readings, there were 19 or 20 of those external readings that measured less than 736. Those were --

JUDGE ABRAMSON: Those were 736 after some grinding.

MR. POLASKI: After some grinding, because they had to grind and then they took the UT readings.

JUDGE ABRAMSON: I'm sorry, let me interrupt one more time. Do we know how much they ground off?

MR. POLASKI: Those that were less than 736 were measured in 1992 were, micrometer readings were taken of the depth of the depression and those were the ones that we discussed yesterday and the numbers range from 100 to 200 mils and specifically Mr. Tamburro has the information in Calc 24?

MR. TAMBURRO: Exhibit 16, Your Honor. That's the Calc 24, revision 2.

JUDGE ABRAMSON: Okay, and those numbers indicate that the amount, this is based on micrometer readings of the depth. Now, let's all remember that you've got a rough surface to begin with and you're putting a ruler basically against the rough surface and then you're pushing a probe into the hole and you're trying to measure how deep that probe goes in. Well, a lot of that depends on how well you get it on the surface too and how rough the surface is.

So what we're finding is numbers that vary between 100 and 200 mils from that. Maybe you ground off 200 mils from the highest point on the rough surface and maybe you only ground off 20 mils from the lowest point on the rough surface because you're laying a ruler on the rough surface.

So what I'm trying to understand is we've got 100 data points and I'm trying to get a handle on

whether there's any statistically meaningful way to compare these things when we've introduced error of something like 0 to 200 mils on these points to begin with and whether statistical analysis of these points will have any meaning at all for us.

I guess that's my real question, Dr. Harlow, and I think you sort of said that in your first comment and then you came back and said well, you've done some statistical analysis, but what I'm wondering is it useful?

DR. HARLOW: No, not relative to what's remaining in the dry well thickness. What that data tells you and what you can do is to measure what exists today which means it has been ground and etcetera, etcetera.

JUDGE ABRAMSON: So you can use it to look at continuing degradation or something, but to compare these 106 points you'd have to get meaningful comparison, you'd have to know how much was ground off of each one. But let me come at it at another way. If I asked you how much variation there was between these 106 points in thickness, can you give me a ballpark number which led you to try to do statistical analysis? Was there variation by more than 100 mils?

DR. HARLOW: No.

JUDGE ABRAMSON: So there's variation among these 106 points by less than 100 mils, and yet we ground off 100 to 200 mils to begin with and we don't know how much. So the variation among the points could well be caused by differences in the grinding and not by differences in remaining thickness at all.

MR. WEBSTER: Just to give you a range on the external measurements, I think the maximum external measurements are around the nominal thickness and the minimum measured data is around .06.

JUDGE ABRAMSON: Is that accurate?

MR. POLASKI: Yes, that's accurate. The thinnest point was about 602 mils and the thickest, there were some readings taken at the higher elevations in the sand bed region where corrosion had not occurred, just to check thickness. So --

JUDGE ABRAMSON: Let's talk about the corroded region which is where we're trying to do. Okay, I appreciate that. If you include the non-degraded areas in the non-degraded -- the measurements in the non-degraded areas when you do this calculation, then you introduce additional what do you want to call it, additional variability in data which is intended to look at thinned areas.

MR. WEBSTER: I think that's another misapprehension is that some of this data is taken deliberately at the nominal thickness areas.

JUDGE ABRAMSON: It makes sense because you want to know where --

MR. WEBSTER: That's right. I'm not saying it doesn't make any sense. I'm saying that it's important when you look at these 104 points or whatever they are to remember they're not all in the thin spots. Some of them are designed to be in the thick spots and some of them are designed to be in the thin spots.

JUDGE ABRAMSON: I think that's good. So in the end what it sounds like is we really can't get any statistically meaningful information out of the fact that we have a data set because the variation introduced in individual measurements is quite significant. In fact, it's -- it could be as much as a third of the threshold that you were worried about, right? Two hundred mils out of 700. It's almost a third. Certainly more than a quarter. Two hundred out of 800 would be a quarter. So 200 out of 700 is more than a quarter. So in the end when we're trying to understand the meaningness of the external data, it comes back up to Harlow to looking at individual data

points and trying to understand the error in that data.

DR. HARLOW: Yes, sir.

JUDGE ABRAMSON: By comparing it to the error in measurements from clustered internal data which tells us something about how accurate the instrument is and how accurate the instrument user is.

DR. HARLOW: Yes, sir.

JUDGE ABRAMSON: Okay, that's very helpful. Thank you. I'm sorry for this long diversion, but Dr. Hausler, do you want to add anything to this? Does this all make some sense to you? It seems to me to be consistent with what you were talking about yesterday about the paucity of data and the difficulty of interpreting it?

DR. HAUSLER: Yes, sir. Your Honor, what I would like to add is this, that I think we did talk yesterday I think with Judge Baratta about the reproduceability of the measurement. We do have an idea as to what the variability of a single measurement point might be. We do not know, however, as you clearly pointed out, that we have no idea how much was ground off.

The other thing that I would like to add is that again, we talk about the 106 points or 109

points, not all of them have been ground. That's the first comment I would like to make.

The second point is that they represent a relatively small area, again, of the entire bay. Just to put this in perspective, Mr. Tamburro has calculated that the internal grids represent roughly, I believe, a half of a percent of total sand bed area and that the external areas that have been explored by UT measurements are not more than five percent. I think it's perhaps of the order of two percent.

So when we talk about trying to project maybe maximum damage from a relatively small area of exploration, we may be able to use extreme value statistics as Dr. Harlow pointed out, but again, we would have to use it with some caution. In that context, I would like to perhaps, this is the moment to do it, to bring to your attention an example of extreme value statistics.

JUDGE ABRAMSON: I think you've provided some examples in your written testimony.

DR. HAUSLER: That's correct.

JUDGE ABRAMSON: So if you just want to repeat that, that's not necessary. We have it in writing.

DR. HARLOW: Okay.

MR. WEBSTER: Would you like to know where that is, Judge?

JUDGE ABRAMSON: Yes, if you want to show us where that is in your testimony, you can just give us the reference and we can look at it. But I remember seeing it --

DR. HAUSLER: No, I have it in front of me. It is Exhibit C, Attachment, I believe 2.

JUDGE ABRAMSON: Okay, thank you very much.

DR. HAUSLER: We probably might be able to project --

JUDGE ABRAMSON: That's okay. We don't need to go through it again. We have it in writing. The purpose here is to try to fill in some gaps in our understanding, not to repeat what we've already seen in writing.

DR. HAUSLER: I think there is perhaps a point that I might make and that is how one comes from a relatively small amount of data to a project that would indicate that -- I mean an estimate that would indicate a value if one had, in fact, made more measurements.

JUDGE ABRAMSON: We're familiar with that technique, Dr. Hausler, but I would ask is how

affected would those projections be by an uncertainty of 200 mils in each data point caused by the grinding, the variability in grinding? In other words, what would it do to the projections?

DR. HAUSLER: Well, that is something that we have explored in the statistical calculations, but my estimate is by that very same amount, which seems like a good first guess.

JUDGE ABRAMSON: Okay, thank you very much.

MS. BATY: Judge Abramson, if I may, you were asked about whether there was a finite element analysis of the current condition of the drywell shell. Would you like the staff to address that issue and how it was treated during the license renewal review?

JUDGE ABRAMSON: Yes, that might be very useful to us. Is Mr. Ashar who has done that?

MR. ASHAR: Hansraj Ashar. Yes, sir.

JUDGE ABRAMSON: Do you want to --

MR. ASHAR: Yes, I had a contract with Sandia National Lab which did the independent study, it was a confirmatory study.

JUDGE ABRAMSON: Okay, we've seen the Sandia study.

MR. ASHAR: Oh, you have seen it.

JUDGE ABRAMSON: So that's --

MR. ASHAR: If you want to know something more about it, I can --

JUDGE ABRAMSON: I think we've read the report and we've had comments about it and we appreciate the comments that Sandia made about it, so --

MS. YOUNG: Judge, may I hand the staff's SER to Mr. Ashar to refer to?

JUDGE ABRAMSON: For what purpose?

MS. YOUNG: To refresh his recollection, because I don't believe he answered the question correctly.

JUDGE ABRAMSON: Okay.

(Pause.)

MR. ASHAR: I think, Mitzi, you are thinking about the feature performed by --is that what you are --

MS. YOUNG: Yes.

JUDGE ABRAMSON: That's not where we're going.

MR. ASHAR: That's not where we are going.

JUDGE ABRAMSON: We're only interested in did somebody look at the -- in the current condition

and I understand that Sandia did that.

MS. YOUNG: I don't believe this is on. I don't know if you can hear me.

JUDGE ABRAMSON: I hear you.

MR. ASHAR: And if you read the Sandia --

MS. YOUNG: There's a commitment by the licensee that they made during the review to do a future analysis. And as part of the ACRS report, the ACRS specifically asked the staff to include a license condition, asking the licensee to do that future finite element analysis using the current condition of the --

JUDGE ABRAMSON: Oh, I see.

MS. YOUNG: That's the only --

JUDGE ABRAMSON: When is the --

MS. YOUNG: I'm not trying to testify, I'm trying to --

JUDGE ABRAMSON: That's okay, because in the ACRS report -- is that okay, Mr. Webster?

MR. WEBSTER: Absolutely. That's absolutely a license condition that requires a fire element analysis.

JUDGE ABRAMSON: Does anybody recall when that is to be done? Is that before the renewal?

MS. YOUNG: The condition is summarized

very succinctly on page 1-18 of the SER. And the ACRS report is Exhibit 3 of the staff.

JUDGE ABRAMSON: Thank you.

MR. GALLAGHER: Judge Abramson, this is Mike Gallagher from AmerGen. Yes, that analysis -- our commitment is to complete that analysis before the period of extended operation.

JUDGE ABRAMSON: Before the commencement of the extended operation.

MR. GALLAGHER: That's correct.

JUDGE ABRAMSON: Okay. Thank you. That's very helpful.

I assume that somebody is going to have to do a lot of measuring to be able to do that, right? Wasn't one of Sandia's comments that a lot of unknown information in order to do the calculation, is that --

MR. GALLAGHER: Well, we're going to use the existing measurements we have. We feel we have --

JUDGE ABRAMSON: For that degradation. You have enough other measurements about the rest of the shell and the loads and such?

MR. GALLAGHER: Yes, we have all that. So it will be a complete 3D model.

JUDGE ABRAMSON: Great.

CHAIRMAN HAWKENS: Could you please

explain to a layman, I am familiar with that commitment and I've been curious as to what exactly a three dimensional analysis is and if you would explain to me what, after performing it, and this will be done before the renewal period, what you'll have and what that will tell you?

MR. GALLAGHER: Yes, Judge. Our expectation is, and if you looked at the -- if you can look at the ACRS transcript, it's very clear that our expectation is that it would show in the current condition that we have more margin than a safety factor of two.

MR. WEBSTER: Judge, I object to this. I think this is speculative.

JUDGE ABRAMSON: It is.

MR. WEBSTER: It is speculative.

JUDGE ABRAMSON: We agree that it's speculative. Nobody knows what will be the result. It will give you -- it will computer a safety margin.

MR. GALLAGHER: It's not inspeculative because just as we've been testifying here, the current model which is conservative, is a uniform thickness of 736 mils in the sand bed region. This would take account of the thicknesses that we actually have.

MR. WEBSTER: I'll object to that characterization.

MR. GALLAGHER: If you have above the area of corrosion --

CHAIRMAN HAWKENS: Objection is overruled. What I'm looking for I want to know exactly what you're going to use to create this three-dimensional model. Are they additional data points you're going to get or are the data points from the prior points you've already taken them which you'll take again in 2008 to create this 3D model?

MR. GALLAGHER: The inputs are the thicknesses we've already measured.

CHAIRMAN HAWKENS: Which you'll retake in 2008.

MR. GALLAGHER: We will retake those in 2008.

CHAIRMAN HAWKENS: To create this model.

JUDGE ABRAMSON: Well, and also there are a lot of other measurements they'll need to use.

MR. GALLAGHER: There's other factors they need and Dr. Mehta can go into that. GE is not doing the analysis, but a 3D model, it's all the things you need in there. You need the thicknesses of all the other plates in the drywell. You need the loads that

are on all the penetrations and things like that. The actual geometries and it's a 360 degree model so that we don't have to make asymmetry assumptions. We can model it exactly and it will have a finer mesh because the computers today are able to do that better.

JUDGE ABRAMSON: Just let me comment Mr. Webster. Part of the reason we're all comfortable with letting this kind of information in in addition to the fact that it gives us some information is as we have said in numerous of our written orders, we give testimony the weight we think it deserves and we understand what this is saying to us, so did you get what you needed, Judge Hawkens, about a 3D model? Okay, thank you. Thank you, Mr. Gallagher.

CHAIRMAN HAWKENS: I have a question for AmerGen regarding Dr. Hausler's testimony that in his opinion there's at least one area in the drywell shell that will exceed the pressure criteria. Can you address that? Are you aware of any locations that approach that limiting criteria?

MR. TAMBURRO: This is Peter Tamburro. None of the data even comes close to or approaches the 490 mil criteria.

CHAIRMAN HAWKENS: And can you tell me why -- what problem then do you see in Dr. Hausler's

analysis?

MR. TAMBURRO: This is Peter Tamburro again. He extrapolates data. He uses improper statistics to look at only the lowest hypothetical measurements and that's not supported by the data.

CHAIRMAN HAWKENS: Did you provide written testimony to that effect or can AmerGen point to where in their written testimony, so we can have easy access to that?

MR. POLONSKY: Are you asking us specifically about the 490?

CHAIRMAN HAWKENS: Yes.

MR. POLONSKY: We'd have to look at the Exhibit C, attachment 2. I don't think we were given a page reference and then look where we responded to in our testimony.

JUDGE ABRAMSON: What we're interested in is we asked Dr. Hausler and his counsel to advise us where they raised this question.

MR. POLONSKY: Yes.

JUDGE ABRAMSON: And rather than go in depth into it in this proceeding, unless there's some specific questions we have, if you've already addressed that -- those assertions by Dr. Hausler, we'd like to just know where and if it takes you some

time, you can tell us at noon.

MR. POLONSKY: We can provide that. I think Mr. Tamburro in pretrial testimony certainly has said that the thinnest measured point in 2006 was somewhere above 600. We don't have any single point below that. So that's, I think --

MR. TAMBURRO: The thinnest point measured in 2006 was in bay 13.7 and it was measured at 602 mils.

MR. WEBSTER: I don't think that was your question, was it, Judge?

JUDGE ABRAMSON: I'm not sure --

MR. POLONSKY: That's in the testimony. So that's the response to 490, then that's the response. We can identify that answer for you.

MS. BATY: Your Honors --

CHAIRMAN HAWKENS: It would be helpful if there's anything additional that he wants to provide a reference to later on in this hearing, we'd entertain that. Thank you.

MS. BATY: Your Honors, may I interject that it could be that the issue of the .490, the challenging of the -- whether they meet the pressure criteria might have been addressed in a motion in limine as well as exceeding the scope of the

contention, of the admitted contention which was buckling, the buckling criteria. So that might be just another -- I just wanted to interject that that might be a place to look for --

JUDGE ABRAMSON: Unfortunately, looking at motions in limine isn't going to answer a technical question, if a technical question was raised earlier and that's why I'm looking to see whether the record has, what we're hearing from Citizens now is that they've raised this question and the question for us is has it been technically addressed.

I understand that part of the answer is that there are -- that part of the reason that Dr. Hausler got that number is the statistical approach he took to analyzing the data and that I understand is in the record. Is that correct or is it not? Is it only in motions in limine because motions in limine to exclude testimony don't help us understand if it's a technical question that's been addressed, then we need to deal with it. And if what you're saying is we've already excluded that, then show us where we've already excluded it or if it's one of those things that we said we'll give it the weight we think it's worth, which seems -- which I believe is our general approach to things, since we think we can understand

technical matters reasonably well.

MR. WEBSTER: Well, let me -- this is part of the record. It was not one of the elements on the few elements that was redacted from Dr. Hausler's memo so it's definitely raised in the record.

JUDGE ABRAMSON: Okay, and so if it's been addressed --

MR. POLONSKY: At a break or lunch we will provide --

JUDGE ABRAMSON: Why don't you see what you can find and then we'll move from there. Thank you.

MS. BATY: Yes, because Your Honors, it may be a matter of an argument that it was outside the scope of the admitted contention.

JUDGE ABRAMSON: We understand. We understand, Ms. Baty.

MS. BATY: That's why we would like to get back to you on that. Thank you.

JUDGE BARATTA: I think we've found it. If you look at our order of August 27th, there's a reference -- I'm sorry AmerGen's motion of August 27th, there's a reference there, although it looks like the cite might be incorrect on page 7. Citizens' argument that there's likely to be a spot thinner than

0.49 is impermissible. And it goes on to discuss why and the .49 appears to come from his analysis of extreme value, using the extreme value statistics where you project out.

Answer 17.

MR. WEBSTER: To be clear, AmerGen moved to strike this testimony and that motion was denied. So the testimony is therefore admitted.

JUDGE ABRAMSON: That's the way it usually works.

MS. BATY: Your Honor, we would like the opportunity to verify that it was -- you said you'd give it due weight. Because I think that might be a more accurate reflection of what the Board's decision was.

JUDGE ABRAMSON: Ms. Baty, let's let the parties move on. As we said, let's at a break or by lunch, let's ese what there is in the record and then we'll come to grips with it from there.

JUDGE BARATTA: For Dr. Harlow, have you had a chance to look at his -- Dr. Hausler's analysis that was done using extreme value statistics?

DR. HARLOW: The answer to that is no, because although there has been repeated mentions of extreme value statistics, it was never really

explained what that meant statistically. So I don't have any idea what they mean when they say extreme value statistics.

MR. WEBSTER: Well, could I refer Dr. Harlow to the record? Again, it's Exhibit C, attachment 2, page 12 provides the graph. And that tells you precisely what is meant by --

JUDGE ABRAMSON: And Dr. Harlow's answer was crystal clear. He hasn't looked at it.

MR. POLONSKY: Could I follow up with a question with Dr. Harlow, Mr. Abramson?

JUDGE ABRAMSON: You may. Judge Abramson.

MR. POLONSKY: I'm sorry, Judge Abramson.

JUDGE ABRAMSON: Or Dr. Abramson. Or Your Honor, not Mister.

MR. POLONSKY: My apologies. Dr. Harlow, is the question that you don't know what distribution he used in his extreme value statistics? Is that the question that you had?

DR. HARLOW: The question is -- there is a well-documented old area of statistics called extreme value statistics. It was started in 1928 by Fischer and Tippit. There are three classical distributions for maxima. There are three classical distributions for minima. None of those had been used

that I have seen in any of the written record, so when you talk about doing extreme value statistics, those just have not been used.

JUDGE BARATTA: Dr. Hausler, would you care to explain how you obtained the curve that appears in Exhibit C2?

DR. HAUSLER: From my understanding, the extreme value statistics approach that has been used in the oil field, for instance, in order to correlate pitting are based on the double logarithmic distribution. This is described in the literature. We have discussed it in the exposé that we wrote for the panel of Judges with respect to question about statistics. We've mentioned in there. We've presented a graph here that can easily be -- well, it's not easily explained because the parameters are although they're mathematical correlations, to put it in layman's terms is not an easy thing to do.

JUDGE ABRAMSON: Did you provide a reference where in your testimony, is there a reference to the analytical techniques so that -- in a way that could be understand by somebody?

DR. HAUSLER: I believe we did.

DR. HARLOW: Your Honor, I'm looking at -- this is Figure 4. It's called extreme value

statistics for external UT measurements in bay 13. This is their Exhibit 3B.

MR. WEBSTER: It's also -- it occurs twice. It's Exhibit 38.

DR. HARLOW: Yes. On the screen there. If you notice on the horizontal axis, there's no indication of what that is. Also, on the vertical axis, there's no indication of what that is. There's a linear least square regression put through points, but you don't know where those points came from. So typically in corrosion, the two extreme valued distributions that are most popular are the Gumbel distribution for maxima and the Weibull distribution for minima. So I'm not quite sure looking at that how you could determine which of those has been used.

There are no double logarithmic distributions. Gumbull distribution has two exponentials in it. So again, I'm not sure what has been done at this point.

JUDGE ABRAMSON: Mr. Webster, did you say there was a reference to the technique or the methodology somewhere in this report?

MR. WEBSTER: Yes, on page 7 of this report, there's a description of the methodology.

DR. HARLOW: Well, again, there's no

equation there, so it's kind of hard to tell what distribution is being used. There's a lot of verbiage again about extreme value statistics, but again, we don't know whether we're talking about maxima or minima and if so, which of those distributions are being used.

MR. WEBSTER: Perhaps we can ask. Dr. Harlow did say he did some extreme value statistics himself earlier.

JUDGE ABRAMSON: Let's go back to Dr. Baratta who -- or Judge Baratta who has been pursuing this line of inquiry and see whether he's got what he wanted or needs some more.

MS. BATY: Your Honor, could I -- do you want to hear from the staff on this --

JUDGE ABRAMSON: Let's have Judge Baratta pursue this. This is his issue.

JUDGE BARATTA: I'd like to hear from the staff because I'm still as confused as I was when I asked the question.

MR. SALOMON: I'm Art Salomon with the staff. Your Honors, I believe either in a response to your Board questions or in some previous testimony regarding extreme value statistics we provided a response that essentially agrees with what Dr. Harlow

said, although I never heard of him or met him until today, so this was developed independently.

The Weibull distribution was essentially one of the first limiting -- it's a limiting value of the minimum of a sample which was what would be used in this case and I also agree with him that I saw no evidence of the Weibull distribution used in it. That's the typical extreme value distribution used when you're talking about the minimum and I assume that in this case since they're referring to thickness, they would be looking at the minimum of a distribution.

JUDGE BARATTA: I am familiar with Weibull distribution and it looks -- it should give you a straight line when you do plot it on the Weibull graph paper. But I was confused by your double logarithmic as well. Are you referring to either the distributions that were mentioned like Dr. Harlow?

DR. HAUSLER: I believe the procedure we used is based on the Weibull distribution.

JUDGE BARATTA: Based on it.

DR. HAUSLER: Yes, I believe so.

JUDGE BARATTA: You're shaking your head.

DR. HARLOW: Well, if it is based on the Weibull distribution, this is not the way you present

that data. Typically, a Weibull distribution on Weibull graph paper, the slope is positive. And again, you would label the coordinates and if it's Weibull probability paper, the horizontal axis would be a log scale and the vertical axis would not be a linear scale. So again, on this figure 4 you've got a linear vertical scale, a linear horizontal scale and neither one of those would be appropriate unless there has been some transformation of the data and again, there's no indication of what that transformation is.

DR. HAUSLER: The transformation is in what's called the reduced variant. And whether the slope is positive or negative, simply depends on how you position the vertical axis. The vertical axis and the graph is pretty clear. It is, in fact, the residual wall thickness. The horizontal axis is what is called the reduced variant. It is a double logarithmic expression for the ranking of the data which in the end comes out exactly the same thing as what you described as Weibull graph paper. We haven't used the graph paper. We have used Excel in order to perform the calculations necessary to (a) ranking the data; and (b) calculating what is called the reduced variant.

It was my understanding that these are in

the statistical community pretty standard procedures.

JUDGE BARATTA: Any comment from the staff or from AmerGen on that?

DR. HARLOW: Well, my only comment is there's a variety of distributions that you can do this kind of analysis with. You have to specify which distribution you're applying when you do this kind of analysis.

JUDGE BARATTA: It appears that he has, namely used the Weibull distribution.

JUDGE ABRAMSON: As I recall, he says he thinks it's the Weibull distribution or to his recollection it's the Weibull distribution.

MR. WEBSTER: I think that's appropriate. I mean I think if we would like Dr. Hausler to confirm that, I think he can revisit his calculations perhaps. I'll discuss it with him at the break whether we can actually look at the calculations and double check.

JUDGE BARATTA: That would be helpful if you could do that at the break.

I believe staff had -- and I apologize. Would you give me your name? I have a terrible memory for names.

MR. SALOMON: Art Salomon. Salomon is the last name.

I just wanted to say that this notion of the reduced variant at a minimum, the formula or expression that was used to compute that should have been presented. Reduce variant can mean any number of things, depending on the particular distribution and when I saw it I had no idea what he was talking about and I've used the Weibull distribution for perhaps 25 years or so and didn't recognize it from his --

MR. WEBSTER: Judge, I can provide some clarification. I think what's happened is that we presented this information at an earlier time and then there was some issue about whether it was or wasn't within the scope of the contention. And then we revived this work when the Board asked us about extreme value statistics. So I think if we on the break, we can probably go back to the earlier more full explanation of this material and then move on. Perhaps we might -- I admit that was an additional exhibit, if it's not admitted as an exhibit already, then that would provide us a basis to go forward on this.

CHAIRMAN HAWKENS: Thank you. We're going to go off the record for one moment.

(Off the record.)

CHAIRMAN HAWKENS: We are back on the

record.

DR. HARLOW: Your Honor, if I could please. This is Gary Harlow. I would just like to clarify something that I may have given you the wrong impression about. When I said I had not seen Dr. Hausler's work, I meant the underlying computations. I have read his testimony and their exhibits. I had seen that, but I had not seen the underlying work that he performed.

JUDGE BARATTA: Thank you for that clarification.

I would like to leave this topic now and go back to something we heard yesterday relative to the inclusions that were apparently observed during the UT measurements. I know this was discussed somewhat yesterday, but again, what we're trying to determine was what is the margin, hence the questions about the statistics that were used in predictions and such.

I think Dr. Hausler, you mentioned that some of the UT measurements were discarded because of some inclusions that were encountered.

DR. HAUSLER: That is what I understood, yes.

JUDGE BARATTA: Are you at all familiar

with any of the standards as to whether, I mean, typically I think this is the case. We'll have to ask the Staff and the Applicant to confirm this, you know, inclusions are expected. Are you at all familiar with any of the specs on that or anything like that?

DR. HAUSLER: I'm not sure I understood your statement. Your conclusions are what?

JUDGE BARATTA: You seem rather surprised that there were some inclusions in there, and I was just curious as to how familiar you are with the ASTM specs that are used to purchase the material. In other words, did they, do you know if they allow for inclusions or not?

DR. HAUSLER: I can't comment on that. I was surprised. I think my comment was that I was surprised at the frequency of inclusions, but I do not know what the standard is for purchasing the material. No, sir, I don't.

JUDGE BARATTA: Is there somebody on the staff or the Applicant can maybe shed some light on that?

