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WITH GPU

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

MEETING ON

TMI STEAM GENERATORS

WITH GPU

Nuclear Regulatory Commission
Room P-114
7920 Norfolk Avenue
Bethesda, Maryland

Tuesday, February 19, 1985

The meeting with GPU on TMI Steam Generators convened at 1:00 p.m., Mr. Harley Silver presiding.

PRESENT:

MARY JANE GRAHAM, GPU
BRUCE CHURCHILL, ESQ., Shaw, Pittman, Potts & Trowbridge
SCOTT GIACOBBE, GPU
STERLING WEEMS, GPU
RICHARD F. WILSON, GPU
DON K. CRONEBERGER, GPU
RALPH E. NEIDIG, JR., GPU
SHELLEY KOWKABANY, GPU
CONRAD McCRACKEN, NRC
HARLEY SILVER, NRC
BERNARD TUROULIN, NRC
FRANCIS YOUNG, NRC
JOHN STOLZ, NRC
C. Y. CHENG, NRC
B. D. LIAW, NRC
MARY WAGNER, ELD/NRC
JOSEPH GRAY, ELD/NRC
JIM VAN VLIET, NRC
HERB CONRAD, NRC
GUS LAMAS, NRC
WILLIAM JOHNSTON, NRC
J. RAJAN, NRC
O. THOMPSON, NRC

P R O C E E D I N G S

MR. SILVER: My name is Harley Silver. I am one of the project managers on TMI 1 at NRC. This meeting was essentially requested by GPU to discuss their requested change in the steam generator repair limits. That being the case, I would like to turn the meeting over to Dick Wilson who presumably will tell us of his agenda and so forth. Perhaps before we do I can introduce the NRC people who are here.

I think perhaps, Dick, you ought to do the same. I would also like to request anyone who speaks to identify himself prior to his words so that the reporter can note who who the speaker is. This is Mary Wagner, one of our attorneys. Joseph Gray. Gus Lainas, who is assistant director for operating reactors. Skip Young, resident inspector, Jim Van Vliet, the project manager for TMI 1, Conrad McCracken, B.D. Liaw, J. Rajan, Mr. Cheng. Bernard Turoulin. And in the corner is Bill Johnston. Owen Thompson next to him.

MR. STOLZ: I'm back here.

MR. WILSON: I am Dick Wilson, the technical director of GPU. Let me introduce the people here from GPU. In the back Shelley Kowkabany and Mary Jane Graham, both from your licensing department. Mr. Neidig. Sterling Weems from MPR Associates, who is a consultant to

GPU. Scott Giacobbe of GPU, who was in our materials group. Don Croneberger, who is here who is the design engineering design director. Bruce Churchill from our attorneys, Shaw, Pittman, Potts & Trowbridge. I think that is all of the GPU people.

MR. SILVER: Is there anyone who has not been identified?

(No response.)

MR. WILSON: Are we all set with the introductions?

As most of you know, we had the tech spec examination of the TMI steam generators in roughly September of 1984. We picked up a number of eddy current indications. We spent the last two or three months looking at those indications, and have come to certain conclusions about them. I think we have given you the data pertaining to those indications, but predominantly the indications are running between 20 or 30 percent through wall to about 70 percent through wall as measured on an absolute probe which measures arc length of the indications.

They are predominantly, I think 85 percent or so, a single coil, which is a maximum of about a little less than 2/10ths of an inch in the circumferential extent. Some of them were two coils. They seem to be characterized pretty much like the indications we had seen two and a half years ago, although a much, much fewer number. In evaluating what to do about the indications, we have examined the plugging criteria, and we wrote you a letter, I think on January 31 of this year, suggesting that under the tech specs that we modify the technical basis for the plugging criteria; the technical basis not being the underlying margins or performance requirements for plugging tube, but really examining the question of what the current technical specifications allow, which was up to 40 percent through wall with either an unlimited axial extent or a 360-degree circumferential extent of defect. And based upon our examination of the basis for the plugging criteria and the resultant margins between failure and design basis accidents, we think there is a sound technical operational logic for trading off through-wall extent versus circumferential extent of the defect.