MR. McALLISTER: This is Martin McAllister. I'm not a metallurgist, but I have done ultrasonic inspections on rolled plate for laminations and typically, that spec is like a three-inch circle.

A lamination is allowed a not exceed.

JUDGE BARATTA: Three inch diameter.

MR. McALLISTER: Yes.

JUDGE BARATTA: Do you have any idea, though, on the number that are allowed or anything like that?

MR. McALLISTER: No, I'm only aware of the one criteria.

JUDGE ABRAMSON: Let me follow this up for a second.

As I understand it, when a plant is being designed and built there are specifications provided for the materials, and the materials have to meet those specifications when they are delivered. Is that correct?

MR. POLASKI: Yes, that's correct.

JUDGE ABRAMSON: And do those specifications include a specification on the maximum number and size and distribution on inclusions to your knowledge? Does anybody know that?

There are very specific kinds of specifications for nuclear power plant components and materials. Let me have somebody who can speak to that.

MR. WEBSTER: Judge, to be clear, are we

talking about in 1969 or --

JUDGE ABRAMSON: We can talk about the time this was purchased. That's when it is relevant. We should probably talk about that.

MR. OUAOU: Your Honor, my name is Ahmed Ouaou, and typically the specifications do not call for inclusions. When you specify is the material you want to use.

In this case, the drywell is SA212. It's a type of material and you would expect inclusions if you do not want inclusions in the material. You specifically -- then you would have to specify I believe a vacuum de-gas type of a plate which is not this material.

JUDGE BARATTA: Okay, so in other words, you would expect to see some?

MR. OUAOU: That is correct.

JUDGE BARATTA: That's what I was trying to get at.

MR. OUAOU: Yes, sir.

MR. DAVIS: This is Jim Davis from the staff. The material was probably ordered in the '60s and the standard steelmaking practice in that time you would expect to see inclusions. What the specifications normally would be, these are ASTM

specifications. Now we use SA which are ASTM specifications in Section 2 of the code and they're very similar to the ASTM standards. But what you'd normally specify as minimally yield strength, tensile strength, elongation, a lack of cracks or laps, lack of delamiantions, things of that type. But you normally would not specify the number of inclusions. But that would be normal in steelmaking.

JUDGE ABRAMSON: And if the inclusions were of a character to affect the physical strength that then the material would be out of spec, right? You have specs that require that certain physical properties of this material, right?

MR. DAVIS: That's right. But they would be -- you would expect to have these inclusions in there and you would still meet the specifications.

You'd have to meet the --

JUDGE ABRAMSON: Physical strength, its ability to withstand a membrane stress, its ability to withstand buckling load. Those properties, the physical properties are part of the specifications and if the material, if the number of inclusions caused it to be nonconforming from those specs, then it wouldn't be accepted. Is that correct?

MR. DAVIS: That's correct, it would be

rejected.

MR. WEBSTER: Just to be clear, Judge, I think Dr. Hausler's testimony is going primarily to the reason why the ASME code has a safety factor of two which is partly taken account of these inclusions and other defects in the material.

CHAIRMAN HAWKENS: Thank you to Panel 3. We'll now sit Panel 4.

Panel 4 is dealing with sources of water.

MR. POLONSKY: Judge Hawkens, I noticed that Judge Abramson has stepped away, but there was a follow-up that we had before we move off of Panel 3 to specifically address a question that Judge Abramson had asked. So if we could wait until he returns and then we could quickly dispense with that, addressing that question, we could then move to Panel 4.

CHAIRMAN HAWKENS: That would be fine. It will be somebody, an individual on Panel 3?

MR. POLONSKY: Yes, Fred Polaski and potentially Pete Tamburro, if there is follow up.

MR. WEBSTER: Judge Hawkens, may we have a moment? We had said that we believe there's some work from Dr. Hausler that wasn't submitted as an exhibit, but was submitted during the course of the proceedings. I haven't actually been able to find

that work in the break.

Would you be interested in having that submitted later or are you happy with the state of the record as it is.

CHAIRMAN HAWKENS: You say you have not found it in the record yet?

MR. WEBSTER: It is definitely --

CHAIRMAN HAWKENS: You believe it's in the administrative record, but you haven't located it yet?

MR. WEBSTER: I believe it's not in the record as an admitted exhibit.

CHAIRMAN HAWKENS: I understand.

MR. WEBSTER: But it is probably part of the administrative proceedings.

CHAIRMAN HAWKENS: When you locate it, just bring it to the Board's attention, please, some time during today's proceeding.

MR. POLONSKY: Judge Abramson, we have one further thing to follow up with you, if we could, regarding Panel 3 before we move to Panel 4.

You had asked specifically whether there was any information about the thickness of the drywell shell near the bottom of the sand bed region because you were investigating what the margin, available margin would be at that location?

JUDGE ABRAMSON: Yes, if you have information that would be helpful.

MR. POLONSKY: Yes, Mr. Fred Polaski -- I would just want him to address that before he ends his participation in Panel 3.

MR. POLASKI: This is Fred Polaski, Your Honor. We looked at the availability of thickness measurement data in the lower elevations of the sand bed region near the floor and if you remember we had shown in Exhibit 28 a map of all of the UT thickness data taken. This is the one with the green rectangles and yellow spots. And there was very few data points in the lower elevations.

However, there are two areas where there is UT information down at those lower elevations. This is the trench data taken from the inside. And in bay 17 which is the trench data that was more -- in the area that was more severely corroded compared to bay 5, we took a look at the lowest 6 inches of data, the 6 by 6 grid at the bottom of that trench. And we were able, in the calculations that have been performed, and they're AmerGen's Exhibit 19 which is eval 09, that the average thickness of the 6 by 6 grid at the bottom of that trend was 965 mils average thickness, which comparing to the general buckling

criteria 736 gives you 229 mils of margin at that elevation.

We'll note that the bottom of that trench is at elevation 9 feet 3 inches. The floor is 8 feet 11. So it's close to the bottom. It's not exactly at the floor level. But those are the lowest readings we've got elevation-wise. They're representative of the corrosion in the most severely corroded bays.

JUDGE ABRAMSON: When we talk about measurements that are in those trenches, that then is a region where the drywell shell is supported on one side by concrete except for the trench. Is that correct?

MR. POLASKI: Yes, that correct. It's filled with -- actually during the construction, the steel was welded in place and then the floor was poured on the inside.

JUDGE ABRAMSON: So from a structural point of view, let me ask Dr. Mehta, where the drywell shell is supported on one side by concrete, what is the effect of that concrete on the propensity to buckle in that location, i.e., is this a relevant failure location?

DR. MEHTA: Your Honor, we have bonding conditions of the floor and as you can see in the

buckling evaluation, the way it forms where the fixed bonding condition, that's one point in that --

JUDGE ABRAMSON: So we have a floor on one side of the shell in this region, but am I correct that one side is not -- that the concrete level on one side of the shell is lower than the concrete level on the other side. Is that correct?

Both of you stay up there, because we've got to see if we can --

MR. POLASKI: You are correct, Judge Abramson. The drywell has concrete on the inside up to elevation 10.3 inches which is the floor level on the inside.

JUDGE ABRAMSON: Okay.

MR. POLASKI: On the outside, the concrete only comes up to elevation 11 feet -- 8 feet 11 inches.

JUDGE ABRAMSON: And the trench was below, it was down below, into that area, right?

MR. POLASKI: It goes close to the bottom, the bottom of the trench in bay 17 is elevation 9 feet 3 inches. So it's a couple inches above the floor in the external surface.

JUDGE ABRAMSON: So now Dr. Mehta, when you did the calculation, where was the fixed boundary

condition? Was it at the top of the inside concrete or was it at the top of the outside concrete?

DR. MEHTA: Your Honor, I think it was 8 feet 3 inch which is at the lower level.

JUDGE ABRAMSON: Okay. Thank you. Okay, so now come back to that. Sorry, come back to that. So the fixed boundary condition is that the bottom where both sides are embedded, right? The inside has cement, and we've got some measurements on the inside below the top of the inside cement, but above the fixed boundary condition. Is that an area where buckling failure is where the shell is likely or less likely, more or less likely to fail in bucking than say a midplane area where it's not supported?

DR. MEHTA: Your Honor, when we looked at the lowest buckling mode which is the lowest single wave, that is -- that forms at the top of the sand bed and then one complete wave coming back to the bottom. So essentially --

JUDGE ABRAMSON: So the maximum amplitude is several feet off that floor, is that right?

DR. MEHTA: Several inches. Because the height is about 40 inches, so 40 inches or so forms one wave.

JUDGE ABRAMSON: A full wave. So a half

wave is 20 inches and to the peak amp is like 10 inches off the floor. And these measurements were where, how high off the floor?

MR. POLASKI: These measurements were from four inches off the floor to ten inches off the floor.

JUDGE ABRAMSON: Okay, so it's in an area where there is a peak.

So it is relevant from a buckling point of view and the numbers are -- this is -- how many measurements to get this number?

MR. POLASKI: Well, this was a six by six inch grid, so there's --

JUDGE ABRAMSON: So there's 49 measurements.

MR. POLASKI: With an average of 965.

JUDGE ABRAMSON: Thank you very much. That's very helpful.

MR. WEBSTER: To be clear, Judge, the bays where the external measurements show the lower 95 percentile confidence limit at or below the general buckling criteria is not at bay 17.

CHAIRMAN HAWKENS: Will counsel please introduce the expert witnesses on topic four, sources of water?

MR. POLONSKY: Yes, Your Honor, this is

Mr. Polonsky for AmerGen. For Panel 4, seated to my right is Mr. John O'Rourke. Seated to his right is Francis H. or Howie Ray. Seated to his right is Jon C. or Chris Hawkins. Seated to his right is Scott Erickson. And behind them is Mr. Ahmed Ouaou.

CHAIRMAN HAWKENS: Thank you.

MS. BATY: For the NRC staff we have Mr. Hansraj Ashar, Dr. James Davis, and Timothy O'Hara.

CHAIRMAN HAWKENS: Thank you.

MR. WEBSTER: And for Citizens, we have Dr. Hausler, who will be wearing disguises so it makes it look like we have more witnesses.

CHAIRMAN HAWKENS: Thank you, Mr. Webster.

Once again the witnesses are reminded they were sworn yesterday and remain under oath or affirmation for the testimony they are about to provide.

(Pause.)

I'd like to hear from Dr. Hausler in what, in his view, the most likely source of water would be and the duration of it.

DR. HAUSLER: Well --

CHAIRMAN HAWKENS: And we have all of your -- the testimony you've previously provided, so if you could summarize it, that would be great.

DR. HAUSLER: Well, I don't think, Judge, that they can go very much beyond as to what has been already stipulated by AmerGen as to where the water comes from.

I have nothing further to add than that the water comes from the refueling bay.

MR. WEBSTER: The other element in the prefile is condensation. Perhaps I could ask for comment.

DR. HAUSLER: There are two things. When we talk about condensation, there may be condensation on the inside of the drywell shell. I am not sure that we can really speculate a great deal about condensation on the outside.

In other words, I don't think that condensation on the outside is really a source of water that we might have to worry about.

CHAIRMAN HAWKENS: So condensation on the outside is not a real problem?

DR. HAUSLER: I don't think so.

CHAIRMAN HAWKENS: For a source of corrosion in your judgment.

DR. HAUSLER: That's correct.

CHAIRMAN HAWKENS: Thank you.

JUDGE ABRAMSON: Let me ask AmerGen folks

and this not so much source of water as to what water was there for how long in the old days when you had corrosion. AS we understand it, the sand bed was holding water that got there during refueling. Is that correct?

MR. O'ROURKE: Yes, it is. This is John O'Rourke.

JUDGE ABRAMSON: Thank you, Mr. O'Rourke.

And in your estimate, was that water there continuously once it got there and not just evaporating and as a source of corrosion, do we have any evidence once way or the other?

MR. O'ROURKE: We don't have specific evidence, but our best guess is that the sand held the water against the shell and that whatever evaporated the next time there was a refueling outage would have been replenished until the issue was resolved.

JUDGE ABRAMSON: So your best engineering judgment is that there was a kind of -- more or less continuous source of corrosion from the beginning of the leak until it was -- until the situation was corrected?

MR. O'ROURKE: Until the sand was removed in 1992.

JUDGE ABRAMSON: 1992, okay. And during

a normal -- during normal operation of the plant today, since the sand bed has been removed, how long does a refueling outage take on average?

MR. O'ROURKE: On average, refueling outages at Oyster Creek, the last two have averaged 26 days.

JUDGE ABRAMSON: And they occur every other year?

MR. O'ROURKE: Every other year, that's correct.

JUDGE ABRAMSON: And are there any other ordinary operational conditions during which there would be water in the refueling bay?

MR. O'ROURKE: None that we're aware of.

JUDGE ABRAMSON: So the maximum time there could be any source of water, whether or not it gets down to this liner would be 30 days every two years?

MR. O'ROURKE: It would be less than 26 days because the cavity is not filled during the entire time that the plant is off-line.

JUDGE ABRAMSON: Okay, thank you.

JUDGE BARATTA: There was discussion about forced outages where if you had to go in and replace -- maybe it wasn't manufactured correctly or something like that. That has occurred in the industry, has it

not?

MR. O'ROURKE: Yes, it has.

JUDGE BARATTA: It is a rare event though, as well?

MR. O'ROURKE: Absolutely rare event.

JUDGE BARATTA: Can you give us a guesstimate on over the life of the plant how many times that might occur, based on industry experience?

MR. O'ROURKE: I reviewed the outages at Oyster Creek since 1990 and the reasons for them. None of those reasons required the reactor cavity to be filled. And none of them involved removal of damaged fuel bundles or any reason why we would have to go into the reactor.

I can't speak to the periods prior to 1990. I had no data on that. I was at Limerick for a number of years and I recollect one time where we took the reactor down to replace a damaged fuel bundle.

JUDGE BARATTA: So maybe, would it be your --

MR. O'ROURKE: Once or twice over the lifetime of a plant would be my best guess.

JUDGE BARATTA: And the time that would be required to do that -- that would be 30 days, 25 days,

10 days or --

MR. O'ROURKE: If the plant were being removed for the sole purpose of removing a failed fuel bundle, and the plant does testing, prior to removing the plant from operation to try to pinpoint the location of the failed fuel bundle, it would be on the order of five to six days.

You would come off and remove the bundle and replace it with a fresh bundle and come back up again.

JUDGE BARATTA: So in other words, at most, let's -- if we had a failed fuel bundle, we might have had maybe five or six days to the --

MR. O'ROURKE: At most and keeping in mind that the cavity is not again, is not filled. You have to take shield blocks off and get down to the cavity before you can put the strippable coating on and then fill it.

JUDGE BARATTA: Really, it's almost an insignificant amount of time, then.

MR. O'ROURKE: I would say so.

JUDGE BARATTA: An insignificant amount of time in an extremely unlikely event.

MR. O'ROURKE: That's correct.

JUDGE BARATTA: Okay, and spread -- and if

you look at the statistics, spread over the life of the plant, not every year.

MR. O'ROURKE: That's correct.

MS. BATY: Yes, Your Honor, if you mind, would the Board like to ask AmerGen how long on average the reactor refueling cavity is filled with water? They said 26 days outage, but how many days it's actually filled with water.

JUDGE ABRAMSON: So asked.

MR. O'ROURKE: Thank you for that question. We have Mr. Howie Ray will -- has the data from the most recent refueling outage.

MR. RAY: Yes, this is Howie Ray and the cavity was filled October 18, 2006 and it was emptied November 3, 2006. So it was less than 30 days.

JUDGE BARATTA: You mentioned in one of the testimony that you do observe a light, I think it was referred to something like a light skin film of rust on the inside of the drywell. Am I correct in my recollection?

MR. POLONSKY: I am just going to consult with my witness to see if this is the correct panel to answer that.

JUDGE BARATTA: Okay. Well, I was trying to get to the source of the water for that light film.

MR. POLONSKY: Judge Baratta, if you'd like to understand whether there is water and what the source of water on the inside is?

JUDGE BARATTA: Yes.

MR. POLONSKY: We can clearly address that.

JUDGE BARATTA: That's what I was trying to get at, that there was a statement that someone made that there's a light film of rust that were adequately formed. So what's the source of water for that that might cause that?

MR. O'ROURKE: The source of water was leakage inside the drywell during operation from any number of sources that drips on to the floor. And this light film of rust was in one of the trenches. When the filler material was removed from the trenches, they observed alight film of rust that was brushed off very easily.

CHAIRMAN HAWKENS: When you say any sources of water are we talking about reactor coolant, nonreactor coolant and what volume?

MR. O'ROURKE: I don't have an estimate of the volume. It could be either reactor coolant from leakage or it could be other water inside. I don't have numbers on those.

MR. RAY: This is Howie Ray, if I may add to that, in 2006 outage we did go in and investigate some of this water source. We did find a defect in the trough that runs underneath the subpile room. Some of the water was getting down into the concrete and we did repair that and validated that it significantly reduced any source of water into the concrete.

JUDGE BARATTA: Where was this trough? Do you have that model or would that be helpful to look at that?

MR. O'ROURKE: I am referring to the troughs that were cut into the concrete.

JUDGE BARATTA: Oh, okay.

MR. POLONSKY: Do you mean trough or the trenches, the two trenches?

MR. O'ROURKE: The bay 5 and bay 17 trenches that --

JUDGE BARATTA: You had a filler material that was to project those to keep any water from getting into there, is that what that water was?

MR. O'ROURKE: Yes. And there was some water that was found when the filler material was removed in -- it was bay 5.

And there was an observation of wetness in

bay 17, but no standing water.

JUDGE BARATTA: And what you've done now is try to seal that water so that when any condensation or whatever, whatever the source of that water was --

MR. O'ROURKE: That's correct. In the 2006 outage, not only was the concrete around the periphery to the shell seal, but also the concrete to the trenches was sealed. It was totally sealed to prevent any water from getting into those trenches.

JUDGE BARATTA: Did you put like a caulk between the concrete and the steel like you have on the outside, is that what you did as well?

MR. O'ROURKE: I can't say that it was the exact -- it was caulk, yews.

JUDGE BARATTA: Similar.

MR. O'ROURKE: Similar. I can't say it was the exact material that was used on the outside, since that material was placed in 1992.

JUDGE BARATTA: And the amount of leakage that you see as you account for make up and such into the primary system or into the feed system as such, it's not something that's significant from operational standpoint?

MR. O'ROURKE: That's correct. The plant

tech specs allow for certain unidentified and identified leakage. There are some leaks that are designed from the recirculation pumps, for instance, are design leakage. Unidentified leakage is limited to an amount that once we exceed that amount we would have to go in and find where that was coming from.

MR. POLONSKY: Your Honor, for the record, Panel 6 will be testifying and they will be assuming that the interior shell that is embedded in concrete on the inside is saturated, that there's water continually present there as a normal condition. Just if that helps to put this in perspective.

JUDGE BARATTA: I was more interested in that film that was -- in what the origins might be of that, just to confirm.

CHAIRMAN HAWKENS: Is it AmerGen's view that its commitment regarding the application of strippable coating and tape to the reactor cavity applies not only to refueling outages, but to forced outages also?

MR. O'ROURKE: Yes, it is.

CHAIRMAN HAWKENS: Does the NRC staff share that understanding of the commitment?

MS. BATY: Could you repeat the question and I think then we can get someone to address it.

CHAIRMAN HAWKENS: AmerGen said that it understood and would apply its commitment to apply the strippable coating and tape to the reactor cavity both to refueling outages as well as forced outages.

MR. O'ROURKE: And to clarify, Judge, that's forced outages where we would need to flood the cavity in order to get into the vessel?

CHAIRMAN HAWKENS: Yes, correct.

MR. ASHAR: Hansraj Ashar. Yes, I have seen the commitment as part of our appendix A and SER.

CHAIRMAN HAWKENS: Thank you.

MS. BATY: Your Honors, would you -- there are additional commitments. Would you like to hear from the staff about additional commitments related to water and sources of water?

JUDGE BARATTA: I have no questions. We're familiar with them. Thank you. We need not hear further on that.

MS. BATY: It is a license condition -- a proposed license condition in Appendix A.
And discussed in our testimony. Not Appendix A, excuse me. 1.7.

CHAIRMAN HAWKENS: Thank you. Citizens, you've heard the questions we've posed to the NRC staff and to AmerGen regarding sources of water. Do

you have anything to add or to rebut regarding what they've said, regarding our questions?

DR. HAUSLER: Not with respect to what they have said, but there are some -- it appears to us there are some open questions. And particularly with respect to the frequency of the water, whether it's always there on the outside of the drywell. For one, we're wondering about on-going corrosion that has been apparently documented yesterday. You do need water for that. So where does the water come from.

CHAIRMAN HAWKENS: May I ask you a question? Do you have any evidence that a source other than the reactor cavity when it's filled would be the source of water on the external shell?

DR. HAUSLER: No, I don't have the evidence. I have the question where it comes from.

CHAIRMAN HAWKENS: Do you have the answer where it comes from?

DR. HAUSLER: No, no --

CHAIRMAN HAWKENS: You say you just wonder where it comes from?

DR. HAUSLER: I just wonder where it comes from.

JUDGE ABRAMSON: Did I understand you correctly, Dr. Hausler, that you believe we heard

yesterday that there is on-going corrosion on the outside and you --

MR. WEBSTER: Can i just clarify this? I think, Dr. Hausler, that the testimony was there's ongoing corrosion, the upper drywell on the outside.

JUDGE ABRAMSON: The upper drywell, not in the --

MR. WEBSTER: And Dr. Hausler's point is that the upper drywell is hotter than the bottom and if there's ongoing corrosion, there must be water there.

JUDGE ABRAMSON: Let's ask the Applicant, what's the source of the water? Is there on-going corrosion in the upper drywell and if so, what's the source of the water? That's a straightforward question.

MR. POLONSKY: Judge Abramson, I think we had detailed questions and answers on this primarily with Judge Baratta yesterday, and we went through the extremely low hypothetical and only statistically based corrosion rate. I think it was .66 mils in the one point in the upper region.

We don't believe that that was real -- that there's actually corrosion ongoing. The testimony walked through what the actual measurements

are from those -- that, I think it was location --

JUDGE ABRAMSON: Let's rather than have the lawyer -- let's put on the individual who did this analysis and let's refresh everybody's memory on it and be done with it. Let's get the information right back. I don't think it's going to take all that long.

MR. GALLAGHER: Yes, this is Mike Gallagher. AmerGen.

JUDGE ABRAMSON: Mr. Gallagher, what I think your counsel is trying to tell us is that we discussed yesterday what sort of analysis one could do with the measurements and from those measurements because of the uncertainty, the worst case within the bounds of the uncertainty would lead one to project 6.6 mils. Can you tell me, have we got this right?

MR. WEBSTER: Judge, I think the analysis you're referring to is the analysis of the external measurements in the sand bed. That wasn't the analysis of the -- these are grid measurements in the upper drywell.

JUDGE ABRAMSON: Let's talk about it.

MR. GALLAGHER: I believe we did discuss this yesterday, but this was a question that Dr. Baratta had about the upper drywell. Okay, which is outside the scope of what we're talking about.

JUDGE ABRAMSON: Right.

MR. GALLAGHER: What we have there, we have a grid system we measure. There's 13 grids we measure. And we do -- if you look at the data, and see the exhibit, Exhibit 3, what page, John?

JUDGE ABRAMSON: We went through this yesterday.

MR. GALLAGHER: I'll just summarize. All the data is flat lined. It's the same situation. There's a grid system. We take the average, the mean. It's all flatlined, meaning there's no on-going corrosion.

In one area, we -- and we have data since the late 1980s, and in one area we conservatively called a corrosion rate, based on statistics, okay? And that was .66 mils per year. It's basically flat lined.

JUDGE ABRAMSON: But that estimate of corrosion was based purely on statistics, not on observation of any actual corrosion?

MR. GALLAGHER: That's correct. And it's uncoded, the upper drywell is uncoded and the other thing I said yesterday is the original water source, which we're monitoring for, was from the reactor activity, would come from the reactor cavity, a leak

behind the plate and then go into the gap. So it passes through the upper drywell area.

So what I said yesterday, it was the source would have been the same source, but there is no on-going source since we control that leakage now. It goes in the trough and goes down the drain into the rad waste system.

MR. WEBSTER: Judge, could I just --

MR. GALLAGHER: That's what I said yesterday.

JUDGE ABRAMSON: Quiet, please.

MR. WEBSTER: Okay, fine.

MR. GALLAGHER: That's what I had said yesterday and that's --

JUDGE BARATTA: And that's what you said.

MR. GALLAGHER: Yes, that's correct.

JUDGE BARATTA: I pulled up the transcript and that's exactly what you have. For future reference, it's on page 108.

JUDGE ABRAMSON: Mr. Webster, is there something you want to add?

MR. WEBSTER: Well, a couple of things. One is I think it would be useful to know the level of statistical significance with which this corrosion has been observed. The second thing is the reason there's

no visual measurement, no visual observations of corrosion at this point I think is because there's an insulating material and there's a three-inch gap. And so these measurements are taken on the inside of the upper drywell. It's not possible to do visual as far as I understand.

JUDGE ABRAMSON: Thank you. We understand where you're coming from. I don't have any further questions. Do you, Dr. Baratta?

JUDGE BARATTA: Nothing more.

CHAIRMAN HAWKENS: We will take a 10-minute break and hear from the next panel.

(Off the record.)

CHAIRMAN HAWKENS: You are missing a critical partner, Mr. Webster, we will wait for him to return.

MR. WEBSTER: I am and actually I was just going to say that he does have one thing to add to the last panel, if he could, which is not in his file testimony.

CHAIRMAN HAWKENS: We will hear from him first.

MR. WEBSTER: Thank you very much.

CHAIRMAN HAWKENS: Let's go back on the record. While we are awaiting Dr. Hausler, let's have

the counsel, please, introduce the witnesses for Panel 5, which deals with the epoxy coating.

MR. POLONSKY: This is Mr. Polonsky for AmerGen. Panel 5 consists of Jon Cavallo, sitting to my right. To his right is Mr. Ahmed Ouaou. To his right is Jon C. or Chris Hawkins. To his right is Scott Erickson. And behind that panel in the second row is Mr. Martin McAllister.

CHAIRMAN HAWKENS: Thank you.

MS. BATY: For the staff we have Mr. Hansraj Ashar, Dr. Davis and Mr. Tim O'Hara.

CHAIRMAN HAWKENS: Thank you.

MR. WEBSTER: And for Citizens yet to be disguised is Dr. Hartzman.