It is summarized in a report which was enclosed in the January 31 letter which examined that question of mechanical serviceability of the tubes for various combinations of through-wall extent of defects vis-a-vis circumferential or axial extent. We came here today to try and discuss that, to try and answer questions about it. And since, we gather in phone conversations, there are some questions or uncertainty on the part of the Staff what the exact intent is and what we want to do, we will try and have that kind of a dialog and see where we end up.

We have a small presentation, a very brief presentation by Don Croneberger, which is nothing more than three or four viewgraphs, which kind of reviews what we think is the licensing basis of the generator and reviews in a broad sense what we have done in terms of examination and analysis. It summarizes our conclusions, which again were pretty well summarized, we thought, in the transmittal of January 31.

So we have a technical presentation. I guess from there we would like to, I guess, take that on first, and then later on, when we are either through with that or gone as far as we can, we would like to then maybe take on, try to discuss some of the ways and means by which such approval could be gotten or what it would require in the way of modification to tech specs or otherwise arrive at a conclusion.

So that is why we are here. Maybe with that, I would introduce Don Croneberger. I would assume a number of the Staff here have looked at the report. Is that a fair characterization?

MR. SILVER: The report is under review, Dick. I think that is quite right. A significant number of the people in the room have looked at it, studied it to various extent. We are not finished with that review.

MR. LIAW: Mr. Wilson mentioned something about the inspection report.

MR. SILVER: Inspection report?

MR. LIAW: Was he talking about -- the one thing I got is the package coming with January 31.

MR. WILSON: The package that came with the January 31 letter was basically the mechanical analysis of the two. The inspection report and inspection data has been made available, I am sure, to the region 1 people on the site. I thought -- Mary Jane, correct me if I am wrong, I thought --

MS. GRAHAM: The TDR that was sent in there was written by John Janiszewski and Scott Giacobbe. This came in, I think, approximately January 10.

MR. SILVER: I wasn't sure you were talking about that. That is B.D., the report that mostly deals with the cause of the current indications.

MR. WILSON: But it does summarize the type of eddy current indications and their interpretation.

MR. LIAW: In either case, current indication or the cause of it obviously would have some impact as far as the --

MR. SILVER: The document that we have in hand, perhaps you do not. I don't know. It has been distributed to mechanical branch and chemical engineering branch and so forth.

MR. CHENG: We didn't get it?

MR. SILVER: I can't say for sure whether you did or not. Herb Conrad. Connecticut PDR 645.

MS. GRAHAM: It accompanied our response to the motions to reopen our hearing.

MR. SILVER: And was submitted separately after that.

MR. CHENG: We will have to check.

MR. SILVER: Okay.

MR. CRONEBERGER: My name is Don Croneberger. Mr. Wilson mentioned the letter of January 31 which submitted the results of the mechanical analysis that was performed to establish proposed acceptance criteria for determining need for plugging a tube to take it out of service. What I propose to do is go through a very brief summary of the logic that went into that evaluation and analysis.

As far as the basic analysis and understanding of the applicable general design criteria that we attempted to satisfy in that analysis, it goes back primarily to GDCs 14, 15, and 31, with 14 being on the subject of reactor coolant pressure boundary which requires a design with a low probability of rapidly propagating or gross failure, GDC 15, which deals with the reactor coolant system design, is that which requires sufficient margin when dealing with GDC 14, and then finally GDC 31 which deals with fracture prevention of reactor coolant pressure boundary. Again, which requires that these design margins remain sufficient through the life of the components, with consideration taken on the effects of the environment and any indwelling flaws.

MR. LIAW: Why GDC 32 is not there?

MR. CRONEBERGER: The intent of putting those up was that these are the primary ones that lead into the ASME code section 3.

MR. LIAW: 32 governs the abnormal leakage.

MS. GRAHAM: We are not concerned with leakage here. Basically we are talking about less than through wall defects. And so we addressed here those which could be used in discussing whether or not you would plug something less than through wall. If it is not through wall, it won't leak.

MR. LIAW: Fundamentally, you are talking about a defense-in-depth concept, and you have leakage limit and everything else.

MR. WILSON: We are not asking for any change in leakage limit. We have now the tightest leakage limit.

MR. LIAW: What I am saying is, whatever defects or form of degradation might contribute to the frequency of normal leakage during normal operation.