CHAIRMAN HAWKENS: Thank you. The witnesses once again are reminded they are sworn and they remain under oath or affirmation for the testimony they are about to present. Before asking questions on the -- regarding the topic of the epoxy coating, Dr. Hausler would like to say something regarding the prior topic, sources of water.

MR. HAUSLER: Well, there has been, you know, comments and I believe it was in a document that had been generated by Mr. Tamburro about the plugging of the drains. In the latest outage, the drains from

the drywell area have been plugged, at least three of them. My question was how did they get plugged? You know, we do know that due to vibration the concrete, you know, in that area has a tendency to degrade, you know, chunks of concrete have been found in that area before.

Now, my question, of course, is how does that get into the drains?

MR. POLONSKY: Now, for the record, just could we get an exhibit number, so we can accurately respond?

MR. WEBSTER: We are having trouble finding the exhibit number. Maybe Mr. Tamburro can confirm with Dr. Hausler's recollection is correct?

MR. POLONSKY: Perhaps we could come back to this after this panel is over, so after Mr. Tamburro has an opportunity to review the exhibit that you are alleging he wrote.

CHAIRMAN HAWKENS: That would be fine. Let's do that and that question will remain on the table. We will not only address it, but find out the corrective actions that have been done and the commitments that are in the record to prevent its recurrence. Let's now proceed to Topic 5, the Epoxy Coating, with a question for AmerGen.

Is there a possibility that some portion of the exterior area in the drywell region has not been coated with the epoxy?

MR. HAWKINS: This is Jon Hawkins. The sand bed region, the elevation goes from 8 foot 11 to 12 foot 3 inches, which is a total of 3 feet 4 inches. That entire area is completely coated. There are areas above that where the gap gets smaller to the 3 inches where they could not reach or could not access.

CHAIRMAN HAWKENS: Thank you. No, my concern was the sand bed region. Thank you.

MR. HAWKINS: That's completely coated.

CHAIRMAN HAWKENS: Thank you.

JUDGE ABRAMSON: All the way down to the floor?

MR. HAWKINS: That's correct.

MR. HAUSLER: Could we perhaps revert to Citizen's Exhibit 63, which is a diagram of that particular region? And we have a question with respect to how far the coating actually goes.

MR. WEBSTER: Actually, it's an administrative matter that is now referred to damage in Exhibit 7. It's the same figure.

CHAIRMAN HAWKENS: Yes, we'll consider that. Again, what exhibit is it?

MR. WEBSTER: It's AmerGen Exhibit 7.

JUDGE ABRAMSON: Is there something about what we just heard from AmerGen that you dispute or that's unclear?

CHAIRMAN HAWKENS: What I think we heard was that the entire sand bed region from the floor up to a certain elevation was coated period.

MR. HAUSLER: Yes, and there is a gap between the vent pipe and the concrete. There is a gap there and we're wondering that is subject to, of course, accumulation of water that was also subject to accumulation of sand there, you know, when the sand bed was poured and we don't know whether, in fact, the sand has been removed from there or whether in fact that area, the rust has been removed from that area and whether, in fact, it was coated.

That area would be severely subject to corrosion if, in fact, you know water comes down the outside of the drywell.

JUDGE ABRAMSON: So let's ask AmerGen. A) is there sand remaining in that gap region?

JUDGE BARATTA: Could we get that up, if you don't mind, before we ask that?

MR. WEBSTER: Yes, it would be helpful.

JUDGE BARATTA: Because I'm not sure what

region you are talking about.

MR. WEBSTER: It's AmerGen Exhibit 7.

JUDGE BARATTA: I have it here, but I don't know exactly where you're talking about on the --

MR. POLONSKY: Your Honor, if we could also just renew our objection on this. We don't know what this has to do with UT frequency., even if we took UT frequency at the points that currently are designated every single second, it would not relate to an area that is on the side.

JUDGE BARATTA: I can tell you're not an engineer then. If you would, continue, please. Sorry.

MR. POLONSKY: I agree. I am not.

JUDGE BARATTA: Could you --

MR. POLONSKY: The area I'm talking about is that gap just immediately to the right of No. 6. That is between the concrete and the vent pipe, that's the area, that's exactly right.

MR. HAUSLER: Is that the area, the drywell?

UNIDENTIFIED SPEAKER: The drywell shell is this piece, right?

ALL: No.

UNIDENTIFIED SPEAKER: No? Where is the drywell shell?

MR. OUAOU: The dark black line, Your Honor, that's correct, yes.

JUDGE BARATTA: And what is this?

MR. OUAOU: That's -- this is on the --

MR. POLONSKY: On this figure, the drywell shell is the dark line running diagonally up from the 6.

MR. OUAOU: Your Honor, that's the drywell shell and as Mr. Hawkins stated that we consider the sand bed region from this level, that's 8 foot 11 to 12 foot 3, that's the elevation here. That's all coated. This gets into the gap and it is accessible for coating. This is a gap between the vent pipe and the concrete and the vent pipe is not part of the dry well shell itself. Ordinarily, there is no sand in this gap. This is all clear.

JUDGE ABRAMSON: And it is not structural for the -- from the perspective of adding to the ability of the drywell shell to withstand buckling. Is that correct? It's just a vent pipe.

MR. OUAOU: The vent pipe was modeled as part of the model that GE did, but it's -- my belief is it's not all they credit it.

MR. WEBSTER: Well, I would like Dr. Mehta. I had thought that the structure to the vent pipe was created for buckling.

JUDGE ABRAMSON: Dr. Mehta, once again, when you modeled the drywell shell for buckling, how did you treat the vent pipes?

DR. MEHTA: In the vent pipes nominal thicknesses were used to include in this model.

JUDGE ABRAMSON: Okay. And how do they -- how are they susceptible to the buckling loads you were looking at? Are they relevant to considering buckling of the drywell shell or does it take much greater loads to cause the vent pipes themselves to buckle? What's the relative relationship?

DR. MEHTA: Your Honor, they are somewhat relevant, but given that the buckled wave is in the middle between the two bays, it will have some insignificant effect or a very small effect if there is any.

JUDGE ABRAMSON: An effect on the buckling of the drywell shell itself, but are the pipes themselves susceptible to buckling prior to buckling of the drywell shell? Which is going to fail first?

DR. MEHTA: Your Honor, the vent pipes are very thick, so they are not susceptible to buckling.

JUDGE ABRAMSON: Thank you.

MR. POLONSKY: Your Honor, if we can put on the record an objection that the contention is about the drywell shell and UT of the drywell shell and we believe Citizens are trying to expand this to an area outside of the drywell shell.

CHAIRMAN HAWKENS: Thank you. We understand the contention is limited to the drywell shell. NRC staff?

MS. BATY: We just wanted to join in with AmerGen's objection.

MR. WEBSTER: May I respond to that objection, which is the reason this area is relevant is twofold. One is that those vent pipes are in regard to structural in the model for buckling the drywell shell. There is a boundary condition put on which does -- is -- assumes that those vent pipes have normal thickness.

Second, AmerGen has claimed air flow through this gap contributing to evaporation. So it's relevant when this gap is full of corrosion products or not.

JUDGE ABRAMSON: Okay. So let's come back to I think we heard from AmerGen that there is no sand in this gap. Is that correct?

MR. OUAOU: Yes, Your Honor.

JUDGE ABRAMSON: And that the drywell shell is coated up to this gap, but can you show us with a pointer where it is not coated?

MR. HAWKINS: It's coated from the floor up the drywell shell, the bottom of the vent header, approximately, up to here on both sides of the vent header coming up each side. So it goes up much higher than the 12.3.

JUDGE BARATTA: Here is a photograph in Exhibit 40. It's on page 91. I don't know whether it shows any of this region, but if you could just grant me, because on that photograph, I would appreciate it, because it looks like we are actually looking -- it's labeled Bay 13, Drywell Shell. And it is --

MR. POLONSKY: That's page 91, Your Honor?

JUDGE BARATTA: Yes, yes. I think it looks like there is something in the background there. I was wondering whether that was a vent header or not.

MR. HAWKINS: Yeah, the vent header is out of the picture, but the support ring that surrounds the vent header, it's an 18 inch -- from the vent header itself to the bottom of the support ring is 18 inches.

JUDGE BARATTA: Um-hum.

MR. HAWKINS: That is like I said above the --

JUDGE BARATTA: Is that what is visible in the background there, that?

MR. HAWKINS: This is a weld that welds the support ring to the vent header and the vent header to the drywell shell.

JUDGE BARATTA: So you can see that that's coated there.

MR. HAWKINS: Yes, all the way up here.

JUDGE BARATTA: And there is also no evidence of any corrosion. In fact, that looks like it is in good condition. Is that correct?

MR. HAWKINS: It appeared to me to be a red painted surface, not a corroded rusty surface.

JUDGE BARATTA: Right. There's no -- like the area that's below that where the external UT inspection location is.

MR. HAWKINS: In this picture here?

JUDGE BARATTA: No, further down. It's clearly corroded.

MR. HAWKINS: Yes.

JUDGE BARATTA: And that looks almost like it's an as-built condition above that.

MR. HAWKINS: Correct.

JUDGE BARATTA: Is that correct?

MR. HAWKINS: Yes, that's the bathtub ring right here. So above that we did take some thickness readings there also and that was -- there was no corrosion and we also have these areas here, which are the prepped areas that we performed the UT inspections.

JUDGE BARATTA: And is this photograph fairly typical of -- this is for one bay. Are the other bays --

MR. HAWKINS: Yes.

JUDGE BARATTA: Are they typical of that?

MR. HAWKINS: Very typical, if not more coating up even higher.

MS. BATY: For clarification of the record, can we put in where the witness was pointing to on that photograph, as far as like the upper right hand corner, to point out how high the epoxy coating goes and where the vent line, support ring -- the support ring and the vent line attaching to the drywell shell? If we could put that in the record?

CHAIRMAN HAWKENS: You go ahead and describe it again and verbally describe where you're placing the pointer on the picture.

MR. HAWKINS: Okay. This is the drywell

shell. This is the weld that attaches --

CHAIRMAN HAWKENS: Right. If you are the -- the laser is in the top right hand corner.

MR. HAWKINS: Oh, okay. The laser is pointing to the top right hand corner of the screen and that is the vent header penetration. Just below that into the gray painted surface is the vent header support ring, which is attached by a weld to the drywell shell which is just below it. And I'm pointing to a flat surface on the screen, which is the drywell shell above the bathtub ring, near the top of the screen or the picture.

JUDGE ABRAMSON: Let the record reflect that the witness has been describing the upper right hand corner of this picture where there are weldments, one running apparently circumferentially across the upper right hand corner of the picture and describing it in an arc. And below that arc there is what appears to be a relatively shiny flat area. And then coming down to the left, lower left from that, one sees a rough surface. I think that ought to be enough to get this in the record.

MS. BATY: Thank you. I also pointed -- I believe the witness also pointed to the one area that is located on -- that's pointed to on the caption

of the picture saying external UT inspection location. That was also described.

JUDGE ABRAMSON: We have enough information. It's in the record.

MS. BATY: Okay. Thank you.

MR. WEBSTER: Judge, I think I have a comment on this photograph. If you can't see a feature on the projection, but in the original photograph there is a feature which has it coming.

MR. HAUSLER: There appears to be an area just below the B as in bed and R as in reach, and in other words, in the center of the photograph on the upper boundary. There appears to be a region that is corroded or is full of corrosion products and it has not been identified as being coated.

MR. WEBSTER: Just a clarification. You cannot see it on the projection. You have to look at the original photograph, which is reproduced on the AmerGen Exhibit 40, page 91.

MR. HAWKINS: He is talking about an area on the original picture that's in this area over here in the upper left hand side of the picture.

MR. WEBSTER: Well, it's in the center below the B in bed as Dr. Hausler described.

MR. HAWKINS: This was below the D in bed?

JUDGE ABRAMSON: Yes, it's right in there. Right there. If you look at the picture, the actual photograph there is some odd geometry in there or irregular geometry which we can't tell what it is.

MR. HAWKINS: In my opinion, that is the concrete wall beyond the shell. Because we are looking at an arc surface as you get off to the -- now, you are seeing the concrete wall that's behind you.

MR. POLONSKY: Can we have one moment, please, Your Honor?

CHAIRMAN HAWKENS: Yes.

MR. POLONSKY: Your Honor, Mr. Tamburro previously testified that he physically was in Bay 13 during the 2006 outage, so I thought you might want to hear, you know, as opposed to a picture, what he saw.

CHAIRMAN HAWKENS: All right. Bring Mr. Tamburro forward.

MR. TAMBURRO: This is Peter Tamburro. I was in Bay 13. I was able to look up in those areas and I did not see any evidence of corrosion on the drywell vessel. There were different colors, different discolorations on the concrete areas on the interface between the drywell and the concrete, but there was no evidence of corrosion in that area.

MR. WEBSTER: I think the question was what was the feature that's on the photograph?

JUDGE ABRAMSON: Yes, and I think the answer we heard from the expert who was describing it is that he thinks that feature is, he thinks, the concrete behind in the background. And one can't tell. And so I think the answer is one can't tell and we'll leave it at that. That's his expert opinion.

MR. HAWKINS: I can clarify my statement by saying that no where on the drywell shell in the area of examination looked like that.

MR. WEBSTER: Well, I mean, I guess the question is when we're talking about the drywell shell, what about this area Dr. Hausler is pointing out between the vent header and the concrete.

MS. BATY: Your Honor, the staff has something. One of our inspectors was there and has something that they would like to share on this.

MR. O'HARA: Tim O'Hara, Your Honor. During the outage in the fall of '06, I entered Bay 13 and Bay 11, physically looked at the drywell. All the regions on the outside of the drywell were coated. Conditions like that exist on the shield wall opposite the drywell shell itself. And all those conditions were documented by AmerGen and they are taking

corrective actions as needed on those conditions. But the drywell shell was completely coated.

I also examined all the records both visual and the video records that AmerGen made and everything that we looked at on the external of the drywell was coated.

JUDGE ABRAMSON: Mr. O'Hara, did you observe any sand remaining in any of these gaps that are in question here?

MR. O'HARA: No, I didn't, Judge.

JUDGE BARATTA: Did you see any corrosion products in any of those gaps or anything like that?

MR. O'HARA: There was no corrosion products visible on the outside of the drywell. On the shield wall and the tendons running through there, there was light rust. There was no visible signs of any moisture in the -- in any part of the sand bed area.

JUDGE BARATTA: Are those tendons concrete or are they steel?

MR. O'HARA: Steel, I believe.

JUDGE BARATTA: The shield wall, is that concrete?

MR. O'HARA: That's concrete.

JUDGE BARATTA: So what we're probably --

it's difficult seeing is one of the tendons?

MR. O'HARA: That would be my guess. But it is not on the drywell shell, in this particular bay, which I did look at.

JUDGE BARATTA: Thank you.

CHAIRMAN HAWKENS: Dr. Hausler, you have expressed concerns about pin holes in the epoxy coating.

MR. HAUSLER: Well, the area that we're pointing to on the vent pipe, on the down comer, you know, in that gap, is, in fact, the pressure boundary and we have been concerned about pressure boundaries on the drywell shell. I believe that is, you know, just, you know, the same area, the same problem with the, you know, 49 or 490 mil limiting --

CHAIRMAN HAWKENS: Well, I'm talking about pin holes in epoxy coating. Is that what you are addressing right now?

MR. HAUSLER: No, I'm not.

CHAIRMAN HAWKENS: We're in the epoxy coating topic. Here is my question.

MR. HAUSLER: I'm sorry.

CHAIRMAN HAWKENS: In your testimony you expressed concerns about the possibility of corrosion in the sand bed region which would occur at pin holes

in the epoxy coating.

MR. HAUSLER: Yes, sir. The studies that have been made prior to the application of the epoxy took for qualification of the application procedure and so on have clearly shown that there is a possibility of pin holes forming, thus inclusions as well as, you know, hairs from brushes and things of that nature.

It is my understanding, you know, from reading of the report that had been prepared by the applicator of the epoxy that on the mark-up where the panels were, you know, prepared, you know, for future study, examinations have been done, you know, for the detection of pin holes by, you know, electrical methodology, you know, the way painters, in fact, you know, do detect pin holes.

However, when the coating was applied in the sand bed area, no such examinations or quality control procedures have been applied. As a consequence, you know, I think it is reasonable to postulate that if pin holes, you know, can, in fact, occur during the study of the coating procedure, it is even more likely that pin holes occur in the actual application, simply because you have more dust and it is not as sanitary environment in the sand bed when

you apply the coating as it is, you know, when you do it on the mark-up.

CHAIRMAN HAWKENS: I understand now. I understand that theory. Is there any evidence, based on the record you have seen provided by AmerGen, that pin holes actually exist?

MR. HAUSLER: No, there isn't, because they haven't looked for them.

CHAIRMAN HAWKENS: Thank you. AmerGen, could you respond to that?

MR. CAVALLO: I would be glad to, Your Honor. Jon Cavallo. In all deference to Dr. Hausler's observations, there is no evidence of any pin holes after 14 years of service in this coating. Pin holes would be evidenced by visual rust staining in the area of the pin hole. In order to bet corrosion and bear with me just a sec and also Barry Gordon will testify on corrosion, we need anodes, cathodes and an electrolyte as we discussed in the previous panel and a path for that electrolyte to get to the steel. That would be a pin hole or one to occur.

In the years of experience I have and probably personal observation in over 40 -- over 50 nuclear power plants in the U.S., plus China, plus

Korea, plus Europe, when we have a pin hole in atmospheric service, such as what we have here, and we expose it to moisture, we would first see a rust bleeding. Very similar to what you would see on your lawn furniture in your home. You would see a rust stain, which would be very large, very visible.

And I have had the opportunity to review the visual inspection records done by the gentleman to my right and there is absolutely no indication of any visual indications of pin holes. So that allows me to state unequivocally we do not have pin holes in the coatings applied to the drywell in 1992.

CHAIRMAN HAWKENS: I would like to hear from the gentleman on your right, who you said actually performed them?

MR. CAVALLO: Please.

CHAIRMAN HAWKENS: The visuals.

MR. HAWKINS: That would be Mr. Erickson and myself performed the majority of the examinations on the drywell shell in those areas and we saw no evidence of the rust seepage from anything at all. No rust at all.

MR. ERICKSON: Scott Erickson and I concur with Mr. Hawkins. I saw no evidence of any rust seepage or any pin hole evidence of rust going on.

JUDGE ABRAMSON: Mr. Cavallo, is there anything unique about the epoxy that was used in Oyster Creek that would make it less likely or more difficult for the rust to show through, to be visible compared to other -- these many other plants you have looked at?

MR. CAVALLO: No, this epoxy is unique in ways that would actually help us to prevent pin holes. One reason is that all three coats that were applied are 100 percent solvent free. Pin holes occur during the application process or during the curing process. Typically it has to do with solvent migration leaving very small holes in the coating or --

JUDGE ABRAMSON: What's the relevance of dust in the atmosphere when you are applying this?

MR. CAVALLO: None.

JUDGE ABRAMSON: Thank you.

MR. CAVALLO: These coatings are 100 percent solid, so we have no solvents in any one of the three coats. That's a very common cause of pin holes in epoxy coatings.

JUDGE ABRAMSON: And to come back to what I asked, because what we are concerned about is whether you would actually physically be able to see the rust. Is there anything unique about this

particular coating that would make it more difficult to visually observe rust underneath if it were occurring?

MR. CAVALLO: No actually, just the opposite. The selection of the top coat color, which is a grayish white would give you a very good visual contrast to, in this case it would be, iron oxide or red rust, so the staining would be very visible to, particularly, trained UT-1 inspectors.

JUDGE ABRAMSON: And in your experience when you have -- in cases where you have seen pin holes, what -- can you describe the character of the rust corrosion that was underneath the epoxy when you have seen it? How big an area was it? How much was being corroded? What was the relationship to the size of the pin hole? Can you tell us anything about the rate?

MR. CAVALLO: I'll speak to -- I won't speak to the rate. I'll ask my colleague, Barry Gordon, to address that in the next panel if you can bear with me.

JUDGE ABRAMSON: Okay. That's fine. That's fine.

MR. CAVALLO: As far as what we would find were we to excavate the coating in the area of a pin

hole, typically with a three coat epoxy such as the one used in the Oyster Creek dry well. We would find if there were no -- there was no carbuncle present, a large swelling of the rust, we would find very localized, very minimal corrosion at that point.

JUDGE ABRAMSON: And that would be at the point where you had seen the color, but not had any swelling underneath. Is that right?

MR. CAVALLO: That's correct, sir.

JUDGE ABRAMSON: Okay. And if it went so far as to building a carbuncle as you call it, what would be typical then? Give me an idea the diameter of a carbuncle, how deep would it eat in?

MR. CAVALLO: The consensus in the corrosion industry is that that carbuncle, the iron oxide or oxide products form would occupy a volume and actually swell and occupy a volume 7 to 10 times the size of the steel that it was replacing. So we would see an irregularly shaped fairly circular rough surfaced deformation of the coating that would be centered on the area of the pin hole.

JUDGE ABRAMSON: Okay. Now, we're mindful that you are saying that there is no evidence of any of these in Oyster Creek, but in the worst cases that you have seen where things have been let go, how big

carbuncles have you seen and how much did it eat in?

MR. CAVALLO: In a benign environment, such as the Oyster Creek drywell, we have very low temperature, air conditioned conditions. We have no extensive moisture exposure as we saw in the previous panel. I wouldn't expect to see carbuncles. I would expect to see over a period of three or four years, which is the frequency of inspection, staining only. I would not anticipate seeing carbuncles.

CHAIRMAN HAWKENS: Does the NRC staff have anything to add to that?

DR. DAVIS: Jim Davis with the staff. I agree with what Jon says. That has been my experience, too, with a lot of years of working with coatings.

CHAIRMAN HAWKENS: Thank you.

JUDGE BARATTA: One thing that has confused me about that is there was a discussion about the environment that the coating is in and the mechanisms that would degrade the coating. It was mentioned that ultraviolet light degrades epoxy coatings. Is that correct?

MR. CAVALLO: That's correct, sir.

JUDGE BARATTA: This area does have a not tremendously, but some gamma radiation in it. Is that

also correct?

MR. CAVALLO: That's correct.

JUDGE BARATTA: How come it doesn't degrade the epoxy coating?

MR. CAVALLO: That's a good question. I can testify that it does not in the doses that we are talking about in the Oyster Creek drywell, based on the plant numbers and I'll let AmerGen testify to those numbers, if you would like. What we have found in probably 50 years of testing is the epoxies are quite resistent to gamma radiation, such as we see in the Oyster Creek drywell. We would see some slight chalking of the epoxy on the surface, but that's a matter of surface oxidation.

There are a number of studies going on right now to actually quantify that number, but we're looking at fractions of a mil and it tends to be surface oriented. It's a radio oxidation phenomena. There is a study going on sponsored by Electrocar Power Research Institute and Electricitas de France, which is going to quantify that, but we're two years away from that. But basically, it's a surface oxidation phenomena.

MR. POLONSKY: Your Honor, if we could just perhaps refresh Mr. Cavallo's memory? We do have

specific testimony on this in AmerGen's direct testimony on Part 5. It was part of the answer to A7, which went from -- started on page 7 of 17.

MR. CAVALLO: What I would like to add is the actual dose rates that were estimated in the drywell, based on measurements that with a dose rate, this is in the section that was just quoted by counsel. 5.6 rads per hour and since the 1992 outage when the coating was installed, we would have estimated a dose of 1.1 x 10^{6th} rads. Most of our epoxy or all of our epoxy coatings used in nuclear power today have been tested to 1 x 10^{9th} rads per hour. So we are three orders of magnitude higher.

JUDGE BARATTA: That was the number that was missing was the 10^{9th}.

MR. CAVALLO: Exactly.

JUDGE BARATTA: Thank you.

MR. CAVALLO: You're welcome.

CHAIRMAN HAWKENS: Dr. Hausler, you have heard the testimony of AmerGen and the NRC staff. Is there anything that they said that was error?

MR. HAUSLER: No. I haven't, you know, seen anything that is in error. I am wondering how 50 years experience with a coating actually relates to specifically to the coating life. You know, we're

talking about a coating life here of, you know, 18 to 20 years. I expect it to last another 40 years. And my question is, you know, how much experience do we really have with respect to this coating going to last for another 20 years?

CHAIRMAN HAWKENS: AmerGen, could you respond to that, please?

MR. CAVALLO: Okay. Could you possibly play the question, Judge Hawkens, to help me out with answering, because AmerGen will answer part of this.

CHAIRMAN HAWKENS: Let me see if I can rephrase it. Citizens are concerned because they recall earlier in the record, it was suggested that this epoxy life may have had a coating between 10 and 15 years. Given that that has expired, we're seeking an extension of 20 years. How does past experience with epoxy coatings give assurance that this epoxy coating which arguably is at a very late stage in life will maintain its integrity during the renewal period?

MR. HAUSLER: Thank you, Judge. You have done better than I could.

MR. CAVALLO: Let us answer that in two parts. One, could we first address the 18 to 20 year question? And I would like Mr. Ouaou to address that with AmerGen.

MR. OUAOU: Your Honor, I think if we can refer to Exhibit 16 which I believe that it says in Exhibit 16, which I believe Dr. Hausler was referring to, Citizens exhibit, Citizens, yes. This is a transcript of our testimony before the ACRS. Citizens Exhibit 16. I just want to refresh Dr. Hausler's memory on what I said in the meeting.

What I said in the meeting is that there were some original estimates initially when the coating was specified that the expected life of the coating was 8 to 20 years, something less than 20 years. And what I found out is that I spoke to the supplier or the vendor of the coating is that the vendor cannot really guarantee a life of any coating beyond 8 years or something less.

However, the vendor suggested that the setting, the environment the coating is in, we should not expect it to last for a long time. And as far as the life, the only way you would determine that is by doing inspections and do repairs if you see anything that comes up. And if you do that, the coating we have will last for a long time. And this is reflected in the --

JUDGE ABRAMSON: Do you have any information that would lead you to believe there would

be a relatively rapid deterioration at some point or that therefore in between inspections there might be some rapid deterioration and you might miss it?

MR. OUAOU: No, Your Honor, no.

JUDGE ABRAMSON: Nothing in your experience with the vendor. How about Mr. Cavallo in your experience, have you ever seen rapid deterioration of epoxy coatings?

MR. CAVALLO: Not applied properly with the degree of care and inspection that these coatings were applied to. We have not seen end of life failure in epoxy coatings in nuclear power plants due to age.

JUDGE ABRAMSON: Okay. Now, let me ask the staff. If there were some deterioration observed in the coating at some point and it got so severe that the coating needed replacing, how would the staff handle that sort of an incident?

DR. DAVIS: Well, through the inspections they would have to replace it if they saw deterioration in the coating.

JUDGE ABRAMSON: Thank you.

DR. DAVIS: But in -- to just add to what Jon said, primarily the reason coatings fail is because of poor surface finish. And then the second factor is the application of the first layer and the

failure normally occurs very quickly within the first few years if it's going to occur. Once it gets past the first few years, then it goes on to five or six years. Then it is much likely to get a rapid failure of the coating. It's much less likely to see a rapid failure.

MR. WEBSTER: Judge, could Dr. Hausler comment on this?

CHAIRMAN HAWKENS: Please, go ahead.

MR. HAUSLER: Well, I think this is, you know, pretty much one opinion against another opinion. I think it is well-known that the epoxy in particular are, you know, subject to, you know, continued hardening with life, particularly, if the temperature is elevated, that is one thing. Another --

JUDGE ABRAMSON: Well, what constitutes elevated, in your view?

MR. HAUSLER: You know, about 150 degrees.

JUDGE ABRAMSON: And have you seen this type of epoxy in use, the type -- this three coat type of this particular chemical composition in use in your experience?

MR. HAUSLER: No, sir, I haven't seen it. I know it from the literature, but this kind of thing happens. I also know it from understanding of basic

chemistry that is involved in forming it.

JUDGE ABRAMSON: Are you a chemist?

MR. HAUSLER: Yes, sir.

JUDGE ABRAMSON: Okay. You have experience in the chemistry of epoxy coatings?

MR. HAUSLER: We did study the nature of epoxy, you know, quite extensively, you know, along with other, you know, polymers, you know, in -- you know, during the, you know, education, that's right.

CHAIRMAN HAWKENS: Carry on.

MR. HAUSLER: Well, the point I wanted to make is that embrittlement of a coating does, in fact, occur. You know, that is known. It does depend on the formulation of the specific epoxy, you know, that there is no question about that. You know, you can avoid the embrittlement with age by choosing the different, you know, components, either, you know, the epoxide itself or the hardener.

JUDGE ABRAMSON: And what can you tell us about the chemical composition of this particular epoxy that tells us whether, in your view, this is the kind of epoxy composition that is subject or is not subject to such embrittlement?

MR. HAUSLER: I cannot tell you anything about that. I'm not familiar with this specific

composition.

MR. WEBSTER: Perhaps Dr. Hausler can do two things. One thing is he can identify something where he positively knows something, but he also can identify data gaps, where, in fact, a certain fact is not known and I think there is a danger here that we don't get to those data gaps if we just keep positively asking do you know this. I could suggest to him are you happy, Dr. Hausler, that the data that we have leads to a reasonable certainty that it won't be a rapid end of life failure of this coating?

MR. HAUSLER: I don't think that the data will indicate that. I am particularly concerned about the fact that this particular area is subject to not only temperature variations, but, in fact, to vibrations. We know that the floor, the sand bed floor that was heavily coated with this epoxy has broken up several times and had to be, you know, repaired. We also know that concrete, parts of the concrete from the, you know, concrete wall around the drywell shell do come lose due to vibration and temperature changes.

JUDGE ABRAMSON: So you are comparing the epoxy that was applied to a concrete surface, the floor, to the concrete that was applied to the carbon

steel liner? Is that what --

MR. HAUSLER: No, I mentioned the example in order to illustrate that, in fact, there are vibrations and there are stresses.

MR. POLONSKY: Objection. Foundation for vibration.

JUDGE ABRAMSON: Well, we understand. Let's carry on.

MR. HAUSLER: And that can, in fact, you know, with age of the epoxy, in my opinion, lead to, you know, possible, you know, crack formation.

JUDGE ABRAMSON: And would you expect the crack formation to be a function of how the material to which the epoxy is applied responds to these vibrations and stresses and would you expect there to be a difference in the response of a steel vessel from that of a concrete?

MR. HAUSLER: The process may be slower, but in principle, I think, that if, in fact, the steel has different coefficient of expansion around the epoxy and the steel does expand with temperature and, you know, on top of it we know that there are vibrations there. We understand that. In fact, yes, it can happen either on concrete or on steel.

JUDGE ABRAMSON: And would you expect

there to be a difference in the response of the two kinds of materials to vibrations? I mean, are you familiar with how concrete in these circumstances in this plant behaves? How it decomposes? How it responds to vibration?

MR. HAUSLER: Let me answer the question, counselor.

MR. WEBSTER: No, I'm very happy to answer the question. I'm just going to suggest that, obviously, Dr. Hausler is not as familiar with the specific details of the plant as AmerGen's witnesses.

JUDGE ABRAMSON: We understand. He is trying to draw an analogy between the way epoxy coating on the cement floor might behave and how the epoxy coating on this stainless -- on this carbon steel membrane might behave. And I'm trying to understand what the foundation is for that analogy or comparison.

MR. HAUSLER: So just to clarify, Judge, then you're asking in principle, rather than that specific plant?

JUDGE ABRAMSON: Yeah. I'm asking in principle, but I want to understand what his understanding is of how concrete behaves under these circumstances versus how carbon steel behaves under

it, 1 inch thick carbon steel behaves under these circumstances.

MR. HAUSLER: Okay. Well, you know, the analogy is -- you know, was brought forth because, you know, we know that the concrete floor has broken up. And when we know that there is this sort of --

MR. WEBSTER: Does that leave epoxy coating to the concrete floor?

MR. HAUSLER: The epoxy coated concrete floor has broken up. We know that.

JUDGE ABRAMSON: And I'm saying, you think that has broken up because of what happened to the concrete or that has broken up because of the flaws in the epoxy? What are you suggesting?

MR. HAUSLER: Actually, we don't know that.

MR. WEBSTER: Judge, let's just say what you are saying is that Dr. Hausler can testify to things we don't know as well as things he does know? And I think the things he doesn't know, since we don't bear the burden of proof, things he doesn't know need to be addressed.

JUDGE BARATTA: Could I ask if -- let's say that for whatever reason that the epoxy cracked. Would that be visible in such a way that it could be

detected by a visual inspection, which is conducted periodically?

MR. HAUSLER: It would eventually become visible. There's no question about that, of course. What we have suggested early on is that the inspection could be much more effectively carried out by tools that are specified, for instance, by name. These are very simple and don't laugh now, but electric and sponge type surface examinations.

MR. SILVERMAN: Your Honor, this does go to the monitoring of the coating, which is outside the scope of the proceeding.

CHAIRMAN HAWKENS: I do agree it's outside the scope. I'll just let him finish his thought.

MR. HAUSLER: Well, I think, you know, any damage to the coating could very easily be detected, you know, prior to actually prior to serious damage happening. That's what we have, you know, suggested early on that, you know, the coating should undergo rigorous quality control and not just a visual examination. Such examination should be, you know, more frequent than, you know, every 4 or 10 years.

MR. WEBSTER: Can I just clarify here that I think Dr. Hausler -- can I just clarify, Dr. Hausler? When you say it could be detected, do you

mean by methods other than visual inspection?

MR. HAUSLER: That's correct.

CHAIRMAN HAWKENS: We understand that argument and as AmerGen correctly said, this is outside the scope.

MR. WEBSTER: I think it goes to the issue of frequency of monitoring. If there is a danger that the coating floors will not be identified through visual inspection, then it effectively means that the longer period where corrosion could occur.

JUDGE BARATTA: Thank you.

MR. SILVERMAN: Your Honor, could AmerGen just follow-up on the issue of temperature effects, which Dr. Hausler testified to?

CHAIRMAN HAWKENS: Please. Let's hear from AmerGen on how the thermal -- how temperature might affect the behavior of this concrete and its embrittlement. I'm sorry, this epoxy coating.

MR. CAVALLO: Now, I'll address that question, sir. Dr. Hausler mentioned a number of 150 degrees fahrenheit. In fact, the maximum exposure temperature, which is in our direct testimony, is 130. So this coating will never see anything about 130 plus a little ever.

JUDGE ABRAMSON: And in your experience

with epoxies, is his number of 150 a reasonable number of where it might start to become embrittled or is it --

MR. CAVALLO: No, no. The surface --

JUDGE ABRAMSON: -- that's a number out of the air?

MR. CAVALLO: Excuse me, sir. I didn't mean to interrupt you.

JUDGE ABRAMSON: That's okay.

MR. CAVALLO: The surface condition of this coating, as in most of our epoxy polymers, is 250 F continuous.

JUDGE ABRAMSON: So it is designed to handle 250 without embrittling?

MR. CAVALLO: Yes, sir. This coating was originally intended for a tank lining, continuous immersion, aggressive service at temperature up to and including 250 F. So it's a much more robust coating than would be needed under normal circumstances in the sand bed region. This was selected to give an extra order of confidence to the performance.

JUDGE BARATTA: And the only situation that you could even approach those would have to be in an accident condition or maybe you're not -- you can't comment on that.

MR. CAVALLO: I am not aware what the temperature would be in an accident situation.

JUDGE BARATTA: Yeah.

MR. OUAOU: The temperature in an accident condition, I believe, is around 281 degrees to 340.

JUDGE BARATTA: And that would be an extreme?

MR. OUAOU: That's an extreme, yes.

MR. CAVALLO: But I believe, correct me if I'm wrong, Mr. Ouaou, that temperature is inside the drywell, so we may not -- the coating on the outside might not see that.

MR. OUAOU: That is correct.

JUDGE BARATTA: And even under those circumstances, you would probably -- would you do an inspection? You would have to do an inspection on the whole system.

MR. OUAOU: That inspection is required after that.

MR. WEBSTER: Could we just clarify the record a little bit? The testimony where the pre-fire was 130, where was that?

MR. OUAOU: That is -- oh, I'm sorry.

MR. POLONSKY: That can be addressed in Part 1 of the testimony, the temperatures, and it's

also incorporated in Part 6 which we will hear from next.

MR. WEBSTER: Okay. Well, I think Dr. Hausler, do you have another comment on that?

MR. HAUSLER: Yes, I do.

MS. BATY: Excuse me, before we move on, oh, sorry.

MR. WEBSTER: We're not moving on. We're keeping -- there is no intention to move on. The intention is to stick precisely with this question.

MS. BATY: Excuse me, can I ask my witnesses if they have anything to --

JUDGE ABRAMSON: Not yet.

MS. BATY: -- add about --

JUDGE ABRAMSON: Not yet, counselor.

MS. BATY: -- epoxy coating on -- the difference of epoxy coating on carbon steel versus on the concrete floor?

JUDGE ABRAMSON: Yes, that's where I want to go with AmerGen and with the staff.

MS. BATY: Okay. Thank you.

JUDGE ABRAMSON: AmerGen, do any of your witnesses have experience or knowledge that might help us understand the difference of the behavior of concrete and carbon steel to the kind of vibration

environment and how concrete can break up and what it does to the epoxy? We would like to know whether this analogy to -- of knowing that epoxy has appeared to have broken up when the concrete broke up makes -- is relevant.

MR. CAVALLO: I'll attempt to address that properly. Two things to realize about the coating system applied to the concrete versus applied to the steel. The steel was pre-primed using a penetrating epoxy seal, again 100 percent solid. That sealer was not applied to the concrete. The second thing to realize is this coating material can be applied, since it is solvent free up to a quarter of an inch thick, as recommended by the manufacturer.

The coating was applied to the concrete less as a preventive measure, but more to slope the coating, as you heard yesterday, towards the drains. It was actually used as a surfacer to change -- to correct the contours. When --

JUDGE ABRAMSON: So it was not designed to prevent moisture penetration into the concrete. It was designed to guide the water into the drains? Is that --

MR. CAVALLO: That's my understanding. But let me let AmerGen address that directly.

MR. OUAOU: That is correct, Your Honor. We --

CHAIRMAN HAWKENS: Please, identify yourself.

MR. OUAOU: Ahmed Ouaou. The epoxy on the floor is actually a putty that was used to fill in the irregularities that were identified in the floor and sent that back in in the late '80s, '90s time frame. It's not just a coating. Actually, it's about -- in some cases before to 8 inches thick. And it is not a coating as we know it.

If I may just add, I'm not sure the source of the vibration that, you know, Dr. Hausler was talking about. I think in our testimony we indicated that the irregularities or the defects in the floor of the sand bed is actually a result of not having finished during construction. It was never -- the sand bed floor was never finished and it's, in my opinion, not a result of live --

MR. WEBSTER: Might I clarify the record with that. I think there's some confusion about what the sand bed floor is, whether it is the concrete or whether it's the epoxy. Dr. Hausler's testimony did not relate to the concrete floor. It related -- which is I think what Mr. Ouaou's testimony relates to. It

relates to the epoxy.

JUDGE ABRAMSON: Yeah, we understand that. Thank you, counselor.

MR. CAVALLO: And I think that again, the thing to keep in mind is that the coating on the floor has no connection with the coating on the corrosion preventive coating on the concrete or the steel liner.

JUDGE ABRAMSON: When you say no connection, you don't mean that there's no physical connection?

MR. CAVALLO: No, no.

JUDGE ABRAMSON: You mean it's an entirely different purpose and entire different material?

MR. CAVALLO: Thank you. Philosophical connection, right.

JUDGE ABRAMSON: All right. Staff has an expert who can add some information to this that I understand?

DR. DAVIS: Jim Davis. I don't have anything else to add. I agree with what they have said.

MS. BATY: They who?

DR. DAVIS: AmerGen.

MR. WEBSTER: Judge, I do think Dr. Hausler has another comment, if you have time.

CHAIRMAN HAWKENS: Is it directly related to what we just asked of the staff and AmerGen? And if it's not, if you can be very brief, go ahead.

JUDGE ABRAMSON: And not get on your sand box.

MR. HAUSLER: Let me just let it go at that.

CHAIRMAN HAWKENS: I'm sorry, I didn't hear you, Dr. Hausler?

MR. HAUSLER: I said let it just go at that, since Judge Abramson doesn't like my sand box, I think I'll just shut up.

JUDGE ABRAMSON: If you have technical information to add that we haven't already seen in written testimony and we haven't already heard, we welcome it, but if it's just repetitive, we don't need it.

MR. HAUSLER: There is --

MR. WEBSTER: I think perhaps the point is --

MR. HAUSLER: -- a concern. There is a lot of confusion about, you know, what the product really is. The difference between the epoxy on the floor and the epoxy on the shelf. It had not been specifically, you know, pointed out. However, what I

do want to point out is that I was not previously aware of the fact that this is not a solvent containing epoxy. That really makes it all the more difficult.

It is more highly viscous epoxy and it makes it more difficult for air bubbles to escape. And I think that would have made it all the more important and imperative to apply good quality control to the epoxy coating after it had been applied in the sense that -- in the same sense that this quality control was applied to the test panels that, you know, had been epoxy coated in the mark-up.

MR. WEBSTER: Could I also -- but I also think it's useful to clarify the difference in 100 -- these various temperatures. I think it's useful for Dr. Hausler to clarify whether these temperatures are threshold temperatures, so there is no effect below a certain temperature or whether they relate to the right situation.

MR. HAUSLER: Well, you know, we are talking about chemistry. And chemistry doesn't start at 250 degrees or not. Chemistry is depending on kinetics and, you know, kinetics are accelerated with temperature. But that doesn't mean that the kinetics, you know, are not prevalent at 130 or 150 degrees.

And we have all the time in the world, you know, for things to happen in the reactor over the next 20 years. And that, in my opinion, is a concern.

CHAIRMAN HAWKENS: I do want to give the AmerGen and opportunity to respond, if it wishes to, to the two points that he made about temperature and about his concern about the epoxy did not contain a solvent may have made it more susceptible to problems at the application.

MR. WEBSTER: Let the record reflect that counsel is consulting with the witness. He was supposed to do that --

MR. POLONSKY: I'll do it on the record.

MR. WEBSTER: Thank you.

MR. POLONSKY: If your pre-file testimony you believe already covers this, the Board has this in front of them. If you think this is somehow something new, you should address it.

MR. CAVALLO: There is a -- just one point of clarification, one point of technical clarification. One, the technical data sheets are in the pre-file testimony and have been available since the -- it's our -- AmerGen's Exhibit 35, I believe, and I hate trusting my memory, but I believe it's 35. Both the pre-prime and the epoxy have been available

since the start of these proceedings.

Second, the use of a 100 percent solid epoxy is preferable in that in Dr. Hausler's pre-file testimony, he refers to things like shrinkage. There is no shrinkage and equate that to cracking with 100 percent solid epoxy. That' -- in reviewing this after the fact, the selection, I applauded, because it was the proper way to go, because we eliminated shrinkage as a potential defect producer.

I think that's all the clarification I need to add.

MS. BATY: Your Honor, can I --

CHAIRMAN HAWKENS: Thank you.

MS. BATY: Could I ask that the Board as both AmerGen and Dr. Hausler about Dr. Hausler suggested that 20 -- things could happen over the next 20 years and then AmerGen did not respond. I'm wondering the frequency is 4 years between inspections and I wonder if there would be any effect on their -- on Dr. Hausler's testimony if he knew -- if he was thinking in terms of the 4 year interval of inspection.

MR. WEBSTER: Can I just clarify for the record? I do believe Dr. Hausler said something that reflects that he thinks that the coating end of life

could occur during the next 20 years and, therefore, it's relevant to try to understand.

MS. BATY: Could AmerGen address the 20 years and how likely it is to fail between inspection intervals?

JUDGE ABRAMSON: Counselor, let me pick this one up. First of all, we have asked the parties about rapid deterioration. And the real question is is there going to be deterioration that would occur so rapidly that it wouldn't be detected in between inspections? I don't see the need for any further testimony on that from anybody. While we appreciate your concern and your interest in our obtaining proper knowledge, I think we have enough knowledge on this point. If my colleagues disagree, they will certainly speak up.

JUDGE BARATTA: No further questions.

CHAIRMAN HAWKENS: Thank you. We are done with that Panel 5. We do have before we go to Panel 6 and we may hold off on Panel 6 until lunch, but Dr. Baratta had a few questions for Dr. Hartzman. He is an NRC staff witness.

JUDGE BARATTA: I want to go back and revisit this ASME Code requirement for design.

CHAIRMAN HAWKENS: May I interrupt? Dr.

Hartzman, as always, when you are testifying today, you remain under oath.

DR. HARTZMAN: Yes, sir.

CHAIRMAN HAWKENS: Thank you.

JUDGE BARATTA: Okay. We're at the design phase. The ASME Code requires a factor of 2. Is that correct?

DR. HARTZMAN: That is correct.

JUDGE BARATTA: Now, for subsequent modifications to the plant, what is required for a factor of safety?

DR. HARTZMAN: The same factor of safety.

JUDGE BARATTA: Okay. When you are dealing with modifications, does it also cover resolution of discrepancies that they have occurred due to construction errors or due to other factors?

DR. HARTZMAN: Any kind of physical modification would require meeting the cold case, the cold case specified factor of safety.

JUDGE BARATTA: All right. So if there were a deviation that occurred due to construction error, would that then have to be analyzed to determine if that factor of safety would be met?

DR. HARTZMAN: It would have to be checked, yes.

JUDGE BARATTA: And what would be done if it did not?

DR. HARTZMAN: It would have to be submitted to the staff for review and for -- for review and approval.

JUDGE BARATTA: And what would the staff usually require in order to make an assessment?

DR. HARTZMAN: A thorough review of whatever analytical evaluation was done of this deviation.

JUDGE BARATTA: Would they require an analytical evaluation typically? Would an analytical evaluation be typically required?

DR. HARTZMAN: Yes, I would think so, yes.

JUDGE BARATTA: Okay. Thank you.

CHAIRMAN HAWKENS: We are going to take a break before we sit the final panel, which will be on future corrosion. We're going to make it an hour and 15 minutes, so we will reconvene at 12:45. During that time, the parties will have another opportunity to present this Board with any proposed questions they may wish the Board to ask regarding the topics we have just covered. And again, the proposed questions should be linked to the line of questioning that were asked by the Board Members.

MR. WEBSTER: Judge?

CHAIRMAN HAWKENS: I meant 12:45 we will reconvene.

MR. WEBSTER: Judge, I think we are making good progress today, but I think we do have quite a lot of loose ends to wrap up during the break. I think it would be helpful rather than taking another break to wrap those loose ends up if we try to find all the things that we said we would find and provide the --

CHAIRMAN HAWKENS: Are you saying an hour and 15 minutes is not enough?

MR. WEBSTER: An hour and a half I would be happier with if that's possible.

CHAIRMAN HAWKENS: NRC staff and AmerGen, do you require an hour and a half also?

MR. SILVERMAN: We don't require that much time, Your Honor. I guess we wouldn't have a strong objection.

MS. BATY: I don't think --

CHAIRMAN HAWKENS: You are accommodating as always NRC staff.

MS. BATY: Yes.

CHAIRMAN HAWKENS: Given the limited manpower that's available to Citizens, I think that's

not an unreasonable request. We will go with an hour and a half.

MR. WEBSTER: Thank you, Judge. We will do our best to wrap up.

CHAIRMAN HAWKENS: And we'll march through. Let's try to make sure we do have all loose ends wrapped up in that time.

MR. WEBSTER: We will absolutely do our best to do that.

CHAIRMAN HAWKENS: Thank you very much.

MS. BATY: Oh, Your Honor, there is --

CHAIRMAN HAWKENS: One second, please.

MS. BATY: -- a limitation of being able to provide additional questions in writing or at least in typed format.

MS. WOLF: I never said you need to type one up. Just be clear it has to go into the docket, so it has to be legible. My knowledge is that we don't have a typed requirement, it has to go into the docket. I never said it had to be printed.

CHAIRMAN HAWKENS: That is good. If it can be typed up, great. If it is handwritten to the extent it's legible, that would be fine. I am advised the library does have a printer available. So we're in recess.

(Whereupon, at 11:34 a.m. the hearing was adjourned, to reconvene at 1:04 p.m. this same date

CHAIRMAN HAWKENS: We are back on the record.

Good afternoon. Before seating the final panel, could we get Dr. Hartzman back up to the microphone. A couple of questions we would like to ask him.

Good afternoon, Dr. Hartzman. As a reminder, you remain under oath.

DR. HARTZMAN: Good afternoon, sir.

CHAIRMAN HAWKENS: Prior to the recess, Dr. Baratta was asking you some questions about the safety margin required. Were you required to comply with the ASME code of 2.0 at the design phase, at the modification phase, and --

DR. HARTZMAN: And at the modification phase.

CHAIRMAN HAWKENS: And you indicated that, yes, you would be required to comply with that. That would be part of the CLB?

DR. HARTZMAN: Yes.

CHAIRMAN HAWKENS: He also inquired whether -- if there was a deviation -- deviation as opposed to a modification?

JUDGE BARATTA: Either a deviation or a discrepancy.

CHAIRMAN HAWKENS: If there were a discrepancy, whether you would be required to comply with the code as part of the CLB, and I believe you answered that in the affirmative as well. Is that correct?

DR. HARTZMAN: It depends what kind of a deviation you are referring to.

CHAIRMAN HAWKENS: Okay.

DR. HARTZMAN: What are you referring to?

CHAIRMAN HAWKENS: Here is my question. Do you view the degradation in the sand bed region of the drywell shell as a deviation or discrepancy that would require compliance with the ASME code?

DR. HARTZMAN: It is -- You could consider it as a deviation, yes.

CHAIRMAN HAWKENS: And to follow up with that, do you as a representative of the NRC staff view that as a deviation that requires compliance with the ASME code which requires a safety margin of 2, and that is viewed as part of the CLB?

DR. HARTZMAN: We have examined the way the licensee has approached this deviation, and we have concluded that in this case the factor of safety

of the code case would not be required to be met.

JUDGE ABRAMSON: Let me pursue this for a moment, because it seems like we are getting some variation in the responses to our questions.

If it were a regular deviation, you would require the 2.0 safety factor?

DR. HARTZMAN: You see, again -- Again, what exactly is meant by deviation? Are you referring to the corrosion that is --

JUDGE ABRAMSON: Yes.

DR. HARTZMAN: -- that has been measured?

JUDGE ABRAMSON: Yes.

DR. HARTZMAN: Okay. Ordinarily, the licensee would be advising us that the -- a corrosion situation has existed, and they would provide analytical recommendation for us to review; and if the basis for the analytical recommendation is acceptable, we would say we will accept the deviation -- a deviation would not -- and the factor of safety of 2 would not be required to be met.

JUDGE ABRAMSON: Okay. let's pursue this a little further, because we have a lot of additional information about the analysis that the applicant provided to you -- licensee provided to you in this case.

They provided you with analysis that indicated, if the entire sand bed region were degraded to .736 --

DR. HARTZMAN: That is correct.

JUDGE ABRAMSON: If -- then that would produce a safety factor of 2, but they also provided the staff with information that the entire sand bed region is not degraded to .736. Did that enter into your thinking?

DR. HARTZMAN: That was part of it, yes.

JUDGE ABRAMSON: And they also provided you with analysis that indicated, if the entire sand bed region were degraded to .736 and there were additional tray degraded along the lines of the -- oh, why can't I -- What is the right phrase?

MR. POLONSKY: Local buckling criteria.

JUDGE ABRAMSON: Local buckling -- local buckling criteria degradation -- Why is that a blank in my brain? I don't know -- that that would produce a somewhat lower safety factor, but that there was evidence to indicate that the liner was not degraded to that condition. So that was another piece of information they gave you.

Did that enter into your thinking?

DR. HARTZMAN: That would be one

consideration.

JUDGE ABRAMSON: Okay. So you've got two sets of analyses that the applicant provided to the staff, both of them based on hypotheticals, neither representing the actual conditions, both of which indicate -- one of which indicated that it would produce a safety factor of 2, and one which indicated it would produce a safety factor of something like 1.9, a little more than 1.9.

Those entered into your accepting this configuration. Do you view yourselves as having accepted a safety factor of less than 2 or not; and if so, why do you believe there is a safety factor of less than 2 when you don't have any analysis of the current configuration?

DR. HARTZMAN: No. The licensee provided an analysis of what you call the local buckling criteria. We examined that analysis fairly thoroughly. We came to the conclusion that that analysis was detailed enough, was refined enough. The basic assumptions on which that analysis is based is refined and conservative -- and conservative to admit the possibility that the factor of safety was indeed -- that analytically, the factor of safety -- it was less than 2, analytically.

JUDGE ABRAMSON: The computed safety factor, but even though it was less than two, as -- I don't want to put words in your mouth, but to me there is --

MR. HARTZMAN: The basis -- The basis for the criteria -- The basis for the criteria, which is that analysis that G.E. provided, and other information, supported a lower factor of safety. In addition to that --

JUDGE ABRAMSON: You mean the theoretical lower safety factor?