MR. WILSON: A lot of things might have contributed to that frequency. We can't really address those things very well. All I can tell you is, based on the plugging criteria and what we intend to discuss, we are not talking about anything which involves leakage. We have the tightest -- I think the issue of leakage is important, because it is one of the defenses, and the kinds of defects that we see clearly are going to, if they propagate, are going to propagate through wall almost to the exclusion in my mind to radial extent of propagation. So it is important that we have the tightest leakage spec or are about to have it, I think, of any plant in the country. That may be being turned into a tech spec limit.

MR. CRONEBERGER: In addition to the leakage question, we do have the requirement for an additional eddy current test after 90 days of full power operation as being a commitment.

MS. GRAHAM: Our present limit is a 10th of a gallon a minute.

MR. WILSON: Our present limit is one gallon per minute with an obligation, if we see a 10th of a gallon per minute change over a base line, to shut down and examine and correct. So in effect, it is a 10th of a gpm.

MR. CHENG: It is not the tightest, one 10th of gpm.

MR. SILVER: Tied for first.

MR. CRONEBERGER: Again, I was going through the general design criteria, as they had a bearing on the standards which we are using to both perform the evaluation for mechanical analysis and to establish what their acceptance criteria is. With 10 CFR 50 requiring the application of the ASME codes, with section 3 rules being instituted to satisfy GDC 14 and 15 and the section 11 rules to satisfy GDC 31.

MR. LIAW: Are you saying that GDC 31 has been satisfied through section 11?

MR. CRONEBERGER: To the extent that we were performing mechanical analyses to evaluate the potential for crack extension, the rules of section 11 were used.

MR. LIAW: You used not necessarily GDC 31 is only being addressed by 31.

MR. CRONEBERGER: We used the section 11 rules to try to evaluate the protection against fracture.

MR. LIAW: You trust that you are going to tell us which section you are going to use?

MR. CRONEBERGER: I can give you the background as to what was done.

MR. LIAW: Later on?

MR. CRONEBERGER: Yes.

What I am discussing now does not represent original work which was performed as a basis for that January 31 submittal. What I am talking about now are the various analyses which have been performed most of which were geared towards establishing the adequacy of the repair program originally implemented for -- during the expansion forming of the new joints in the steam generator, the issues which have been previously litigated. As far as the section 3 fatigue analysis is concerned, the original work was done in B&W report 10146 that was dated in 1980. It represents a basic reference we continue to use.

This employed section 3 methodology. This report was conservative in that it used generic loadings which bounded all the B&W plants. From a fatigue standpoint it used a fatigue strength reduction factor of 5, which apparently was a question that was asked internally by the Staff here. And this report was both referenced by us and also referenced by the NRC in evaluating GPUN, TMI 1 and other plants.

GPUN employed section 3 calculations also in evaluating ID imperfections. Again, the analysis that was performed to support the original repair of the steam generators was conservative in that the same B&W numbers for tube loadings were used in the analysis.

Again, it used the same fatigue strength reduction factor of 5 which was employed by B&W back in 1980, and the results were consistent with that report. This was used by us to support what we called TR 008, which was the fundamental safety evaluation which was prepared in support of the original repair of the steam generators.

Again, in the context of the technical basis for the original repair of the steam generators, there was a section 11 fatigue strength evaluation which was documented in TDR 388 which is our internal technical data report. This used linear elastic fracture mechanics techniques. We had developed stress intensity solution appropriate for a thin tube. The material properties were used for the Inconel 600 actually in the steam generator. This report which was made available to the Staff was a reference in the basic safety evaluation, and we did submit this basic report back in 1983 as background information supporting our safety evaluation. The NRC did engage Brookhaven to review this report, and their evaluation is contained in the TER which was in support of new reg 1019.

MR. LIAW: Did Staff make a specific evaluation with regard to TDR 388?

MR. CRONEBERGER: Yes.

MR. LIAW: Could you tell me in what section that was referenced?

MS. GRAHAM: The Staff SER?

MR. LIAW: Yes.

MS. GRAHAM: The TER was its own attachment. I believe it was attachment 7.

MR. LIAW: I am talking about SE.

MS. GRAHAM: Your SER, that TER was an attachment to your SER supplement 1. It is not in supplement 0. It is the supplement that was published in November of that year. It was a letter sent to us, I believe the date is November 24, 1983. It sent supplement 1 and a copy of the Brookhaven TER.