MR. HARTZMAN: Yes, theoretical. This is an analytical factor of safety. the actual factor of safety of the as built structure is higher than the factor of safety corresponding to the acceptance criteria, for the simple reason that the actual thickness, the wall thickness, is greater than what was chosen for the acceptance criteria.

So, yes, it is very possible that the true factor of safety may be as high as 2 or greater, even today, even with degraded areas.

MR. WEBSTER: Judge, I don't think the witness has quite answered the question of what is the acceptable level factor of safety.

JUDGE ABRAMSON: We haven't answered it

sufficient for our purposes.

CHAIRMAN HAWKENS: Thank you, Dr. Hartzman.

Would AmerGen please introduce the witnesses for the final panel.

MR. POLONSKY: Yes, Your Honor. This is Mr. Polonsky. For Panel 6, seated to my right is --

MR. WEBSTER: Sorry. Before Mr. Polonsky, just remind the panel that we do have a few loose ends to sweep up from this morning with regards to debris in the concrete -- concrete debris in the drains, and a couple of other issues.

CHAIRMAN HAWKENS: Thank you for bringing that to my attention. Why don't we tie up those loose ends first before going to the final word.

MR. POLONSKY: If we could, AmerGen's preference would be to get Panel Six out of the way and then go back to the loose ends. Frankly, some of the things we thought were going to be provided to us, like specific citations, you know, we are still looking at. So we would not be prepared to wrap up those loose ends at this time.

CHAIRMAN HAWKENS: All right. If you are not prepared to wrap them up, we will proceed with the --

MR. WEBSTER: Judge, I think we are prepared to do at least the concrete debris in the sand bed drains. That's very easy, and it will be cogent with the testimony we had this morning.

JUDGE ABRAMSON: Why don't you let Judge Hawkens run this proceeding.

MR. WEBSTER: Well, I am merely offering a suggestion.

CHAIRMAN HAWKENS: And I appreciate that. Let's go ahead and introduce the members of the final panel and go forward with that.

MR. POLONSKY: Seated to my right is Mr. Michael Gallagher. Seated to his right is Barry Gordon. Seated to his right is Mr. Edwin Hosterman. Mr. Gordon and Mr. Hosterman have not been on a previous panel. So I guess I would just like to add that Mr. Gordon is with Structural Integrity Associates and is our proffered corrosion expert, and seated to his right, Edwin Hosterman is with Exelon's corporate group out of Kennett Square, Pennsylvania, and he is more of a heat transfer evaporation expert.

CHAIRMAN HAWKENS: Thank you.

MS. BATY: For the NRC staff, we have Mr. Hans Ashar, Dr. Jim -- James Davis, Dr. Mark Hartzman, and Dr. -- excuse me, Mr. Timothy O'Hara and Mr.

Arthur Salamon.

CHAIRMAN HAWKENS: Thank you.

MR. WEBSTER: And for Citizens, metaphorically wearing his spandex and cape, we have Dr. Hausler.

CHAIRMAN HAWKENS: Thank you very much. For the record, the witnesses were sworn yesterday, and the witnesses are reminded, those who have not been empaneled yet today, that they remain under oath or affirmation.

JUDGE ABRAMSON: I have no questions for this panel. The beauty of being a Judge is you don't have to be an expert. It's up to the experts to educate us.

CHAIRMAN HAWKENS: Let me ask a question to AmerGen. If the coating fails, and if there is water in the sand bed region, what would the rate of corrosion be?

MR. POLONSKY: Mr. Gordon is best to answer that.

MR. GORDON: Assuming that situation, the water -- source of water would be very high purity water, and there have been studies performed, corrosion rate as a function of temperature over this range where the sand bed region is exposed to.

Typically, at the temperatures of about, at the lower end where the flaw is, where you would expect to have the most amount of possible water, which is 93 degrees Fahrenheit, the corrosion rate would be about 3 mils per year.

JUDGE ABRAMSON: That's assuming no coating?

MR. GORDON: No coating, fresh surface, shiny steel where the corrosion rate would be at its highest.

JUDGE ABRAMSON: And continuous exposure to water?

MR. GORDON: Continuous exposure over that period.

JUDGE ABRAMSON: Refresh my recollection. In the old days when you had the sand bed, what was the computed average corrosion rate over the period?

MR. GORDON: the highest identified corrosion rate was about 39 mils per year. This is water, saturated sand against bare carbon steel.

JUDGE ABRAMSON: What made that so much greater than the situation you are suggesting here?

MR. GORDON: Well, it's a number of things. You have a higher conductivity water.

JUDGE ABRAMSON: Because?

MR. GORDON: You have chlorides present and other impurities and stuff like that, but the only water that would come down now will be very low conductivity water.

JUDGE ABRAMSON: Why was that other water -- Why did the water in the old days have chlorides and such in it, and the water that one might expect today to get down there be different?

MR. GORDON: Well, it traveled along the shell. It traveled through the sand. The sand is stored in a marine atmosphere outside the plant while the plant was being constructed, and it was basically sort of like marine sand. So it had a lot of impurities in it, and so the conductivity was higher.

MR. GALLAGHER: I would like to add, Judge Abramson, as far as that 39 mils per year, it is an early-on corrosion rate before the corrective action.

If I can just point you to a graph that shows the long term before the corrective action, look at Exhibit 3, AmerGen Exhibit 3. And I'm sorry, there doesn't seem to be page numbers. Let me see if I can point you to it.

If you look at -- there is a page 6-22, which is a title page.

CHAIRMAN HAWKENS: Are we able to put that

on the screen? Let's see if we can get it up on the screen.

MR. WEBSTER: Sorry. Which page?

MS. YOUNG: 6-22.

MR. POLONSKY: We are going to be going to 6-22, which is the beginning of Attachment 1, but then there are a number of unnumbered graphs that are within Attachment 1, and once we get to 6-22, we can direct the projector to go to the specific page we are trying to get to.

MR. GALLAGHER: So this is -- Go 15 -- This section has all the graphs. Go 15 slides forward, 15 pages forward, and just -- I just wanted to point out the biggest rate, which is -- It's Figure 18. It is labeled Figure 18 at the top. Okay. That's it.

On the lefthand side where it has the corrosion rate of negative-18 mils per year. So that was the rate that was sustained through that period of time before the corrective action was put in place.

JUDGE ABRAMSON: What is the relationship between that 18 mils corrosion rate and the 39 you gave me earlier? I'm lost.

MR. GALLAGHER: The 39 was an early projection based on a few data points, and it would

have been, you know, a --

MR. WEBSTER: Objection, Judge. That witness didn't testify to the 39. So I don't know how he knows what basis it was.

MR. POLONSKY: Mr. Gordon, can you please respond to that?

MR. GORDON: If you can look at AmerGen Exhibit 23, the second page, you will see a table of corrosion rates, and you will see the 39 was the highest rate on that page.

MR. POLONSKY: But, Mr. Gordon, could you address why -- I mean, you started talking previously about a shiny surface and why the corrosion would be higher earlier. Could you address, I guess, that question?

MR. GORDON: Yes, certainly. When you put fresh metal into an environment, the iron wants to go into solution, and if there is nothing there, no film on the surface, it will go in very readily. As film builds up, as rust builds up on the surface, it becomes more and more difficult.

So the initial corrosion rates of fresh metal in a solution is always the highest.

JUDGE ABRAMSON: So these corrosion rates were indicated in the sand bed region when sand was

there holding this water that had a lot of impurities that could cause corrosion?

MR. GORDON: That is correct.

JUDGE ABRAMSON: And it was continuously there. What is AmerGen's expectation for the presence of water in the bottom of the sand bed region going forward from today?

MR. GALLAGHER: Well, our expectation is there wouldn't be. We have corrected the situation, and we have the leak-off from the trough that handles the water. We have also made commitments that, if water was detected in there, we would take corrective action.

JUDGE ABRAMSON: And as we understood from the earlier panel's testimony, the maximum number of days there would be water in the reactor cavity is something like 15 days a year.

MR. WEBSTER: Objection, Judge. That is not established.

JUDGE ABRAMSON: We were told that the water in the reactor -- During refueling, the reactor cavity -- Refueling took 26 days, and I think what we heard was that it took something like -- and refueling occurs every other year, and if you take 26 days and divide it by two, you come up with 13. Is that where

that comes from?

So I said 15. I'm sorry if I overestimated it. In fact, we heard information that the water in the reactor cavity is there for less than 26 days. It is there for something like three weeks or less. So, in fact, it is a lower number than that. So that is where that is coming from. Sorry if I am able to do some of these calculations in my head.

MR. WEBSTER: I misheard you. My apologies, Judge.

JUDGE ABRAMSON: If there were water there and it were to leak during those 15 days, what would happen to it in the bottom of the sand bed region, once it got there?

MR. GALLAGHER: It would drain off into the sand bed drains, and as we testified before, the floor on the sand bed is shaped so that it goes away from the shell and into the drains.

The other thing I would mention is we daily -- During refueling outages, because there is water in the reactor cavity at the time, we check those drains daily, the sand bed drains, the five sand bed drains. We check those daily.

JUDGE ABRAMSON: Oh, you check them daily.

MR. GALLAGHER: For leakage.

JUDGE ABRAMSON: So if it drained off, while there might be some residual, one could expect some evaporation of the residual, and if there were no protective coating on the drywell shell, then that would be the time that there could be some corrosion. Is that correct?

MR. GALLAGHER: Yes. As we testified, the time that the water could be on the shell is only during the refueling outage and when the plant starts up, the shell is heated up and --

MR. WEBSTER: I object on foundation for that.

MR. GALLAGHER: -- would quickly evaporate off.

CHAIRMAN HAWKENS: Objection is overruled. Please continue.

MR. GALLAGHER: I'm sorry. And one of the things I do want to point out from Dr. Hausler's testimony, he had indicated that there is no air flow in this region.

MR. WEBSTER: Objection. This witness doesn't have expertise in air flow.

MR. GALLAGHER: Yes, I do.

CHAIRMAN HAWKENS: Objection is overruled. Please continue.

MR. GALLAGHER: Between the bioshield and the drywell shell, there is a one-inch air gap. Okay? And so there is continuous air exchange between that volume and the exterior, and also from the bioshield is not airtight, because there are various penetrations through the bioshield for the piping that penetrates for the primary containment.

JUDGE ABRAMSON: Natural circulation air flow?

MR. GALLAGHER: Yes.

CHAIRMAN HAWKENS: Does the 3 mil per year include interior corrosion?

MR. GORDON: No, that's just based on the exterior corrosion.

CHAIRMAN HAWKENS: Do you have any estimate for interior corrosion?

MR. GORDON: It would be very low, probably a value lower than that. You have -- Any water that is present will be high pH concrete pour water, which produces a protective film on the steel, and the corrosion rate is essentially negligible.

CHAIRMAN HAWKENS: NRC staff, do you have anything to add to that discussion?

MR. ASHAR: I am Hansraj Ashar. I wanted to find out when you ask question that is it internal

-- do you mean the corrosion on the inside surface or the measurement is taken from inside?

CHAIRMAN HAWKENS: My latter question, I was asking whether it be 3 mil per year included a figure for corrosion on the interior.

MR. ASHAR: Interior. Thank you, sir.

CHAIRMAN HAWKENS: Thank you. Nothing more from the NRC staff?

Dr. Hausler, could we hear from you your response to AmerGen?

DR. HAUSLER: Yes. I have just a few minor comments, really. With respect to the 3 mils, I would like to comment that that was specified for 93 degrees Fahrenheit, and of course, we do know that the corrosion rate is dependent on temperature. That is the first thing.

The second thing is that the high corrosion rate --

CHAIRMAN HAWKENS: Excuse me, Dr. Hausler. So it is your view that it would be slightly higher than 3 mil per year?

DR. HAUSLER: Well, specifically, the corrosion rate is set to increase -- to double as the temperature increases 10 degrees Centigrade. That is more or less correct.

So in other words, you know, if we go up 40 degrees Fahrenheit, you know, we can assume that the corrosion rate more or less quadrupled.

JUDGE ABRAMSON: Mr. Gordon, is that accurate?

MR. WEBSTER: Excuse me.

JUDGE ABRAMSON: This is our style, and if you will just allow me to get answers to my questions. Dr. Hausler has made an assertion about what the corrosion rate -- what the effect of temperature is on corrosion rate. I'd like to have an answer --

MR. WEBSTER: I object. My witness did not have a chance to respond in full to AmerGen. AmerGen had a chance to put their case in full, and I think it would really be one-sided if AmerGen rebuts each point, point by point, while we have to wade through it in an interrupted fashion.

CHAIRMAN HAWKENS: As we informed you at the beginning before we started this session, the purpose of this session is for us to ask questions and to get answers. We advised you in a telephone conference, and we have advised you on numerous other occasions, that our style is to get various experts and to ask experts what they think of what other people are saying.

We've done that. We are doing it now, and please, Mr. Gordon, just give us your view of whether it is reasonable to expect the corrosion rate to increase with temperature of this kind of magnitude that we are --

MR. GORDON: Certainly, below a certain temperature -- The corrosion rate goes through a maximum. At about 160 Fahrenheit, you reach a maximum corrosion rate in this environment of about 8 mils per year. At 130 degrees Fahrenheit, it is about 5 mils per year. So it does go up, but it doesn't go up by 10 degrees. It depends on the activation energy.

So it's close. It's like 15 degrees, 16 degrees, carbon steel.

JUDGE ABRAMSON: So now, Dr. Hausler, you have what he has to say about this. What is your view of this?

DR. HAUSLER: It's a number -- The doubling of the corrosion rate or 10 degrees Centigrade is a number that is quoted in practically all textbooks on corrosion. I don't think we have to go and establish that in great detail now.

CHAIRMAN HAWKENS: Fine. Carry on.

MS. BATY: Would you like to hear from the staff?

MR. WEBSTER: Well, again I would ask if my witness could --

CHAIRMAN HAWKENS: We have asked who we wanted to ask. Let's have Dr. Hausler keep -- If my colleagues want more information, they will ask. This is our style. This is our hearing. This is our inquisition, if you will.

MS. BATY: Your Honor, it was just if you wanted to hear from us on the -- our expert on the corrosion rates for the temperature.

JUDGE ABRAMSON: We may.

MS. BATY: Okay.

JUDGE ABRAMSON: Please, Dr. Hausler.

DR. HAUSLER: Thank you very much. I do appreciate it.

Let's also consider that the corrosion rate -- you know, whether it is in oxygen or in acid or another environment -- is highly dependent on the nature of the metal. And in fact, there are different types of steels. For instance, 533A which is a high tensile strength steel, or there is, I think it is 210 or 218 that is being here is lower. There are different alloys in these steels to achieve the tensile strength of them. There are different heat treatments, and all of these affect, in fact, the

corrosion rate.

I don't need to go into the detail. I don't need to, I think, give you a lecture on the effects various parameters --

JUDGE ABRAMSON: Did I ask you if we need it?

DR. HAUSLER: -- that affect the corrosion rate. However, I would like to touch on a different subject, and that is the nature of the water.

We have seen, in fact, a number of analyses for the water, and that was drained out of the sand bed, and it was accused for the corrosion rates that were --

JUDGE ABRAMSON: This was during the -- before the sand was removed or after the sand was removed? You say drained out of the sand bed.

DR. HAUSLER: Actually, those were before the sand bed, because the corrosion rates that were quoted of 39 mpy, 18 mpy and so on, were in fact corrosion rates that were established in the sand bed.

JUDGE ABRAMSON: Okay. So you really meant the water that was there at the time they had the --

DR. HAUSLER: Yes. Your question was why 39 versus 3, you know, why 18, why the spread. The

answer was from Mr. Gordon, I believe, because of the amount of chloride that was in there.

Now it is a fact, of course, that chloride does accelerate the corrosion under these -- corrosion rate under these conditions. However, the numbers that we have seen for chloride recently were of the order of .04 ppm, and that is too low a number, too low, in fact, a concentration to affect the corrosion.

JUDGE ABRAMSON: Was that water that was taken out late, you know, in recent years as opposed to water that was taken out in the early days when the sand was pretty fresh? What I'm wondering is: These chlorides come from salt in the sand, I assume.

DR. HAUSLER: Your Honor, we have seen quite a number of water analyses that were, in fact, passed on from AmerGen in the discovery process. Now these --

MR. WEBSTER: Judge, can I just interrupt my witness a little bit. I think we have to be careful here to distinguish between chlorides on the interior and chlorides on the exterior. I think the record reflects that water was found that drained from the sand bed region. After years of monitoring, water was found in 1996, but I think the record reflects that AmerGen threw that water away before they

analyzed it.

JUDGE ABRAMSON: But we are talking about the difference between the corrosion rate 20-some years ago and the corrosion --

MR. WEBSTER: No, I understand that, but what I'm saying is I don't think there are recent measurements of the chlorides in the water that drained from the sand bed region.

JUDGE ABRAMSON: That is-- But that is not what we were asking. Dr. Hausler, I think, is advising us what he thinks the chloride concentrate was in the water that was coming through the sand.

DR. HAUSLER: Actually, I am trying to advise you that we don't know what the chloride concentration was for the very simple reason that the analytical reports that presumably came out of the laboratory from AmerGen did not indicate the concentration associated with the numbers that were presented there.

So there is a confusion whether this is actually 48 parts per billion or 48 parts per million, because, you know, at times we have seen in the documentation ppm, and at times we have seen parts per billion.

Nevertheless, the water that even was 40

parts per million would be reasonably fresh, so that we would not expect a great acceleration of the corrosion rate.

JUDGE ABRAMSON: So to what do you think one might attribute this higher corrosion rate when the sand was there as opposed to what we are hearing might be expected today?

DR. HAUSLER: I think it depends on where you measure.

MR. WEBSTER: Judge, could I just help my witness one second? I just remind the witness about the 5rd material in the gap between the sand bed, and whether that could be a source of chlorides.

DR. HAUSLER: Well, that was another sort of confusion. I didn't want to touch on that, because of the uncertainty there. But the 5rd at one point in the testimony was, in fact, identified. In fact, I think it is in the SER identified as magnesium oxychloride, which I think is utterly impossible, but that was the designation there.

In the beginning, I thought, yes, indeed, you know, that's where the chloride comes from, but later I think it was identified as different type of fibrous material.

JUDGE ABRAMSON: Is it only chlorides that

could cause this differential in the corrosion rate?

DR. HAUSLER: Well, you know, it is halites, but the most abundant halite, of course, is chloride. Chloride will not have the same effect, but iodide and bromide would, but the most abundant is, in fact, chloride.

So I don't think we can take these numbers on face value. They do vary, and we don't really know exactly what the parameters are -- the level of the parameters are that affect the numbers that we are talking about.

There was a thought that just escaped my brain. I am sorry.

JUDGE ABRAMSON: You're not alone.

DR. HAUSLER: I do have a senior moment as well.

Of course, you know, we also realize that all of these corrosion rates were, as has been pointed out, before corrective action was taken. So, you know, they don't necessarily -- are not necessarily valid anymore.

Judge Abramson, you asked why we would expect a difference between -- a difference of 39 versus maybe 10 or 18 or whatever. I indicated that that was most likely because of where the measurement

was taken.

The sand is not uniform, as I have indicated earlier. It is not necessarily level, and in this particular case of corrosion that we identify is crevice corrosion or under deposit corrosion.

It is very important to, in fact, specify the location where the measurement was taken with respect to the surface of the deposit, and the depths that you go into the deposit to properly characterize the measurement that has been taken.

Of course, we don't know that, really, because when the measurements were taken, we assumed that there was a sand bed there, but we didn't know how high it was, what the surface at the sand bed was, and so on. I think that should explain the differences in these numbers.

MR. WEBSTER: I think I want to make sure that AmerGen testified that because the epoxy on the floor is there that the water would go to the drains. Is that necessarily true?

DR. HAUSLER: Well, the floor was shaped. I haven't been there. So I really can't testify effectively as to what the slope of the floor really was. However, I think I do want to come back to the question of water being there in 2006.

Some drains had, in fact, been found plugged. Now if drains are plugged, you don't find any water coming out from the sand bed, but that doesn't mean that there is no water there. That is the first point I wanted to make.

The second point is that the plugging had been indicated by material -- and this, by the way, is AmerGen's -- No, it is our Exhibit 52, on the third page. The deposits or the plugging material had been identified as most likely being cement.

Again, I do ask the same question I asked this morning. How does the cement get into the drains? There has to be water there to sweep it there. Otherwise, we cannot assume that just fortuitously cement falls off the bioshield right into the drain.

MR. WEBSTER: One other question. If there were cracks in the floor, would that have an effect on how the water flows?

DR. HAUSLER: Yes, of course, it would. You know, there was a concern about -- as we had indicated earlier, that the floor cracked. Now we do know that in '92 the floor wasn't finished, etcetera, and then it was built up.

We also know that more recently the floor

had to be repaired again, because there were cracks there. Now in my mind, those cracks would actually cause the water to flow toward -- or could cause the water to flow toward the shield rather than away from it. But we get into an area that may not necessarily be within the scope of this hearing, and so I don't want to pursue it unless you urge me to do that.

CHAIRMAN HAWKENS: I'd like to hear from the NRC staff on the correlation between temperature and corrosion, please.

DR. DAVIS: Hi. This is Jim Davis from the staff.

It is a little bit more complicated than Dr. Hausler stated. It is very true that the Arrhenius equation applies to all kinetic reaction, and that's for every 10 degrees C increase in temperature you get a tenfold increase in reaction rate.

That assumes that all reactants are constant.

JUDGE ABRAMSON: Tenfold?

DR. DAVIS: Or twofold. I'm sorry, twofold.

What actually happens is, when you heat water, of course, the oxygen solubility drops. So

that Arrhenius equation does not hold in water, and also you have to be extremely careful when you are looking at a situation like this, because you may actually be going from corrosion in an immersed condition to atmospheric corrosion, which is a total different ball game.

I think you would be more likely, although I doubt if you would get much atmospheric corrosion under the conditions, because the humidity is not high enough in this area. So you would see very little corrosion unless you were immersed in water, but it is a little bit more complicated than what Dr. Hausler expressed.

That's why you go through a maximum, because -- and you even drop more, like I've done a lot of experiments at higher temperatures where, when you go above about 200 degrees in just a laboratory experiment, your corrosion rate drops dramatically, because your oxygen is almost insoluble. You no longer have the oxygen driving force for the reaction to occur.

So you have to make sure that nothing changes when you are applying an Arrhenius equation, none of the reactants change.

MS. BATY: May I ask the staff's witness

to spell the name of the equation for the record?

DR. DAVIS: A-r-r-e-n-i-o-u-s, I believe.

JUDGE ABRAMSON: I think it is u-s.

MS. BATY: Someone spell it for the record, please.

DR. HAUSLER: Well, it is A-r-r-h-e-n-i-u-s.

MR. POLONSKY: If AmerGen could address two issues, when the Judges are ready.

DR. HAUSLER: May I respond to the comment from --

CHAIRMAN HAWKENS: Please, Dr. Hausler. Go ahead.

DR. HAUSLER: What the witness just said is entirely correct. I did not want to bother Judge Abramson with a lecture on the kinetics of corrosion. However, there is another --

CHAIRMAN HAWKENS: A quick interruption. You have three Judges up here. One is not legally trained. So please, don't hesitate to share your knowledge with us.

DR. HAUSLER: I am perfectly prepared to that, if you are willing to listen for the next 15 minutes.

CHAIRMAN HAWKENS: Well, that is a little

bit long, but go ahead and summarize what you wanted to say.

DR. HAUSLER: It is quite correct, of course, that the oxygen eventually now will get out of the water, and so you have competing effects. You have less oxygen, but higher corrosion rate, and you get into questions of mass transfer, how fast can you get the oxygen to the surface of the metal. And so you get into questions of flow rate or stagnant situations and so on.

If you get to higher temperatures, however, the water can, in fact, take the place of oxygen, and the water can react with iron, you know, forming hydrogen and hydroxide irons, in essence iron hydroxide. That is why we often find magnetite on the surface of corroded metals or magnetite-type corrosion product.

So, yes, the witness was quite correct. The situation is a lot more complicated than what I ventured to explain in the first part of the testimony.

CHAIRMAN HAWKENS: Based on your review of the record, during the time the reactor cavity is filled, what would the temperature range be during that several week period?

DR. HAUSLER: I am really confused on that, Your Honor.

CHAIRMAN HAWKENS: Okay. Should I address that to AmerGen or are you prepared to provide an answer based on the record?

DR. HAUSLER: Let me tell you what it is that I know. Originally, that there was a pressure specification of 66 psi and the temperature specification for the operation of the reactor environment, the reactor housing of, I believe, 173 or something like that. Later on, the pressure had been lowered to 44 psi, and the temperature had been increased to 273. This is actually in the record.

Now I just want to mention that I am kind of confused as to what the temperature in that sand bed region really was. I'm not sure anybody really knows what the temperature there is during normal operation.

MR. WEBSTER: Can I just clarify, Judge? There are two questions: What's the temperature during normal operation, and what the temperature during the refueling outage?

CHAIRMAN HAWKENS: My principal concern was during the refueling outage, because my understanding is that's when the likelihood of water -

- Well, if there is to be water, it is coming from the reactor cavity, and that's when the water would be expected to be there.

So my question was limited to during that time period, what would you expect the range of temperatures to be?

DR. HAUSLER: I don't know. I haven't been around. I'm sorry.

CHAIRMAN HAWKENS: Well, that's all right.

DR. HAUSLER: I can't answer the question.

CHAIRMAN HAWKENS: Thank you. Let me see if AmerGen can eliminate the confusion.

MR. POLONSKY: Your Honor, that was one of the two points that I was hoping to get to. If we could hand the mic, I guess, over to Mr. Edwin Hosterman on heat transfer, I believe he has done calculations about what the temperature would be during refueling outages. And you are talking about the exterior where the water would be present?

CHAIRMAN HAWKENS: That is correct.

MR. POLONSKY: Okay.

MR. HOSTERMAN: Well, just to be clear, the calculation I did is normal --

CHAIRMAN HAWKENS: Can you identify where in the record?

MR. HOSTERMAN: Excuse me. Edwin Hosterman, Exelon.

Just to clarify the record, the calculation that I did for the purposes of calculating evaporation rates was based on normal operation. However, the starting point for that calculation would be the expected temperature in the air space that would occur during a refueling outage, and those would be roughly the same temperatures that we would see in the torus room, which can range up to about 90 degrees Fahrenheit, which can range up to about 90 degrees Fahrenheit, and that will vary, depending on when we start the refueling outage and what the outside air temperatures are at the time. But 90 degrees is probably pretty typical for the upper range of temperatures in that room during an outage.

CHAIRMAN HAWKENS: Thank you. And is that in testimony in the record or otherwise in a record exhibit?

MR. POLONSKY: Let me just quickly look through the rebuttal and surrebuttal testimony.

CHAIRMAN HAWKENS: While you are looking, Mr. Polonsky, is there another area you wanted to have a witness address?

MR. POLONSKY: Yes. It was the allegation

that the drains were plugged, which I guess we interpret as no water could go through, since Dr. Hausler suggested we wouldn't see the water. So I thought I would have an AmerGen person answer that question.

CHAIRMAN HAWKENS: All right.

MR. POLONSKY: Pete Tamburro.

JUDGE ABRAMSON: Almost as ubiquitous as Dr. Hausler, Mr. Tamburro.

MR. TAMBURRO: I am not sure how to take that. Pete Tamburro.

I have looked at Exhibit -- Citizens Exhibit 52. This is an issue report that was issued by myself during the 2006 outage.

During the 2006 outage, we inspected the five sand bed drains. The way we inspected them was by inserting the boroscopic device, and we snaked it through the entire drains.

Three of the drains were completely empty and had no debris in it. A fourth drain had some debris in it, but we were able to push the boroscope -- minor debris in it, and we were able to push the boroscope through, completely through it.

The fourth one had some blockage, and I described the debris as -- and I am reading from

Exhibit -- Citizens Exhibit 52: Debris looks like loose --

CHAIRMAN HAWKENS: What page?

MR. TAMBURRO: Page 3 of 5: Debris looks like loose concrete.

CHAIRMAN HAWKENS: I'm sorry, what page?

MR. TAMBURRO: I apologize. It is Citizens Exhibit 52, page 3.

MR. GALLAGHER: Upper righthand corner. This is a corrective action report from AmerGen.

MR. TAMBURRO: Can I continue? Okay.

So in summary, one of the five drains was blocked, and we could not pass our boroscope through. I entered this corrective action, and we corrected the situation by removing the blockage and clearing the two drains that had any debris in it.

My opinion of this one drain that was blocked physically so that the boroscope could not pass through was that it was not clogged. There were plenty of spaces between the loose pieces of what I termed concrete that would have allowed flow. There was no water in that line or any of the five lines, and we have since resolved that and cleared the two lines.

JUDGE ABRAMSON: Mr. Tamburro,

unfortunately,I'm having trouble finding the right page in the exhibits that we have.

MR. GALLAGHER: It's Citizens Exhibit 52.

JUDGE ABRAMSON: Citizens 52? Okay. I'm sorry. We were looking at your exhibit. Thank you.

CHAIRMAN HAWKENS: Mr. Tamburro, does AmerGen have a practice in place for the future to ensure the drains do not become clogged?

MR. TAMBURRO: Yes.

CHAIRMAN HAWKENS: Can you explain that to me, please?

MR. TAMBURRO: We will perform the same inspection periodically. In addition, we have looked inside the sand beds for loose material that could end up in the drains, and there was none. None was reported in any of the inspections.

CHAIRMAN HAWKENS: Is that part of your commitment, the drain inspection part of AmerGen's commitment for the renewal period, or is that an internal procedure?

MR. TAMBURRO: I'm not sure. I could ask Mr. Gallagher to answer that.

MR. GALLAGHER: It's an internal procedure.

CHAIRMAN HAWKENS: Thank you.

MR. POLONSKY: Your Honor, I have identified the page in the testimony, if I could just confer to this with Mr. Hosterman.

CHAIRMAN HAWKENS: Please.

MR. POLONSKY: We may have to bring on one other witness after this as well.

MR. HOSTERMAN: As I had specified, the original calculations that I had done for the sand bed region were for normal operations, and this is for an internal drywell temperature of 130 degrees.

I calculated an air temperature in the sand bed region of approximately 109-110 degrees, 109.5, to be precise, but that would be during normal operations. Refueling outages would be lower temperatures, because we do not have the heat sources in the drywell.

MR. WEBSTER: What are we referring to here?

MR. POLONSKY: I'm sorry. My apologies. This is AmerGen's direct testimony, and it is Part 6, and Mr. Hosterman was reading or referring to refreshing his memory from answering 19, which is on page 12 of 15.

CHAIRMAN HAWKENS: Does the NRC staff have anything to add to that?

MR. O'HARA: Yes, Your Honor. Tim O'Hara, Region 1 inspector.

During the fall outage in 2006, I did note that condition along with Mr. Tamburro. It is our -- my opinion that the drains did have debris in them, but were not blocked, and we agreed with their summation of handling it and cleaning it out.

CHAIRMAN HAWKENS: Thank you.

JUDGE ABRAMSON: Do you have any idea where the debris came from, how it got there?

MR. O'HARA: My guess would be that it came from the shield wall, spalled off the shield wall inside the sand bed region.

JUDGE ABRAMSON: Is a swelling normal under these circumstances, these physical conditions?

MR. O'HARA: It's not abnormal.

JUDGE ABRAMSON: Does AmerGen want to comment on how the debris got there? Does that sound like a sensible guess?

MR. GALLAGHER: Our analysis was that it was historical, and it was probably from --

JUDGE ABRAMSON: That it had been there for some while?

MR. GALLAGHER: It was just not cleared out when the original drains were cleared out, and as

we testified, it did not impact actual flow area.

MR. O'HARA: I would like to add, as we had said before, we didn't see any evidence that there had been water in there that had swept this into the drain.

DR. HAUSLER: Let me just comment that, when the floor in 1992 was repaired, so were the drains. I think it is bit disingenuous to indicate that the debris in those drains was historical. It's the one point.

The other point said here in the conclusions: Sand bed drains from elbow to sand bed were agglomerated, thus preventing water from draining, and have been cleared. That's the conclusion on page --

MR. WEBSTER: Just to be clear, that is Citizens Exhibit 25.

DR. HAUSLER: That is the conclusion on the same page that we just looked at. I mean on the same exhibit that we just looked at. That would be page 4.

MR. WEBSTER: That's Exhibit -- Could you just verify, Dr. Hausler, which exhibit that is.

DR. HAUSLER: That's Exhibit 22, I believe.

MR. WEBSTER: I'm sorry. My apologies. That is Citizens Exhibit 22.

DR. HAUSLER: And that would be on page 2 that I just read from.

MR. WEBSTER: No, it's not the same.

DR. HAUSLER: Exhibit 22, and it is page 2 that I read from.

MR. TAMBURRO: May respond, Your Honor?

JUDGE ABRAMSON: Yes, please.

MR. TAMBURRO: Exhibit 22 is a report that was performed prior to 1992 when we discovered these drains were clogged and we repaired them then. This was not -- This is not a report describing the 2006 condition.

MR. WEBSTER: Can I just say that Mr. Tamburro is entirely correct. The witness is providing response to the suggestion that these concretes were historic.

JUDGE ABRAMSON: So the point is that this debris was cleared out in 1988.

MR. WEBSTER: Ninety-two, I think.

JUDGE ABRAMSON: I thought this report said 1988. The debris was there in '88. Right? Am I reading this wrong?

MR. WEBSTER: Dr. Hausler, what date is on

that exhibit?

DR. HAUSLER: The date is '89, I believe, March 3, '89.

JUDGE BARATTA: Now, Dr. Hausler, what you are saying is that there was debris in there in 1988, which was cleaned out in 1989, based on that report.

DR. HAUSLER: Right.

JUDGE BARATTA: And that any subsequent debris that was found, such as what was found later, was not, therefore, historical?

DR. HAUSLER: Well, again, you know, the sand bed floor was build up. The drains were repaired in '92 as well, and I would be highly surprised if the drains at that time were not cleaned up for the water to flow.

I believe subsequently it has also been observed that -- well, in fact, it was in 2006 that water did flow out the sand bed drains and had been collected in water bottles that subsequently were discarded prior to an inspection by NRC. That has also pretty well established, I believe.

JUDGE BARATTA: Thank you.

CHAIRMAN HAWKENS: AmerGen, do you have any response, or the NRC staff? If not, I have a question for AmerGen.

How often during shutdown and how often during operations are these drains checked for water?

MR. GALLAGHER: For the sand bed drains, the sand bed drains are checked daily when there is water in the refueling cavity, and quarterly during other times.

CHAIRMAN HAWKENS: Again, I am non-technically trained. Why only quarterly during operations?

MR. GALLAGHER: There really is no source of water to come into the sand bed region, because the source is the refueling cavity when we fill that with water during refueling outages. So what we did is, again, as a belt and suspenders check, is to quarterly look for the possibility of anything else going on.

We have done those inspections, and there's no water.

CHAIRMAN HAWKENS: Do other factors contribute to that? For example, is it a radiation area that you want to keep people out of or is it purely driven by the fact that, in your judgment, there is no source of water that would contribute?

MR. GALLAGHER: In our judgment, there is no source of water. Quarterly is fine. It is an area that the operators would have to dress out in. It is

a contaminated area.

CHAIRMAN HAWKENS: NRC staff?

MS. BATY: The NRC staff, if the Board would like to hear about the commitments that AmerGen has made regarding water, monitoring for water --

CHAIRMAN HAWKENS: I would like to hear them, please.

MR. ASHAR: This is Hansraj Ashar. I just want to point out that in the number of commitments that are made and which are in the Appendix A of SER, there is a line item 3 under commitment 27. Second bullet says, "The sand bed region drains will be monitored quarterly during the plant operating cycle. If leakage is identified, the source of water will be investigated." Otherwise, the following items will be performed, and there is a lot of things that they will do if they find water.

So what I am saying is -- I will get a clarification from AmerGen as to what they are going to do, because I heard the word periodically and not the quarterly test.

CHAIRMAN HAWKENS: All right. Thank you.

MS. BATY: And just for the record, the SER is Staff Exhibit 1.

MR. WEBSTER: I believe Dr. Hausler has a

comment.

CHAIRMAN HAWKENS: Dr. Hausler.

DR. HAUSLER: You asked the question, you know, why the investigation, the monitoring of the water, was quarterly, and you asked whether this was because of radiation.

I just wanted to add to this, and perhaps this is not in scope. But monitoring of water can be done differently than having to send persons into areas that are contaminated.

CHAIRMAN HAWKENS: Thank you. My understanding from his answer was that, although it would require them to dress out because it is a contaminated area, that was not the driving factor. It was their judgment there was no source of water.

DR. HAUSLER: I don't think I want to comment on that, but there is no certainty that there is no water in 45 days, in three months. In fact -- I am sorry -- 90 days, in three months. There is indeed a possibility during normal operation that, if water is there, damage could be done.

This goes toward how well do we know things, and how certain are we that things are under control. The water could be monitored electronically, and this has been done in other places as well.

CHAIRMAN HAWKENS: Thank you.

That concludes the Board's questions for this panel. I do have a couple of questions I would like to pose to AmerGen and have the staff weigh in on. And, AmerGen, I'll let you determine which witness is most appropriate to respond.

In the absence of a corrosive environment, could statistically significant corrosion in the upper drywell occur?

MR. POLONSKY: We are a bit caught off guard, Your Honor, because I thought the upper drywell was outside the scope of the proceeding.

CHAIRMAN HAWKENS: We have discussed it earlier, though, and you said there was minimal corrosion. It was not -- It was significantly -- statistically significant, and the question is: In the absence of a corrosive environment.

MR. POLONSKY: We can have Pete Tamburro give an answer, I think, consistent with what he testified before, but I think you may be mischaracterizing. But, obviously, Mr. Tamburro can address that. Pete?

MR. TAMBURRO: To be honest with you, I'm not sure I understand the question. In the absence of a corrosive environment -- which would indicate to me

that --

JUDGE ABRAMSON: Let's see if I can clarify that, to put it a little more directly. It was a nice indirect question from a lawyer. To put it as a scientist, I'll put my other hat on for a moment, Your Honor.

How could there have been statistically significant corrosion in the upper drywell, if there was no corrosive environment?

That's the inverse of the question that had been posed.

MR. TAMBURRO: The inspections of the upper drywell started in the mid-Eighties prior to many of the corrective actions that occurred, which was the strippable coatings and monitoring water. That series of inspections occurred from the mid-Eighties until 2006, and as we do know, there were outages where we did have water early on that were in this environment.

The small corrosion rate, .6 mils per year, is an indication, in my mind, that that occurred early on and is a conservative judgment of what is a rate in one location, using statistics.

MR. WEBSTER: Could I just clarify? The record states this has been ongoing corrosion there.

Is that incorrect?

CHAIRMAN HAWKENS: We would have to take a look at the exhibit. Is that correct, AmerGen? Does the exhibit indicate there is ongoing corrosion?

JUDGE ABRAMSON: We discussed this earlier today ad nauseam.

CHAIRMAN HAWKENS: Well, if there is ongoing corrosion -- Go ahead.

MR. POLONSKY: Mr. Tamburro, if the title of that slide may have said statistically significant observable corrosion, what is your answer to that?

MR. TAMBURRO: The rate of .66 mils per year was, from a statistical standpoint, observable. It met the f-test. However, that rate was measured over a long duration, from the mid-Eighties to 2006.

MR. POLONSKY: Does that mean that there is actually any ongoing corrosion?

MR. TAMBURRO: In my opinion, there is no ongoing corrosion at this time.

CHAIRMAN HAWKENS: Thank you. That answers my question.

DR. HAUSLER: Could I perhaps ask a clarifying question? Over what period of time was that corrosion rate of .6 mpy determined?

CHAIRMAN HAWKENS: Mr. Tamburro, could we

hear from you again, please?

MR. TAMBURRO: That period of time was from the late Eighties until 2006. We included all data.

JUDGE ABRAMSON: So if the corrosion took place over, say, the first 10 years, then can we assume that the rate would have been higher than .6 mils per year, because you are dividing it by less years?

MR. TAMBURRO: Yes, sir.

JUDGE ABRAMSON: Thank you. I think that's where that goes. Thank you very much.

DR. HAUSLER: Well, the point, I think, is -- You are looking at me questionably, Your Honor. So I feel like maybe I have to add something.

JUDGE ABRAMSON: Not unless you think we need more information on this.

DR. HAUSLER: No. The corrosion could have occurred anytime, and it could have occurred at a fairly high rate over a short period of time.

JUDGE ABRAMSON: Yes.

DR. HAUSLER: Or a very low rate over a long period of time.

JUDGE ABRAMSON: Yes.

DR. HAUSLER: And I think that is perhaps-

-

JUDGE ABRAMSON: We understand. Thank you very much. We don't know when it occurred or how long it took.

CHAIRMAN HAWKENS: Do the parties at this point have any -- I think Mr. Webster mentioned earlier that -- Oh, excuse me.

JUDGE BARATTA: I just was looking at the SER, and under -- On page A-28, Item number 13, it uses the term reactor cavity trough drain. Is that the same as the sand bed trough drain?

MR. GALLAGHER: No. There is -- Did you want me to show you in exhibit what drain that is?

JUDGE BARATTA: If you don't mind, yes. Please.

MR. GALLAGHER: Okay. If you go to AmerGen Exhibit 4.

JUDGE BARATTA: Is that those lines that come in underneath the vent pipes on either side? Is that what you are --

MR. GALLAGHER: No. If I can just point it out to you. So this is AmerGen Exhibit 4. The sand bed drains are in Detail C, down here, these little lines here -- okay? -- coming off of Detail C.

MS. BATY: Can you indicate more precisely

for the record?

MR. GALLAGHER: I am pointing at Detail C.

CHAIRMAN HAWKENS: It is identified on the diagram.

MS. BATY: Okay.

MR. GALLAGHER: Now the trough drain we are talking about, Judge Baratta, is up here in Detail B, and if I can take you to that exhibit, which is --

JUDGE BARATTA: Okay. So that is in connection with the refueling cavity.

MR. GALLAGHER: Yes. Exhibit 8. Exhibit 8 shows the trough drain at the bottom of that bellow seal, which is --

JUDGE BARATTA: A line labeled "drain for concrete trough"?

MR. GALLAGHER: That's correct.

JUDGE BARATTA: Thank you. I have a question for the staff.

Item Number -- Again referring to Appendix A of the SER, page A-30, Item 18. This refers to AmerGen will perform a 3-D finite element structural analysis. What is meant by the last section -- I guess it's the last sentence.

It says, "If the analysis determines that the drywell shell does not meet required thickness

values" -- What are the required thickness values? -- "the NRC will be notified in accordance with 10 CFR 50 requirements."

What are the required thickness values we are referring to there?

MR. ASHAR: This is Hansraj Ashar. The whole thing about the new analysis was to -- Your question was what is required thickness. Correct?

JUDGE BARATTA: Yes, that's correct. I think I understand the previous part, but it depends upon what your answer is to this. I may not have.

MR. ASHAR: It was the thickness which was being used during all the evaluations and thickness which is required to meet the criterion that had been placed together.

JUDGE BARATTA: Well, that is where I got a little confused, because it says in the beginning of this, AmerGen will 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 margins that exist above the code required in minimum for buffering.

In light of that, I didn't understand that last sentence.

MR. ASHAR: As you know, in GE analysis they used .736 as the uniformly corroded surface in the sand bed area. Now it is possible that in the 3-D analysis they might use the true depth at various places in various ways to do the analysis.

So this is what they mean to say -- not meaning to say, at least. Applicant is the one who proposed it, and we accepted. So in that sense, that is what we understand, that it does not meet requirement, NRC would be notified in accordance.

So there the whole idea as to which thicknesses they will meet, which thicknesses that are existing, you know, and that is what we understand, that true thickness are existing at present time.

JUDGE BARATTA: So you are taking the required thickness values as the .736. Is that what I understand?

MR. ASHAR: No. See, in the front that you read, it stated that they might use the true thicknesses in various ways to analyze the shell. What we mean by required thickness means, if the required thickness -- if they come out with a conclusion that they cannot meet all the design criteria that have been established for it, then it could be sent to us for review.

JUDGE ABRAMSON: So let's see if we can clarify this with the applicant. Thank you, Mr. Ashar.

As I understood what we heard about this analysis, you are going to do a 3-D analysis using the current configuration as best you can understand. Is that correct?

MR. GALLAGHER: That's correct.

JUDGE ABRAMSON: And out of that analysis will come buckling load safety factor?

MR. GALLAGHER: That's correct. If I could just tell you what our intention was here, obviously, the currently analysis is our current licensing basis, and that is what we judge everything to. This 3-D analysis we are performing, as I stated earlier, our expectation is that it will show we have more margin than we have in our current analysis. But we put in here the flip side.

If we did this analysis and it showed a problem with our current condition, then we are obligated by Part 50 to notify the NRC, and that's all we are saying here.

JUDGE ABRAMSON: And let me pursue this for a minute, because I'm trying to understand how this all fits together with some rather confusing

testimony we have heard about how the safety factor fits into the current licensing basis.

The design safety factor, we understand, is 2.0. Is that correct? For buckling.

MR. GALLAGHER: That is correct.

JUDGE ABRAMSON: Okay. So let's talk hypothetically. You do the analysis. You get a new safety factor. The new safety factor is less than 2.0 with the existing thicknesses; you report to NRC. If it's greater than 2.0, you don't need to. Is that kind of the gist of this?

MR. GALLAGHER: That essentially it, yes.

JUDGE ABRAMSON: Okay. And therefore, one might expect that that will lead into a review of the frequency of your inspection of corrosion. Let's say it turns out you have a safety factor of greater than 2.0. That would support the frequency of inspection as proposed?

I am trying to understand sort of how this fits together, what the agency could expect to happen as a result of this analysis, other than just reporting.

MR. GALLAGHER: Well, if I can back up to say what was the intent. The intent of performing this analysis was -- and you would have to look at the

transcript of the ACRS meeting. It was really a discussion of the current model, and the current analysis you have now is very, very conservative. You know, the uniform thickness in the sand bed -- you don't have that. All the things that you --

MR. WEBSTER: Objection. Mischaracterizes the ACRS.

JUDGE ABRAMSON: Well, we can read the ACRS transcript.

MR. WEBSTER: Well, it is not entirely in the record, Judge.

JUDGE ABRAMSON: The ACRS transcript is not in the record?

MR. WEBSTER: The whole transcript is not in the record.

JUDGE ABRAMSON: Is part of the transcript in the record?

MR. GALLAGHER: It's a public record.

JUDGE ABRAMSON: We will access it and look at it. Thank you.

MR. GALLAGHER: And the discussion that we had with the ACRS was you are being very conservative here; what are your real margins? And we said, we'll explore that, and we will do this 3-D, find that out in the analysis.

JUDGE ABRAMSON: That was the origin.

MR. GALLAGHER: That was the origin, and you know, we are very confident in our current licensing basis that it is conservative and we can use that as acceptance criteria, and this particular is really a comfort level to show that there is much more margin than we have.

So our expectation, it will show more margin. But we put the flip side of it in this.

JUDGE ABRAMSON: So the flip side is, if it shows less margin than you have, that it might well lead to a shortening of the inspection frequency. Is that --

MR. GALLAGHER: Well, we would enter in our corrective action program, and we would take the appropriate corrective action. The first step would be to notify the NRC, because that would be a Part 50 requirement, and then the second step would be, you know, the evaluations we would have to do, and that type of thing.

JUDGE ABRAMSON: And you would interact with the staff in deciding what the implications of that were.

MR. GALLAGHER: Of course. We would be obligated under Part 50 to take corrective action and,

as appropriate, notify the NRC.

CHAIRMAN HAWKENS: Are there any administrative matters or evidentiary matters that we need to address now? Let's start with Mr. Webster.

MR. WEBSTER: I have a couple. We were in the middle of discussing them with opposing counsel and with NRC staff counsel. We can proceed with them or we can take a short break. We could discuss them further and see if we can reach --

CHAIRMAN HAWKENS: Is it something you need to discuss before we can resolve it?

MR. WEBSTER: Well, let me go forward. One issue has to do with the extreme value statistics, exactly how those were done. Dr. Hausler has now refreshed his memory on precisely how those were done, and he can offer testimony on that.

The second issue is this what we are now calling the Rosetta Stone, the translation between the references for the internal buckling -- so the internal grid locations and the exterior monitoring locations.

We were provided an exhibit number by AmerGen or a disclosure number by AmerGen. That exhibit does not -- certainly does not enable us to make this translation. It may enable AmerGen to make

that translation.

CHAIRMAN HAWKENS: Why don't we proceed with that right now. Let's start off with hearing from Dr. Hausler.

It is about 2:22. Let's take a recess until 2:45. During that period, if the parties have any additional questions on the final topic they would like the Board to address, please submit them to Ms. Wolf.

Additionally, counsel can prepare, to the extent it is necessary, for their closing statements, and we will reconvene at quarter 'til. Thank you.

(Whereupon, the foregoing matter went off the record at 2:26 p.m. and went back on the record at 2:45 p.m.)

CHAIRMAN HAWKENS: The Board is three minutes late. I apologize for making the audience and the parties wait. Did the parties provide Ms. Wolf with any additional questions that they wish to have asked?

MR. WEBSTER: Citizens don't provide any additional questions.

MS. BATY: No questions from the staff.

MR. POLONSKY: None from AmerGen.

CHAIRMAN HAWKENS: Thank you. There are

two administrative matters that Mr. Webster had mentioned before we took the recess. One was what he characterized as the Rosetta Stone which I think was the data from AmerGen to make the internal grids correspond to the external points. The other was some of the underlying calculations for Dr. Hausler's equations, the extreme value statistics.

One of the Board's significant concerns is to allow additional data to come in from either party at this point. It would expand the record. It would open the door conceivably to additional briefings so that the record could not be closed which would create an extension as far as getting out a final decision.

With that in mind, let me ask AmerGen what are its views on this administrative matter letting in additional exhibits into the record.

MR. WEBSTER: Excuse me, Judge. If I could just clarify. For the first issue, the extreme value statistics, I don't think there is any need to go beyond the record. I think we can do it by oral testimony.

CHAIRMAN HAWKENS: All right. Thank you.

MR. WEBSTER: The second issue I think is slightly more thorny.

JUDGE ABRAMSON: Frankly, counselor, I

don't agree with you. If we get additional information in that I don't believe that either the applicant or the staff has had a chance to review in depth all that information. I, for one, am not willing to make a ruling without hearing the parties debate those at length.

MR. WEBSTER: Well, Judge, we have just showed the calculations, rather simple calculations actually, to both AmerGen and the staff and they have staff witnesses and they have had opportunity to look at the spreadsheet that Dr. Hausler used to make the calculations to produce the points that were in the chart.

MR. POLONSKY: Your Honor, I think Judge Abramson characterized it well. I thought he used the words "in detail review." We may have had about two minutes to have Dr. Harlow look at the spreadsheet.

MR. WEBSTER: We are very happy to submit -- I just want to clarify we have no objection whatsoever to submitting the spreadsheet and having further hearings on the issue. I just thought that was a desire by the Board to move forward quickly.

MR. POLONSKY: If we can discuss it orally that would certainly be our preference, AmerGen's preference on the issue of extreme value statistics.

We frankly already have the extrapolation and interpolation plots as exhibits.

Dr. Hausler, I think, is just providing what he believes is the underlying support for how they generated some of those plots. AmerGen, I think, is already on the record that the whole concept of extrapolating and interpolating and treating the internal/external data as representative of the shell is improper.

MR. WEBSTER: Objection to that characterization. Amergen's witness said he did do it through value statistics on the data.

MR. POLONSKY: One moment, Your Honor. As I said, I think limited oral testimony on the issue of the underlying analysis of the extreme value statistics is appropriate.

JUDGE ABRAMSON: Staff have a view? Is there some fruitful oral discussion we can have?

MS. BATY: Your Honors, our expert, AmerGen's expert, had just two minutes to peruse Dr. Hausler's spreadsheet and so obviously we have not had a chance to -- he's not had a chance to analyze the material but we wouldn't object to an oral conversation about the information.

JUDGE ABRAMSON: So let me ask applicant

and the staff this question. Suppose that after this oral discussion of what underlies Dr. Hausler's information this particular Judge is not satisfied that he has got adequate information to deal with it and requires further briefing by all parties and rebuttal of further briefing by all parties.

Do you think that is a likelihood or do you think you can actually get to the end of this in a few minutes of oral discussion? If you want to take a couple minutes to discuss, do.

MR. POLONSKY: If we could have a couple more minutes to discuss this. We would still like to proceed. This is Amergen, Judge Abramson. We think you won't have any follow-up required. If I can, I think, remind us of why we came to this extreme value statistics issue in the first place, I think -- Richard, please correct me if I'm wrong -- there was an assertion about the pressure criterion being exceeded and that pressure criterion is 490.