MR. LIAW: Brookhaven?

MR. CRONEBERGER: Yes.

MR. LIAW: Thank you.

MR. CRONEBERGER: Again, referring to that same technical report, 388, it did include an evaluation of one-time-only loads, with governing load being the same as that addressed in that previously referenced B&W document, which was the main steam line break being the limiting accident load. B&W did develop that again, generically to bound all of their plants. It was documented in B&W report 10146. In evaluating that load for a whole spectrum of defect configurations, we had performed solid mechanics evaluation of that spectrum of defect sizes which were reported in this TDR.

Again, this portion of our analysis which was supporting the original repair basis was evaluated by the NRC in that Brookhaven TER. When we were talking about the previous application of this TER 388, the principal application was to verify the application of current detectability. We are talking about using that same methodology, the same results in establishing a repair criteria which is based on a uniform margin of safety rather than a uniform through wall reading.

What I would like to do is to simply review the results of the analysis and how we had presented these in that previous TDR 388.

Again, the action cease on this chart are extent of through-wall thickness and the arc length. And in this particular case, which is a little bit different than is shown in that TDR, I have only shown it up through 180 degrees arc length of the tube.

Again, for the entire spectrum of depth versus arc length an analysis was performed using section 3 methodology to determine for what defect dimensions section 3 fatigue rules were satisfied considering the 40 years of load cycling which the tubes would be anticipated to -- the upper bound of what the tubes would be anticipated to experience.

That is this plot here, which wasn't shown in the TDR.

Again to get some sort of a feel for the sensitivity of fatigue damage using the section 3 rules, as a function of service life, I have plotted here a line which represents the same kind of an evaluation if one were looking only at five years of service in lieu of the 40 years of service which was our basis for evaluating the adequacy of our repair program.

This line here represents again an evaluation of a spectrum of defect geometries, uniform defect depth versus defect arc length. And what was shown on this evaluation, again, was not an evaluation where a crack would grow to a critical crack size, but one which was performed to evaluate what the defect size would have to be which, if interacted with the design cycles, would propagate to through wall. And what it says here is, if I would be looking at a line which is roughly 6/10ths of an inch arc length and something like 70 percent or a little bit greater than 70 percent through wall extent, this line which was included in that little evaluation suggested such a defect during the cycling over 40 years would simply propagate to through wall, at which point the defect should be detectable via leakage.

MR. CHENG: You know the section 3 fatigue doesn't take into account environmental effect, so how are you going to factor the environmental effect in your analysis?

MR. CRONEBERGER: As I understand the rules that were used in section 3 -- in fact, I believe Bill Cooper prepared a writeup recently which he was distributing to some of the section 11 committee members, talked in terms of a correction factor which was applied to the test data which was built in originally to the section 3 rules, a factor of 20 on cycles and a factor of 2 on stress, which was intended to take into account both uncertainties from a residual stress standpoint as well as from an environment standpoint.

MR. CHENG: That was done for the size, because you are talking about the smallest measurement. The environmental effect, maybe you can say it could be covered by that. But we know from experience some of the environmental effects are considerably much greater than what you can account for by that factor. That is well known.

MR. LIAW: Procedurally, this is not the basis for licensing evaluation. Number two, let me ask you one more comment or one more question here.

The mechanism of degradation, recognizing I have not seen your report that I was asking for earlier, what was the form of degradation, what have you accounted for in this chart, the rate of degradation?

MR. CRONEBERGER: Scott Giacobbe can talk about the original form of the mechanism for the corrosion attack.

MR. LIAW: What about procedurally?

MR. WEEMS: The more accurate calculations are the fracture mechanics calculations, and these do take into account the effect of hot water on the parameters.

MR. CHENG: Temperature effect.

MR. WEEMS: Hot water.

So there is some effect due to environment, and that is accounted for by the fracture mechanics calculations. A separate issue, the code calculations do not specifically account for environment. However, the strength reduction factor that GPU has chosen to use, namely this value of 25, is -- was chosen specifically to be as conservative as they could get. That is about the maximum factor that is used in the code, and I believe that is one notch higher than the highest factor used by anybody else.