We were going to provide you with citations where AmerGen had said in its testimony that we thought there was no such location and Citizens were identifying their use of extreme value statistics to identify such a location. I don't know if --

JUDGE ABRAMSON: Please. Let's hear what

the lawyers say in response to my inquiry and then we'll deal with it.

MR. POLONSKY: So, frankly, we think we can supply you with those citations.

JUDGE ABRAMSON: That's fine. I understand. You are okay with going forward. How about staff? Staff shouldn't have the dog in this fight. It's the licensee's application. It will be delayed if there is more information required.

MS. BATY: Actually, Your Honor, we conferred with our expert and he does have some concern that he shares your concern that this discussion could open doors and require -- there is a chance that there would be a need for further briefing in rebuttal as you had suggested depending on how clear the discussion can be. He hasn't had a chance to review this. What he saw he asked questions that he would like to have answered in addition.

I believe this -- correct me if I'm wrong but the staff's understanding is the issue of extreme value statistics arose at least partially out of the Board's question in the August 9th order that you asked us to address the use of extreme value statistics and provide testimony.

MR. WEBSTER: Citizens also --

MS. BATY: So Citizens had an opportunity at that point to provide the necessary information for the foundation of their use of extreme value statistics.

MR. WEBSTER: Well, we have -- excuse me. Citizens did provide --

MS. BATY: And they had another opportunity in surrebuttal as well.

JUDGE ABRAMSON: Let's not go into who had an opportunity when. I think it's the applicant who has a dog in this fight. Applicant said there would go on and take the risk that this may lead to further briefing. I think, as far as I'm concerned, that settles the question for me.

CHAIRMAN HAWKENS: Although I will ask this one question. Citizens having had the opportunity to address it and, in fact, did address it, is there something material and new that you didn't address in your prior submissions?

MR. WEBSTER: No. This is just a clarification from the witnesses this morning. We are saying they didn't quite understand what Dr. Hausler said he used the log log distribution exactly what that meant. Dr. Hausler is prepared to clarify exactly what he means when he says he used the log log

distribution.

This is not new -- this is not anything new. This is the result of prefindings. In fact, the problem is as a result of surrebuttal these questions were not raised on surrebuttal. They could have been dealt with on surrebuttal and we wouldn't be in this position.

CHAIRMAN HAWKENS: We would like to hear clarification from Citizens and a response by AmerGen and the NRC staff, please.

DR. HAUSLER: I would like to add that I don't think at any point we have stipulated that there are areas that are less than 490 mils. I think we have said in a previous study as well as the extreme value statistics that there is a finite probability that such areas exist, that we have used extreme value statistics to extrapolate from 37 points to 50 points or to 100 points.

Yes, that stipulation shows that there is a finite probability that, in fact, such a point might exist if enough measurements had been made. That is, in fact, what the extreme value statistics are being used for.

The other thing that we did in an earlier memorandum to counsel was to analyze some of the data,

some of the external data that had also been analyzed by experts for AmerGen to show that if one were to use the standard deviation for certain means that the external data could actually also be as low, or the points in the external data could be as low as 490 mils depending on how one wants to accept the standard deviation that we have defined at that point.

We have extrapolated things. We have said there is probabilities. We have never said that such points exist. I needed to clarify that because I think counsel misrepresented -- counsel for AmerGen misrepresented what it is that we said. Thank you.

CHAIRMAN HAWKENS: Thank you.

JUDGE ABRAMSON: Sorry. Did you want to clarify something about your extreme value statistics or is that all you wanted to say? That's it?

DR. HAUSLER: The extreme value statistics stand for themselves.

JUDGE ABRAMSON: So there is nothing more you want to offer on this? That's it?

MR. WEBSTER: Actually, that's not quite correct, Judge. There is something that Dr. Hausler has to offer which is the equation that he's used or the exact methodology that he's used to produce that plot and he can go through that right now.

JUDGE ABRAMSON: Has that been made available to the parties?

MR. WEBSTER: Yes, it has. It was made available just now, Judge.

JUDGE ABRAMSON: This is the material that the licensee and the staff have looked at for a couple of minutes. Is that correct?

MR. POLONSKY: That's correct, Your Honor.

MS. BATY: Yes. A two-minute perusal on Dr. --

DR. HAUSLER: Let me describe it very briefly what was done. We have a number of data points. We rank the data points from the highest to the lowest. This gives us a ranking from 1 through 37. The number may not be quite accurate. Anyway, you know, we divide that ranking by the number of observations plus 1 in order to get the relative ranking.

We then calculate the logarithm of the negative logarithm of that relative ranking which is standard procedure in the statistics. We call that the reduced variant. We plot the actual wall thickness, or remaining wall thickness, against the reduced variant in the linear plot. If we do get the linear correlation, then that is an indication that

extreme value statistics, as we just have defined them, is applicable.

You get the correlation equation for that straight line which is in our exhibit that we mentioned earlier. You get the correlation equation and you extrapolate that from 40 points, or 37 points, to 90 points or 100 points or whatever.

In this particular instance we extrapolated it to 37 points -- from 22 to 37 points and found the number at 488 mils residual wall thickness. Right? It's on that basis that we say if, in fact, one had measured 37 points there is a very good probability that one might have found a point that is already at that limit.

JUDGE ABRAMSON: And all of those points that you used for external measurements which had been milled down to get a thickness. Is that correct? You said you started for 22 and you extrapolated 37. The 22 points you used are external data points?

DR. HAUSLER: Correct, for bay 13.

MR. WEBSTER: Just to be clear, we don't know if they were milled or not.

JUDGE ABRAMSON: Okay. I understand. But there is an uncertainty of up to 200 mils.

MR. WEBSTER: There is plenty of

uncertainty around here. There is no question. Could I just make one other point, Dr. Hausler? Could you just give us a correlation coefficient or the linear plot?

DR. HAUSLER: The correlation coefficient is .913. That is not a correlation coefficient. Generally that is considered excellent but it is a decent correlation coefficient. That's all we have.

CHAIRMAN HAWKENS: Thank you very much.

AmerGen.

MR. POLONSKY: Can AmerGen take three minutes to go caucus? Five minutes to go caucus?

CHAIRMAN HAWKENS: Yes. Please do. We'll reconvene at 10 after.

MR. POLONSKY: Thank you.

(Whereupon, at 3:07 p.m. off the record until 3:16 p.m.)

CHAIRMAN HAWKENS: Back on the record.

MR. POLONSKY: Your Honor, AmerGen has no testimony to provide in response. In response we would just like to identify as the Board had requested before those locations in the prefile testimony where we argue that there are no measurements below 490 in AmerGen's direct testimony, Part 3.

The answer to question 5 at the top of

page 6 states what the thinnest UT measurement obtained at any time between 1992 and the present and it says it's 602 inches. Therefore, the pressure criterion is also easily satisfied because there are no single UT measurements below 490. I'm sorry, .602 inches or 602 mils.

The second citation is to AmerGen's prefiled rebuttal testimony also in Part 3 starting with the answer to question 40 which starts at the bottom of page 31 and encompasses answers 40, 41, and 42.

CHAIRMAN HAWKENS: Thank you. NRC staff, anything you wish to add?

MR. SALOMON: This is Art Salomon for the NRC staff. Your Honors, not wanting to extend the proceeding but if required to make a decision on the applicability of the interveners exhibit or testimony, I would prefer to have additional time and the background equations and model and all the steps in the procedure to review before saying that the procedure is applicable and used properly.

CHAIRMAN HAWKENS: Thank you. So the NRC staff does not endorse at this time this statement made by Dr. Hausler.

MR. SALOMON: That is correct.

CHAIRMAN HAWKENS: Thank you.

MR. WEBSTER: It also does not negate it either.

JUDGE ABRAMSON: That's correct.

CHAIRMAN HAWKENS: Thank you.

MR. POLONSKY: Your Honor, that is similarly the position for AmerGen.

CHAIRMAN HAWKENS: Thank you. I think a final admin. matter deals with data points underlying some of the internal and external points that were graphed by AmerGen in an exhibit. Is that correct?

MR. POLONSKY: Yes, Your Honor. I guess it's Exhibit -- Amergen's Exhibit 28 is that lovely chart of green triangles, yellow triangles and green rectangles which is provided as part of an ACRS presentation.

The underlying document, which was the basis for this, although this was not to scale horizontally, is the same document that is the underlying basis for AmerGen's Exhibit 44. That document was produced in discovery. AmerGen provided that OCLR Bates number to Mr. Webster at the break and he now has that exhibit.

CHAIRMAN HAWKENS: You have what you need, Mr. Webster? You are satisfied with that?

MR. WEBSTER: Obviously not, Judge, or we wouldn't be discussing it on the record here. While it may be possible to translate from the document that was disclosed to the coordinates that were used, in fact, I think the sequence is that I asked Mr. Polonsky for the coordinates of the external points and the internal points all in the same relative coordinate frame.

JUDGE ABRAMSON: When did you request that?

MR. WEBSTER: I don't recall exactly, Judge.

JUDGE ABRAMSON: Was it in the last few days or was it many, many months ago?

MR. WEBSTER: It is subsequent to seeing AmerGen plot. It's approximately two to three weeks ago I would estimate.

JUDGE ABRAMSON: Does that sound accurate to you, Mr. Polonsky?

MR. POLONSKY: I disagree with the characterization but I'll let Mr. Webster continue before I provide a reply.

MR. WEBSTER: Okay. So as to those coordinates you said that -- I don't recall too precisely what you said. He said something along the

lines of that there wasn't any coordinates but if they had disclosed something from which one could deduce the coordinates but didn't tell me exactly where in the record. I do believe Ms. Young can corroborate this.

I complained to her at the time that it's a pretty hard job looking at 40,000 sheets of paper to try and find one document. I think there is -- well, I think that certainly didn't help Citizens develop their record because obviously we have limited manpower and plowing through 40,000 pages is a significant task.

Subsequently, AmerGen has produced Exhibit 44 on surrebuttal which attempts to do the same thing again. It's actually to scale this time. Citizens still have questions about whether these coordinates are actually properly overlaid. We, therefore, request AmerGen to provide the underlying coordinates used for these plots and an explanation of how they calculated those coordinates from the document that was disclosed.

CHAIRMAN HAWKENS: Amergen.

MR. POLONSKY: First of all, the document is not a new document. The document was provided in the mandatory disclosure process. It has a Bates

stamp and it obviously was produced before the close of discovery. When was that? In June.

Secondly, the original document, which should have raised this question in Citizens' mind was provided as part of a presentation to the ACRS whether it was in October or January or February. Mr. Webster attended that ACRS meeting. He never at that time asked AmerGen why or what the underpinning of that document was.

In fact, my recollection of the first e-mail that he sent to me, which I would agree was about three weeks ago, said, "Perhaps it's too late for me to be asking this but where is this document or was it produced?" We then did some diligence to confirm --

CHAIRMAN HAWKENS: Excuse me, Mr. Polonsky. The ACRS document you are referring to, is that Exhibit 44?

MR. POLONSKY: No. The ACRS exhibit -- I'm sorry. ACRS presentation is Exhibit 40 but the slide from that exhibit we had previously attached as Exhibit 28. Exhibit 28 should be duplicated somewhere within one of the presentations. It's Exhibit 40, page 101. I believe it's in black and white there. That document was available. He had a prior opportunity, therefore, to raise the issue.

Regardless of what transpired there is no discovery allowed here now. There is no new document that has been generated that Mr. Webster or Citizens have not seen. In fact, what they would like us to do is do the work for them it appears and we have given them the document that my client spent weeks correlating those coordinates and plotting them and making various engineering adjustments.

This is not something that a lawyer can do. This requires an engineer and QA and QC of that internal and external correlation. The grid measurements for each of the internal grids and their coordinates from known welds are shown on the figure that I identified the OCLR document for to Citizens today.

CHAIRMAN HAWKENS: Thank you. Let me hear from the NRC staff, please.

MS. BATY: The NRC staff doesn't have a position on this other than our understanding was that the request for this document, or at least AmerGen's promise to provide the document, was made yesterday. There was a request to have a correlation and the OCLR number was identified.

MR. WEBSTER: I think generally most of these things are quite correct. There have been two

requests. One was made to Mr. Polonsky previously and one was made yesterday for the specific OCLR number since we did not have that previously. I think what Mr. Polonsky is saying is basically that AmerGen wants take advantage of the fact that they have far more resources than we do.

Therefore, they want to hide the ball and not identify where the locations were taken. They criticized us for not putting the internal points upon the contour plots. With a weld we could not do that. I think this Board in the interest of fundamental fairness should require this document to be disclosed to us and give us an opportunity to check whether Exhibit 44 really reflects the appropriate coordinates.

CHAIRMAN HAWKENS: I want to for clarification, AmerGen, you provided them with the Bates number where the data is located. Is that correct? Page numbers?

MR. POLONSKY: Essentially, yes. It's a single figure and the figure has a depiction of the entire drywell shell with weld locations, grid locations, and then in the bottom left-hand it has each of the grid numbers and associated coordinates up, down, left, right from those welds.

MR. WEBSTER: Judge, just to be clear, Mr. Polonsky just said that it took weeks of work to go from that figure to the actual coordinates of the use for Exhibit 44.

DR. HAUSLER: Could I --

CHAIRMAN HAWKENS: No. I think I just want to hear from the attorneys on this legal motion. The motion is denied. I think Citizens has had ample time to request this data. In addition, there is simply no reason to think -- no reason that you have provided.

You haven't had the data. You do have it now but there has been no reason for this Board to doubt the veracity of these charts to the extent once you review this you determine that there is a problem that may well provide a basis to reopen the record. You are to otherwise petition the Commission for relief but the motion at this late date to receive that into the record as an exhibit is denied.

MR. WEBSTER: I would like to move for reconsideration, Judge, and look at facts that will led you to think about it some more.

CHAIRMAN HAWKENS: No. Motion is denied. Thank you.

MR. WEBSTER: You won't allow me to add

any facts that may be relevant to the motion?

CHAIRMAN HAWKENS: I gave you full opportunity several times already.

MR. WEBSTER: I didn't realize there are some additional facts. The reasons that we believe this figure may be mistaken is because that exhibit that AmerGen provided to the ACRS at the time we thought it was accurate. What we find on the spectrum is that it is not accurate.

I think the Board yesterday reviewed the comparison between Exhibit 44 and that diagram that was provided to the ACRS, which I think is Exhibit 28 which noted the significant discrepancies between the two diagrams. Thus, I think there is no confidence that -- well, we certainly don't know which of these exhibits. One was not to scale and this one purports to be at scale.

Now, furthermore, with Mr. Tamburro's analyst, which is revision to the 24 count, there were likewise significant -- maybe I wouldn't characterize them as significant but there were errors in the locations of the points and in the drawing of the areas. I think this is a fundamental point, the overlap of this areas. I really think it would be in the strong interest of this Board, of the agency, and

of nuclear safety to allow full discovery on this point.

MR. POLONSKY: Your Honor, I think there has been clearly full discovery on this point. The Board cut off discovery and this document was produced before that cutoff date. I believe the Commission has a precedent although I cannot cite to you cases right now which say the argument that we don't have enough money or we don't have enough resources is not a legitimate claim for a party in an NRC proceeding to state that they cannot meet their burden. We don't believe that is a convincing argument. In addition --

MR. WEBSTER: We have not --

MR. POLONSKY: I will finish, please. The exhibit 28 I believe Mr. Webster is mischaracterizing that. The footnote on the document explicitly states that it is to scale in the vertical direction. We have already had testimony on that. It is not in the horizontal direction nor really could it since each bay is 15 feet wide and we are trying to put it all on a single piece of paper.

The mandatory disclosures have ended. This document was provided. No discovery is allowed in this proceeding. I will just echo again they are asking us to do their work for them and we think that

is fundamentally unfair. Thank you.

MR. WEBSTER: May I just, say, Judge, we said yesterday that Exhibit 28 contains a mirror image of some of the data locations on the horizontal scale. That is not really not to scale. It's in error.

CHAIRMAN HAWKENS: Thank you. The motion is denied. Are there any other administrative matters the parties want to bring to the Board's attention?

MS. BATY: Your Honor, the date for transcript correction submission, we need to set that among the parties. I believe that was an item -- administrative item left open. The parties, I think, have discussed this and I don't have a date in my head but I believe there is a consensus now, an agreement to Friday, October 5. Is that correct, Mr. Silverman?

MR. SILVERMAN: That is correct from AmerGen's perspective.

CHAIRMAN HAWKENS: Citizens is October 5th?

MR. WEBSTER: Provided the transcript is available on Monday that will be fine. Citizens request five business days.

CHAIRMAN HAWKENS: If it is not available to you at that time, please let us know.

MR. WEBSTER: Thank you, Judge.

MS. BATY: Another point of that is we were expecting to have the corrections in hand by close of business. That was the deadline. We believe that was the agreement. It wasn't close of business?

MR. SILVERMAN: That was what I understood so I guess we are clear.

MR. WEBSTER: Well, I have never heard that before. What is the purpose of close of business Friday? Presumably no business will occur if we have it sent in by midnight on Friday.

MR. POLONSKY: The purpose we thought, Your Honor, of getting a corrected transcript was so that when we cite to the transcript in our findings of fact and quote the transcript that we are actually quoting things that parties have reviewed. As long as we can have them in our hands on close of business midnight, whatever it is, on Friday, and only those pages which have changes, could be sent to the parties.

CHAIRMAN HAWKENS: I understand. Close of business. Mr. Webster, if that poses a problem because you didn't receive it in time, please let us know.

MR. WEBSTER: Judge, my wife will be very happy to hear that close of business is the deadline

actually.

JUDGE ABRAMSON: I think the implication from all this is that Morgan Lewis is going to work over the weekend. I don't know about the staff.

MR. WEBSTER: We have seen a lot of weekend work already, Judge.

CHAIRMAN HAWKENS: The Board's right hand has brought to my attention that when they are submitted the parties should have gotten together, collaborated to make sure there is agreement on the proposed revisions. Does that pose a problem? Why is that, Ms. Young?

MS. YOUNG: Well, basically we have a very abbreviated finding schedule in this proceeding and I'm not sure we are going to be able to complete our findings and do that but we will make an attempt to to the extent we can to share our proposed corrections between the parties but have an agreement on any changes that are made to the transcript is not likely. I believe you know the history of the participation among the parties. There are areas which we have been able to agree and there are many areas with which we disagree.

CHAIRMAN HAWKENS: Those have generally been substantive matters. I want to emphasize this is

a motion for transcript corrections. That is not a motion for transcript enhancements.

MS. YOUNG: Absolutely. Absolutely.

CHAIRMAN HAWKENS: And I think that is very important. I don't want Ms. Wolf to have to be going through and refusing to, you know -- we don't want to make her job harder.

MS. YOUNG: Absolutely.

CHAIRMAN HAWKENS: So to the extent you can make her job easier by simply insuring that any suggested corrections you make are necessary endeavor to get everybody's agreement and get the motions to her by close of business on Friday I think we would all be grateful.

Mr. Webster.

MR. WEBSTER: If I could give one possible solution. We all have been suffering from a very abbreviated schedule so far. At the time we agreed to that abbreviated schedule this proceeding was the critical part for relicensing. I believe that is no longer the case because of the Coastal Zone Management Act Consistency from New Jersey. I question whether we need to adhere to this abbreviated schedule now because this proceeding is no longer on the critical path.

CHAIRMAN HAWKENS: The Board is in favor of going forward consistent with the schedule we have already established. Again, let's shoot for Friday unless the Board is willing. If parties are willing to get their draft motions to each other on Friday and then submit them by close of business on Monday that would be an alternative. Monday is a federal holiday. That would be Tuesday. Is your wife willing to accept that, Mr. Webster?

MR. WEBSTER: Federal holidays do not have an affect in my household I'm afraid.

MS. YOUNG: The staff is amenable to that.

MR. SILVERMAN: And AmerGen is amenable to that.

CHAIRMAN HAWKENS: All right. Tuesday close of business would be --

MS. YOUNG: Which is the day before the findings are due. The staff does have one small administrative matter.

MR. WEBSTER: Before we move on, I think it's going to be very difficult for us to submit proposed findings with full references to the transcript.

CHAIRMAN HAWKENS: That's why initially we were going with Friday.

MR. WEBSTER: I know. Perhaps one approach would be to submit it in draft and then tidy up the transcript references later when the transcript is finalized.

CHAIRMAN HAWKENS: Let's go with having the motion submitted on Tuesday by close of business, again emphasizing this is just to ensure the court reporter has not misconstrued words. It's not to make the parties, the witnesses, or the Judges sound more articulate than we actually are and not to include punctuation.

And to the extent that you find the proposed findings of fact, conclusions of law require some corrections because the transcript page cites are incorrect, you can provide them subsequently.

MR. WEBSTER: Thank you, Judge.

CHAIRMAN HAWKENS: Ms. Young.

MS. YOUNG: This is a separate issue, small administrative matter. I just wanted to thank Mr. Donnie Ashley, the plant project manager for Oyster Creek for his willingness of taking the responsibility and the fantastic job he did in accessing exhibits during this hearing. It was a last minute request on my part that caused him to be in that position. I just wanted to thank him definitely

on behalf of the staff and possibly the Board and the parties.

MR. WEBSTER: Absolutely. Citizens concur.

CHAIRMAN HAWKENS: On behalf of the audience especially who wouldn't have had the benefit of having the exhibits in front of them so bravo. Thank you very much. Anything else from the parties before we go to closing statements? The Board has a couple of more items

Directed towards AmerGen, I think it was Mr. Tamburro who had indicated that internal procedures govern the periodic checking of the sandbed drains.

MR. POLONSKY: I think Mr. Gallagher provided the final testimony on that.

CHAIRMAN HAWKENS: Okay. You testified they were internal procedures as opposed to licensing commitments.

MR. GALLAGHER: That's correct.

CHAIRMAN HAWKENS: The Board's question is would AmerGen have any objection to making this a commitment to be done at least every -- consistent with your internal procedures?

MR. GALLAGHER: This is the sandbed --

verifying the sandbed drains are clear?

CHAIRMAN HAWKENS: Correct.

MR. GALLAGHER: We would not oppose that.

CHAIRMAN HAWKENS: All right. Thank you.

JUDGE ABRAMSON: Okay. And, unfortunately, we have one final clarification which comes back to the new 3D analysis and what is going to happen with it. Let me see if I can phrase this in a way that we can come to grips with it. Here is the Board's concern. I think this envelopes everything that has been going on here at the proceeding. The focus of this proceeding is the ultrasonic testing frequency sufficient to detect a problem before the corrosion creates a problem.

The purpose of the current condition full 3D analysis is to determine what the safety margin is. What the Board is not clear on is what will happen with that result.

First of all, we are not comfortable with the way the language of the SER is stated and we would like the staff and the applicant to rewrite that and give us a draft rewrite so that it makes some sense to us. We understand that the purpose of that is to calculate a new safety -- to recalculate a safety margin for the current configuration as degraded. Is

that correct?

MR. GALLAGHER: That's correct.

JUDGE ABRAMSON: Okay. And we understand that what the applicant has committed to do is to comply with the law which is if there is a problem reported to the staff and then come to grips with it with the staff under the regs. That is fully appropriate. We are wondering, however, how this meshes with the issue at hand here which is what is the ultrasonic frequency -- ultrasonic testing frequency and is it adequate.

Here is the question we have and we're not quite sure how to come to grips with it in the context of 10 CFR 50 and the context of the regs and the SER and the condition.

If you were to come up with a new current condition safety margin that indicated you were on the margin or right at the point where there could be a problem, we presume you would then iterate with the staff to figure out what that meant and that would mean examining your -- since this whole thing is brought about by corrosion, you would be examining your look at the corrosion, your look at the epoxy and your ongoing UT frequency. Is that correct? Is that what you would expect would happen if you were in that

mode? You want to talk about it? We are trying to understand.

MR. GALLAGHER: I'm not sure that the analysis would necessarily factor back into a UT frequency because what we would be calculating is the current condition we have now and the safety margin, the safety factor.

JUDGE ABRAMSON: Suppose that safety factor came in and let's say the current licensing basis requires a safety factor of 2.0. Let's assume that is the case. I'm not absolutely clear that's the case but let's assume that's the case. Suppose you did a calculation and you came in at 1.99 or 2.01.

I assume that even at 2.01 or 2.02 you would feel some necessity to report to the staff given their are some bounds of uncertainty in that kind of analysis. You reported to the staff that you were on the edge of having a -- you are satisfied but you would be on the edge or you nearly satisfied the safety margin requirement of the CLB.

The question is since that is what's at issue here, i.e., the frequency of UT testing is being driven by whether you are going to run into a problem with the CLB or, to put it another way, the license extension you have to demonstrate that you will meet

the CLB for the period of the license extension.

This analysis is being done before the license extension is granted and we are wondering how this would play out between the applicant and the staff if you came in on the margin. Now, you don't expect you will. I don't know but certainly we have heard indications that the current analyses are very conservative and the number is likely to be even larger. If you came in on the margin, what would happen?

MR. GALLAGHER: Well, let me first start out with in 2008 we are doing the full scope of inspections so we will have additional data at that point. The same data points but we will have the additional data.

JUDGE ABRAMSON: And it's about that same time you are doing this analysis. Is that right?

MR. GALLAGHER: We need to be done the analysis by April of 2009. I think -- can I take a minute to confer?

JUDGE ABRAMSON: Sure. Please.

MR. GALLAGHER: Okay, Judges. After conferring with my colleagues here, let me talk about both sides of the equation. Our expectation is that we are going to have a greater safety factor than our

current analysis shows. If that is the case, that is good information. Just for clarity that doesn't affect our CLB because if we wanted to change our CLB with this new better case, this new model, we would have to pursue that via staff review and approvals. That is on the positive side.

On the side that you're pointing out, if we had a calculated safety factor less than 2, as we said, we would notify the NRC and we would take corrective actions, one of which would be enhancing our inspection program, the locations of inspection, because we could characterize to determine we have more metal and then factor that back into the analysis. That's one possible solution.

The other is obviously other corrective actions, you know, that we could pursue. The short story of saying we put in a corrective action system and pursue that. The staff we would obviously since we notified the staff they would be involved in any outcomes we come up with.

JUDGE ABRAMSON: Thank you. That is very helpful. Does the staff have any comment?

MS. BATY: The comment is that the license condition and the commitment is that AmerGen is supposed to perform this 3D analysis prior to the

period of extended operation which means that the Board's decision, the Commission's decision about license renewal, this analysis does not have to be done prior to -- it doesn't have to be approved prior to a Board decision, Commission decision on license renewal the way it is written to say prior to the period of extended operation which means before the current license.

JUDGE ABRAMSON: Which is long after our decision hopefully and that is the idea. I understand that.

MS. BATY: Okay. We wanted to make it clear. Also, this appears also as a proposed license condition in the SER so that is the language. The language is not identical between those two. I guess the staff is saying there is no basis to reword the commitment because there is a proposed license condition.

JUDGE ABRAMSON: Right. It is the proposed license commitment we would like to see clarified. What's in the SER doesn't make any sense to us so we would like to see that clarified to talk about what the real result of this analysis which is not going to be determination that you meet your required thicknesses but that you meet your required

safety factor which would be a function of the thicknesses which will indicate where you are on thickness.

Just give us a draft of a revised proposed licensing condition and the two of you can work on that. We just want it to be clear what it really is and it's not clear. If that means messing with your commitment, then mess with the commitment, too. Get it right. That's all.

JUDGE BARATTA: One point of clarification. What we are talking about is a license condition. Not commitment, license condition.

JUDGE ABRAMSON: I think what I hear the staff saying is this will be done before the license extension so it's the commitment that needs to be clarified. It becomes a condition in the SER that this commitment is satisfied. It will all be fait accompli I assume by the time the license is actually issued so it's not a condition of the license itself. It's a condition to issuance of the license.

MS. BATY: Your Honor, can we -- I'm going to read the condition as it currently is stated.

JUDGE ABRAMSON: We've read it in the SER.

MS. BATY: We're confused about what is unclear so we would like -- the staff would appreciate

the Board's guidance in what we need to do to address this. Right now it says, "The 7th license condition requires the applicant to perform a 3D finite element analysis of the drywell shell prior to entering the period of extended operation."

JUDGE ABRAMSON: That's appropriate. There's another sentence. Maybe it's in the condition then that talks about to make sure that -- where was that, Tony?

MR. GALLAGHER: It's in the commitment.

JUDGE ABRAMSON: It's in the commitment. Okay. Then let's just fix the commitment. The condition is fine.

MS. BATY: Okay. Thank you.

MR. GALLAGHER: Judge Abramson, just one point of clarification. I think you had said something like it would be a condition to issue the license. Our understanding of what this is it's a license condition. You are right the condition will be satisfied before the period of extended operation but it's not a condition to issue the license. It's a condition within the license.

JUDGE ABRAMSON: I stand corrected. That's fine. The license can be issued early but you don't get your extension unless this condition is met.

MR. GALLAGHER: We have to comply with the condition.

JUDGE ABRAMSON: Okay. Thank you.

CHAIRMAN HAWKENS: Does that conclude administrative matters before hearing final statements? Citizens?

JUDGE ABRAMSON: Let me just plead with the counsel who are going to give these closing statements. You are going to have plenty of chance to spell this out in your proposed finding so please keep it brief.

CHAIRMAN HAWKENS: NRC staff, no final administrative matters?

MS. BATY: No.

CHAIRMAN HAWKENS: AmerGen?

MR. POLONSKY: No final other administrative matters.

CHAIRMAN HAWKENS: All right. Before going into the closing statements, the Board would just like to once again express its appreciation to the Ocean County officials who allowed us to use this and especially to Ms. Flynn back there. I wanted to make sure I express my gratitude to you before you stepped out. Thank you very much.

We also express our gratitude to the Under

Sheriff's Office for all the support they have given us both during the limited appearance sessions and during this session. Thank you very much.

And to Rob. I don't know Rob's last name but he's with Wolf Sound Company and he helped us out with the sound system here today. We are very grateful for that.

Closing statements. As per ordered, they are limited to 20 minutes per party. The NRC staff has declined the opportunity to provide a closing statement. We will hear first from Citizens. The parties need not use the full 20 minutes, although they may.

MR. WEBSTER: Was there a hint there somewhere?

CHAIRMAN HAWKENS: No, it's a plea.

MR. WEBSTER: Well, it's kind of hard to be brief when so much has happened. I will do my best but also please remember this is sort of an extemporaneous summary of what has occurred so I'll do my best to sort of produce some sort of wonders or oratorical -- I lost the word already. Obviously I'm going to fail at that. I'll try to keep it simple and try to get it right.

There are six groups here, Citizens

groups. These have been wrongly characterized as anti-nuclear groups. In fact, they cover a very broad range of interests. We have mothers who have found their children's teeth with high levels of radiation in them. We have citizens who have genuine and serious safety concerns.

We have nuclear engineers who believe that Oyster Creek is the first plant in the country and should not be relicensed. We have citizens who believe that the NRC is fundamentally failing to properly regulate nuclear safety. And we have citizens who are anti-nuclear so there is a broad range of motivations for this intervention.

I don't think the motivations matter that much. This is an arduous process, as we've seen. Forty-four relicenses have been through with no citizen intervention, no successful citizen intervention. Thus, without a valid scientific point citizens simply are unable to get to this point.

What we've heard over the last couple of days I think has certainly troubled us and I think has troubled people beyond this room. To use the metaphor, the sea of uncertainty appears to have been rising. I've got my snorkel out right now.

What we've seen is that really we don't

know if the pressure criterion is met, we don't know if the LOCA buckling criterion is met, and we don't have 95 percent confidence that the generalized corrosion criterion is met in every bay. I would call that a pretty uncertain situation. The question is what do we do with that uncertainty?

We have tried repeatedly. This is not a situation where citizens have hid the ball here and said AmerGen is springing on your this concern. We have been to the ACRS with this issue and that is where the requirement for the new final element modeling came from. That was a commitment made at the last minute by AmerGen to try to mollify the concerns of the ACRS.

Since then we have done more data analysis. We have finally managed to find coordinates to scale. We have analyzed those. We have shown that the characterizations of the measurements were completely incorrect. The measurements have been characterized by showing only severe errors of degradation near the vent header. That's completely wrong.

There are areas of very severe degradation and that most -- well, it is most likely -- let's put it this way. In a sea of uncertainty it's very

difficult to make definitive statements about this drywell.

If I phrase this as carefully as I can, the best interpretation of the data that we can produce shows there is a probability that there are very severe areas of corrosion that go beyond the CLB in the most sensitive areas of the drywell. They are at the edge of the base.

AmerGen has never put the data for two bays together and analyzed the two together and see whether this nine square foot area actually extends over the two bay. Each bay has been analyzed completely separately from another.

The level of analysis has been -- I'm struggling for the right word here -- has been, I think, poor. Let's put it this way. If this was a physics paper I think you would get a D, revision 2 of the 24 Calc. I find that surprising because this was a revision that was produced once this litigation had already started.

If I was the largest nuclear company in America, I might have taken some time to get that calculation right but it appears that AmerGen didn't do that. They put out a document that was riddled with errors. It was simplistic and, at best, shows

marginal compliance. At worst it shows they are already by their own assessment beyond the CLB and makes no attempt whatsoever to estimate margin.

Let's say a few words about NRC. As you might have gathered by now I wasn't born within these shores. I'm going to use a soccer analogy here. Somebody said earlier this is like a baseball game. Well, I'm not too familiar with baseball so I'm going to stick with a soccer analogy.

As far as I'm concerned we have been coming down the field here pretty strongly. We have been reaching the penalty box which, for those who don't know, is 18 yards from the goal. Just as we are moving into the penalty box NRC suddenly grabbed the goal post and ran off down the field with it.

The requirement to meet the ASME code factor of 2 was acknowledged by the applicant repeatedly and has been acknowledged again by the applicant. It is an amazing situation where the regulator is suggesting a less stringent criterion is appropriate than the applicant.

This is a situation that I have spent many years as both an environmental consultant and a few years as a lawyer. I have never seen a situation where the regulator is saying, "Oh, we think we have

an exemption," or the applicant is saying they don't. How can citizens appropriate intervene in a hearing like this when we don't even know what the requirements are.

The CLB is kind of like the Holy Grail. Everybody refers to it. It can't be challenged. The only thing is none of us know what it is. There's no statement of it. Even now this Board is struggling to try to figure out what it is after a year and a half of litigation. That is an entirely ridiculous situation.

How can you have public transparency of nuclear regulation when citizens are unable to find out without doing months of work on what the requirements are? Even when citizens do figure out what the requirements are, NRC staff then arbitrarily changed them at the last minute.

Why does NRC say they can change the rules just as we start to win the game? They say they know more now about the drywell than they knew when it was built. That is entirely wrong. When it was built the drywell had a nominal thickness. There was presumably some natural variation of nominal thickness but it was very small.

When it was built they hadn't thrown away

the files that they used to design it. When it was built there was an allowance for inclusions and all this other stuff. That was the safety -- well, the safety factor 2 came in a little bit later. The previous code actually required more analysis if a thinning of 10 percent was observed. When it was built the safety factor was something around 3.85.

Since then we have thrown away the files and we've had severe corrosion. We have heard that we don't know where the severe corrosion is. We don't know how thin it is. We know very little actually. I think that is the overriding theme. We know very little about this drywell.

We have 100 points from the exterior and we have these tightly-spaced grids, 12 grids with a quarter of a square foot and three square foot on the outside, three square foot of a 700 square foot vessel. We know very little. NRC's explanation, NRC staff explanation for now we can now relax this safety factor 2 makes no sense whatsoever. If anything, NRC should now require something greater than a factor of two because the level of uncertainty has increased since design, not decreased.

Likewise, this Board has characterized NRC staff counsel in the role of amicus but at every stage

-- not at every stage but more laterally NRC staff counsel has more vigorously fought the citizens' attempt to add documents to the record, has cited more reasons for to strike documents that citizens have provided and has generally put itself in an adversarial position to citizens.

If the goal of the NRC in these proceedings is to have issues fully aired, it's hard to understand why NRC staff while spending their time and Government money objecting to Citizens putting in exhibits in a proceeding like this when the applicant isn't objecting.

So now finally we reach the point, and I think we are all very glad to be here, and certainly my wife is very glad we are here, which is that we know very little. AmerGen has to provide -- the legal standard is AmerGen has the burden of showing that they have reasonable assurance so they can meet the requirement.

Now, there is a circuit court case out there, I think it's North Anna, that interprets reasonable assurance as a clear preponderance. What we have here, for instance, let's take an example. On the very LOCA pressure criterion .49 we don't have a clear preponderance. We have Dr. Hausler's analysis

saying there's a good chance that there are some areas that are thinner than 4.9. We have no testimony from the other parties. That's not a clear preponderance.

On the LOCA area criterion AmerGen hasn't even sought to establish what the margin has been. There is no evidence -- the best evidence is that there is no margins so you can't find a clear preponderance in favor of compliance with the LOCA area criterion.

Now, moving from a legal term to a statistical term, we have shown that federal courts regard the 95 percent competence interval as the basic cornerstone of sound science. In federal court you cannot show, for instance, causation to less than 85 percent competence. The court will not allow you to do that.

A single plaintiff cannot recover money from a drug company, for instance, that cannot show to 95 percent competence. There has been causation. It's hard for me, and I think it will be hard for everybody else, and I hope the Board will find it impossible to find that when the safety of thousands of people is at stake and billions of dollars that a lower level of competence than 95 percent would be appropriate.

In fact, citizens assert that 95 percent competence is the absolutely minimum that is supposed to require it legally and require it technically. Here perhaps we have a happy coincidence of more than technicalities which don't always occur where it appears that sound science and the law are reasonably coincident.

AmerGen has refused to plot these 95 percent competency rates. Again, it's hard to find a clear preponderance that we know these margins are 95 percent competence when AmerGen has refused to even evaluate the margins at 95 percent.

So the sea of uncertainty has been rising. The Board is now faced with a question. Does it decide that AmerGen had plenty of chance to dispel this sea of uncertainty and didn't bother to do it. Why didn't it both to do it? Presumably it figured the NRC has exactly been the toughest agency in nuclear the last few years.

They figure no intervenor has ever managed to get through the process of actually intervening and getting a hearing so why dispel the uncertainty? The only danger if you dispel the uncertainty is you find something you don't like. AmerGen adopted a don't look, don't find policy. Amazingly NRC staff endorsed

that policy.

So now the Board has to decide -- well, let's say this. Based on the record before the Board because there is no clear preponderance of evidence showing that the margins are met, we cannot move forward with relicensing based on this record.

Similarly because there is no showing what the minimum margin is, it's impossible to determine the ultimate question which is what is the appropriate monitoring frequency. We've had testimony that there is corrosion, that AmerGen's expert is assuming there is some degree of corrosion. Therefore, what we have to do, there is certainly corrosion on the interior. There is no argument about that. There's no coating.

AmerGen's expert has assumed there is some corrosion going on and that makes perfect sense. It also makes sense to assume there is some corrosion going on on the outside. We have some corrosion. The question is what is the minimum margin? We don't know. We don't even know there is a margin.

How am I doing, Judge Abramson on time?

CHAIRMAN HAWKENS: You are doing well. You have another five minutes.

MR. WEBSTER: Another five minutes. I should wrap up early in that case.

So the Board now has to decide. AmerGen is struggling with this uncertainty. Do you want to throw them a life ring or do you want to let them drown? It's our assertion that by now the biggest nuclear company in America should have got this right. Their failure to get it right calls into question their ability to operate this plant safely in the future.

It's our assertion, therefore, that the Board should not throw them a life ring. The Board should decide that relicensing of Oyster Creek cannot go forward. However, if as is the habit of the agency the Board decides to throw them a life ring, then it should lay down a number of conditions and it should not close this proceeding. It should keep the proceeding open so the Citizens can see how the issues that we have put forward are.

What is required here are some requirements. We have this promise of more analysis. The problem is we don't know what the requirement is. Dr. Hausler said, well, it could be 1.9, 1.8, 1.7. He really doesn't know. I don't understand then how this analysis can be useful. How will we know whether the analysis shows that the drywell meets the requirements if NRC doesn't have any requirements?

If the Board decides to throw AmerGen life ring, which we believe it should not, the Board will have to decide what standard should apply. At minimum the Board should apply ASME code safety factor of 2. Actually because there is more uncertainty in this case, well, we can go either way really but we have to make sure there is also a known level of certainty attached to either the condition of the drywell or to the safety factor.

Secondly, should the Board take this nonrecommended route citizens should have the chance to submit a new contention after the analysis is complete because this analysis would be new information. Even AmerGen doesn't know what the results are going to be.

Finally, I think the Board needs to be clear with the staff that the staff should not allow SERs to go out without a staff being able to assign competence in the mix to the parameters that they are judging to be in compliance. This is a fundamental point. If you don't have 95 percent competence and compliance, I don't know how many acceptance criterion there are in a nuclear plant but I know there are more than 40.

On a statistical basis if we have 95

percent competence and compliance, of two-tailed distribution, that is, and then we have 40 parameters, one of those parameters would be out of compliance. We questioned for the Board whether that's enough but at minimum we should know what the competence intervals are. It's utterly inappropriate for the staff to go forward with the safety assessment when they don't know the competence intervals on the parameters that they are judging to be in compliance.

In summary, we wish we could trust NRC. We wish we could trust AmerGen. Unfortunately -- NRC staff, that is. Unfortunately, in the course of this proceeding we found we cannot trust AmerGen, we can't trust Exelon, and we have sadly lost trust in the NRC staff.

We now place our trust in you, this Board, to salvage from this sea of uncertainty some vestige of legitimacy for this agency and make it clear that the nuclear industry does not have the NRC in its pocket, that NRC is a vigorous agency that will vigorously uphold safety standards and safety requirements and will not continually slip those standards so that Oyster Creek today is a far less safe plant than Oyster Creek was 40 years ago.

What that means is the NRC now is allowing

a huge safety gap to emerge between new plants and 40-year-old plants. I know it's not this Board's position to make policy but at minimum it must ensure that the 40-year-old plants actually meet some reasonable standards of safety.

We put our trust in you, gentlemen. We know that you are very intelligent. We know that you are very inquiring. We know that you have a lot of training and we know that you have a lot of experience. We ask you to have a lot of courage. Thank you.

CHAIRMAN HAWKENS: Thank you very much, Mr. Webster.

NRC staff. Excuse me, AmerGen.

MR. POLONSKY: Thank you, Your Honor. First and fundamentally, contrary to Mr. Webster's statements, AmerGen's experts have acted professionally, in good faith, and with a high degree of technical competence, in particular Mr. Tamburro. We strongly disagree with Mr. Webster's aspersions on their integrity and rigor of analysis.

In our opening statement we described the incredible assumptions the Board would have to make in order to find that a four-year UT frequency was not adequate. Citizens' testimony over the past two days

did not make those assumptions any more credible.

In fact, Citizens' testimony confirmed that their arguments about the acceptance criterion, available margins, sources of water, performance of the epoxy coating and future corrosion rates are based either on a misunderstand of the facts or an inappropriate application of science. Let's go over each of those areas.

Acceptance criterion first. The general buckling criterion and pressure criterion really never were at issue in this proceeding and nothing over the past two days called those criteria into question. Contrary to Mr. Webster's assertion we did provide the citations which refute that there is no exceedance of the LOCA buckling criterion -- I'm sorry, the pressure criterion.

As for the LOCA criterion, LOCA buckling criterion, the current licensing basis is AmerGen's description in Applicant's Exhibit 11, namely a one-foot square center 536 surrounded by a transition of one foot to a uniform thickness of 736 mils. Dr. Har Mehta from GE has demonstrated that Citizens misread the GE analysis. That was the basis for this LOCA buckling criterion when they interpreted that criterion to be half the size.

Amergen then demonstrated that Citizens also misread AmerGen's documents when they argued that this LOCA buckling criterion has changed over time. In fact, Citizens' only expert could not address the CLB because he was unfamiliar with it. Finally, the staff concurred that the LOCA buckling criterion is part of the CLB and that it has not changed over time.

Two, available margin. As for identifying the available margin, the testimony has demonstrated that AmerGen's approach to use the average of the internal UT grid data is adequate and is the standard in the nuclear industry.

Citizens would like a different standard which would require AmerGen to use the lower 95 percent competence interval for the data. That approach we believe would actually ignore data and ignores the phenomenon that the ASME code is seeking to present, namely buckling, which is a phenomenon over large areas, not single points.

In their opening statement Citizens cited to federal courts and scientists who require each fact to be proven to a 95 percent confidence. Mr. Webster alluded to that again in his closing. Reasonable assurance, however, does not require a 95 percent confidence.

As for the bounding available margin, the Board has made it abundantly clear that AmerGen has the burden here but the record now makes clear that AmerGen's bounding available margin estimate of 64 mils in a six-by-six inch area in bay 19 is extremely conservative and that the likely available bounding margin is considerably higher.

We started with 64 mils in an area in bay 19 located in the upper sand bed region but it is now clear from Dr. Hausler that the likely future site of corrosion, if any, will be near the sand bed region floor because if there is any new water in the exterior, it would accumulate on the floor because there is no longer any sand to keep the water in contact with the higher elevation in the sand bed region. There is significantly more margin near the sand bed floor. Bay 17 trench data show more than 200 mils of available margin in this elevation.

Moreover, the contour plots -- pardon me. There has also been quite a bit of discussion over the past few days about whether the internal UT grid data are representative of the bounding conditions from the drywell shell when considering buckling.

AmerGen unequivocally demonstrated that the external UT measurements are biased thin because

(1) they were selected in 1992 to be the thinnest locations as documented in historical reports; (2) the internal grids when superimposed on external data technically demonstrate that the external points are thinner than surrounding areas; and (3) the photos and personal observations of the exterior surface visually show that they are.

Accordingly, Citizens' contour plots of the drywell shell which treat these data as randomly selected and, therefore, representative of the drywell shell, are meaningless. Moreover, the contour of other failings. They are not based on actual UT thickness measurements.

Approximately half of the points used on the bay 13 contour plot in Citizens' Exhibit 61 were manipulated by taking 1992 data and uniformly subtracting 20 mils from each point. The contour plots then extrapolate behind the known data. As Dr. Hausler stated, this is an exercise in speculation.

As for the sources of water, the testimony is now conclusive that there is no potential for water during normal operation and that only the refueling cavity when it is filled with water could be the source in the future. This cavity is only filled during refueling outages.

It is only expected to be filled during refueling outages. The time that the exterior shell, therefore, could be wet is very short, less than 30 days every two years. All parties now agree that condensation of the exterior, whether during normal operation or an outage, is not an issue.

As for the epoxy coating, Dr. Hausler lacks the experience to provide a meaningful opinion about the performance of that coating. The coating on the exterior drywell shell is located in a benign atmospheric environment. It simply cannot suffer the same untimely and rapid degradation as a coating in an oil field which is located in a submerged, pressured, and elevated temperature environment. Dr. Hausler's testimony on this issue, therefore, deserves little, if any, weight.

Finally, future corrosion, future corrosion rate for the external surface. Mr. Gordon explained why 3 mils is a reasonable annual corrosion rate assuming no coating, no sand, and the presence of water. This is based on an outage temperature of 93 degrees F and Mr. Hosterman testified that this temperature is reasonable considering temperatures in the external sand bed region during normal operations, which would be hotter, is around 109.5 degrees.

For the interior surface Mr. Gordon demonstrated why any future corrosion of that surface of the drywell shell is of no engineering concern. He also explained in his prefile testimony that the chemistry of the water in contact with the internal drywell surface that is embedded in concrete meets the NRC's goal and every guidelines for a noncorrosive environment.

Citizens provided no evidence to the contrary. Thus, there is no basis for Citizens alleged annual interior corrosion rate of 10 mils per year and, frankly there never was a basis other than an unsupported arguments that 2 mils of corrosion is going on right now and that this rate might be multiplied by five if new water reached the concrete drywell floor and somehow came into contact with the drywell shell before its pH was increased by the ever-present concrete.

Mr. Gordon logically explained in his prefile testimony that the pH of any new water would quickly become basic from its contact with the concrete. Under no scenario would this rate be sustained for an entire year. The Citizens contend when they list 10 mils it's an annual corrosion rate.

As for any rate of general corrosion on

the exterior, that remains frankly outrageously speculative. To explain, to exceed the over 200 mils of bounding margin near the base of the sandbed floor, the Board would have to conclude that greater than 50 mils per year of corrosion would need to occur during the four-year UT inspection interval.

The Board would also need to find that the coating, which is in excellent condition, would degrade and that it would do so near the floor of the sandbed region. Coating failure would have to be in an area larger than 9 square feet because anything smaller than that would be evaluated using LOCA buckling criterion which, due to the bottom of its tray of 536 allows significantly more metal to be removed before exceeding that criterion and the LOCA buckling criterion which is seven.

The water would then have to come into contact with the same large area of failed coating and remain in contact with the underlying bare metal surface for over four years without AmerGen detecting the water and taking corrective action. This is despite fact that AmerGen has committed to check the sandbed drains every three months.

There is no known source of water during operations and there is only speculation that water

could reach the sandbed region during the approximately 30-day long outages every other year. In addition, the floor of the sandbed is now sloped to facilitate drainage away from the shell.

For all these reasons there is reasonable assurance that AmerGen will be able to manage the effects of aging in the drywell shell during the period of extended operation consistent with the current licensing basis. Thank you.

CHAIRMAN HAWKENS: Thank you, Mr. Polonsky.

That concludes the presentation of the parties for this hearing. Some administrative matters I would like to address in closing. A reminder parties that propose questions will be provided the Sec'y. When the Board issues its written decision a request for Citizens. We did provide your handwritten confidential questions. If you would do us the favor of providing Ms. Wolf with a typed copy of that by Thursday, close of business. Would that be possible?

MR. WEBSTER: If I could get a copy of the questions back, Judge, that would be fine.

CHAIRMAN HAWKENS: You certainly may. As a reminder, the parties have agreed they will submit their motions for transcript corrections by October

9th. If Ms. Wolf has not done so already, she will provide you with a format.

MR. WEBSTER: Sorry, Judge. I'm sorry to say that Dr. Hausler informed me, and he had been wanting to inform the Board, that he has said that he is over-committed for the next two weeks and cannot, therefore, provide to me his transcript corrections.

I suggest that perhaps an approach might be that I could certainly provide the corrections I believe are appropriate by the deadline we had discussed previously. I think it is appropriate since it is Dr. Hausler's testimony to allow him to correct his own testimony at a later date.

CHAIRMAN HAWKENS: What date can Dr. Hausler supply his transcript corrections?

DR. HAUSLER: Monday of the third week of October. I'm committed through the 15.

CHAIRMAN HAWKENS: October 22nd? That's the date?

DR. HAUSLER: That would be fine.

CHAIRMAN HAWKENS: All right. We will have then the parties submit their motion consistent with our original understanding. On October 9th they will have the corrections agreed upon by the parties with the exception of those corrections by Dr.

Hausler.

You will provide your proposed findings of fact and conclusions of law consistent with the corrections submitted. To the extent there are further corrections, you may provide a revised draft of those proposed findings of fact and conclusions of law.

MR. WEBSTER: Sorry, Judge. I'm a little slow by the end of the day.

CHAIRMAN HAWKENS: Your proposed findings of fact and conclusions of law are due on or before October 10th.

MR. WEBSTER: I understand that. Are those going to be based on the draft transcript?

CHAIRMAN HAWKENS: Yes. Correct.

MR. WEBSTER: Okay.

CHAIRMAN HAWKENS: The party anticipates issuing its decision sometime in November. The Board does. I'm sorry. I get a little slow also this time of day. If a party wishes to challenge that decision, it must file a petition for review within 15 days of the service of that decision with the Commission.

If no petition for review is filed, if the Commission does not initiate any review action, the Board's decision is final Agency action 40 days after

its date of issuance. As a reminder to the parties, under Commission regulations you must seek Commission review as a prerequisite for seeking judicial review.

Are there any other additional matters to discuss before we close the record subject to the motions for transcript corrections?

MR. POLONSKY: Nothing for AmerGen, Your Honor.

MS. BATY: Nothing from the staff at this time.

MR. WEBSTER: Is there going to be another time? Nothing for Citizens.

CHAIRMAN HAWKENS: Thank you. Thank counsel and their witnesses for the service they provided for cooperation and the contributions to this hearing. We express our gratitude to the audience for their attendance. The record is closed subject to the motion for transcript corrections and the hearing is closed. Thank you very much.

(Whereupon, at 4:34 p.m. the hearing was adjourned.)

CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: Amergen Energy Company
Oyster Creek Hearing
Docket Number: 50-0219-LR; 06-844-01-LR
Location: Toms River, New Jersey

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

James Salandro
Official Reporter
Neal R. Gross & Co., Inc.