In other words, we have the more accurate calculations, the fracture mechanics calculations. And then as a further check and as a separate check with a somewhat wider approximation involved, an estimate for very conservative strength reduction factor, this is what was used in the code.

MR. LIAW: The strength reduction factor was for the fatigue. Back in 1979, at that time the mechanism was identified to be the fatigue or vibration mechanism. Not a stress and corrosion cracking.

MR. WEEMS: That was a different steam generator. Different deal.

MR. LIAW: You didn't choose a reduction of 5. I thought that was B&W did at that time.

MR. WEEMS: I understand from Mr. Croneberger that that is what B&W used. I am not as closely familiar with that report. I know that the factor of 25 is the factor that was used in all of the recent submittals by GPU for these code calculations.

MS. GRAHAM: You spoke about stress corrosion cracking. Is it -- are you asking your questions under the assumption that we have ongoing stress corrosion cracking?

MR. LIAW: Yes.

MS. GRAHAM: Because we do not. I think if Scott Giacobbe will address the questions that you asked originally, that we may be back to the question that all we are dealing with is fatigue.

MR. LIAW: What mechanism are we dealing with today?

MR. CRONEBERGER: What we are talking about today is having the presence of some defects, a mechanical analysis, an evaluation to determine the susceptibility of, for fatigue damage.

MR. LIAW: I don't understand. Somewhere or at some point in your mind you must have determined fatigue is the damaging mechanism to cause the defect.

MR. CRONEBERGER: It is simply a parameter that has to be evaluated.

MR. WILSON: He is going to talk about two or three kinds of mechanical damage of the tube. Fatigue is one. Direct tensile loading from main steam line rupture is one. It is those mechanisms we understand to be the mechanisms which would cause rupture or severance of the tube under design basis accidents and which we have to protect against. That is why he is talking about that.

MS. GRAHAM: We are attempting here to extrapolate and make predictions about future behavior of tubes that have small indwelling cracks or pits or some other kind of eddy current indication. We are not here to today to talk about what originally created the indications that were assigned in the eddy program.

MR. LIAW: You are talking about establishing new criteria which inherently has the term in there which includes the eddy current uncertainty and degradation rates. Therefore, one talks about degradation rate, you have to know what form of degradation you are talking about. You are not talking about that subject today.

MS. GRAHAM: That is because it was already closed, because we had made an earlier submittal on this back in the beginning of January in response to the motion to reopen the record. It was reviewed by the Staff and they also responded to the motion to reopen. That is the document that you haven't read which says that we found we did not have ongoing stress corrosion cracking. We don't feel we have any ongoing corrosion mechanisms.

MR. CHENG: Maybe you don't have an ongoing stress corrosion cracking problem. You used section 3, which is stress. If you read the section 3 code, they advised the owner to take into account the environmental effect.

MR. WILSON: I think we responded that we did do that by the factor of 5.

MR. CHENG: Which I am not sure is sufficient, because the strength factor of 5 was there not intended to cover environmental effect.

MR. WEEMS: The code did not intend a factor of 5 to cover environmental factors. We used that as a concern, but separately from that, we calculate with fracture mechanics and we use the data for crack growth rate that does account for the exposure to hot water. That is our calculation which covers the effect of environment.

I believe Scott can talk separately with regard to any other corrosion effects from other chemical PCs, but for the environment that this is intended, the fracture mechanics calculations cover the effect of environment.

MR. CHENG: We are not questioning the fracture mechanics. I am asking the question on fatigue. We will have more questions on the fracture mechanics.

MR. WEEMS: The fracture mechanics is one way of calculating the fatigue character of this. What Mr. Croneberger is showing is that if you continue to run the plant under the various cyclic loading that it would be exposed to, that these are the largest size defects that would not fail the tube. We have both the fracture mechanics calculations and the code fatigue calculations to support these curves.

MR. CHENG: Do you have the experimental results?

MR. WEEMS: We have the --

MR. LIAW: EADN in terms of the fracture, increase in fracture toughness.

MR. WEEMS: Not fracture toughness. Crack growth rate.

MR. LIAW: Growth is measured based on fracture toughness you have at the tip of the crack, right? It is just an intensity factor, right?

MR. WEEMS: The --

MR. LIAW: Your crack growth rate is based on -- is measured as a function of the toughness or the stress intensity factors. Fracture mechanics is a phenomenon for a stress condition. But for a thin tube like that, you have a plain stress condition. How do you reconcile that?

MR. WEEMS: We simply have in these reports -- the details that you need to go through to cover those issues, I believe, have been addressed, but they take longer than I think we could get into today.

MR. CRONEBERGER: I would like to reiterate that the data that I am talking about here and the subject for the discussion was that which was in that TDR 388 and was the subject for the review by Brookhaven.

Do you have any other references for them that might be helpful in their review of the history?

MS. GRAHAM: I think that our work is summarized briefly in topical report 8 in chapter 9, roughly pages 82 through 89. The TDR 388 then was our basis document for that.

Do you have a copy of that? Have you had a chance to look at that? A lot of our work in there of how we developed the crack growth rate and all that sort of thing is in here.

MR. WEEMS: It does consider that, yes.

MR. WILSON: One other way of getting at this is intellectually not very satisfying. Currently the tech specs allow the crack 39 or 40 percent through wall, 360 degrees circumference. We are talking about a crack of a different shape, but in terms of environmental effects and so forth, I don't know any difference between those two cracks.

MR. LIAW: That is true. I don't want to disagree with you. You continue to go through your presentation. I have -- my staff has just come back from Palm Springs this week and it was not settled on that issue. Here I guess you try to ask us to use that as a basis to approve the new piping criteria, which is up to 70 percent, in essence. If you look at this curve, nothing more than of the --

MR. WILSON: I will make the assertion, although it does not appear in this PDR, that any mechanical basis one wants to accept and use, regardless of what it is, you will find greater margins with limited circumferential extension, if you will, at 40 percent.

MR. LIAW: No disagreement there. Therefore, the remaining question is, what is the form of degradation and what is the rate of degradation.

MR. SILVER: Why don't we let Scott answer that question. I think it would be helpful.

MR. GIACOBBE: The form of degradation that we have found in this last eddy current examination clearly is the same form of degradation that we detected back in 1982. If you recall back then, we found numerous circumferential-oriented in-ground stress corrosion cracks. Along with that we found a number of other defects which we described to you as IGA islands or IGA pits. Clearly these were the small patches of intergranular attack that may or may not have had any appreciable axial or circumferential extent to them. They were small patches of IGA.

Having gone through all the plugging and removed all the cracks from service, we believe what has happened here is that as a result of going through hot functional and loading of the tubes, these very small patches of IGA which -- in a sense, you look at IGA, which is nothing more than the grain boundaries around the grains having been dissolved due to a corrosion process, you can have the grains remain intact. You just dissolve the boundaries and leave the grains. Hence this provides a very difficult signal for eddy current detection because it is such a small amount of volume lost.

We have stressed these tubes. You find that you can actually have grains drop out or you can expand the grain boundaries a little bit due to the straining of tubes, which has a significant impact on the detectability by eddy current. So what we have ended up with is we are now seeing the IGA, because we have increased the volume of it somewhat, that always existed back from the original corrosion mechanism. We have gone through, and I think Staff has gone through with us, all the long-term corrosion test programs and the corrosion testing analysis and we have gone through very stringent layup requirements and have analyzed everything that the tubes have seen since 1981, and conclude, and our data supports, that really nothing has happened from a corrosion standpoint. It is merely the remains of the attack that occurred in 1981. So we are ending up with, we are looking at a typical mechanical propagation that might be associated with these defects, because there is no longer any active corrosion mechanism going on. It is residual damage.

MR. CRONEBERGER: Would you want to explain what the original form of the attack was and why we think that fact --

MR. LIAW: You don't need to go through that. I think what you are saying there, you have two problems I have with it. Number one, your counsel just stated on the record, you don't have any form of degradation. You say you have something started, something going on there.

MS. GRAHAM: He said something happened there four years ago.

MR. LIAW: And it is gone?

MR. GIACOBBE: We have degradation, but it occurred four years ago. I had corrosive attack occurring four years ago. It left some incipient damage known, as we call it, IGA islands or pits. It is now inactive.

MR. LIAW: How do you know it is not active any more?

MR. GIACOBBE: We went through quite extensive test programs on corrosion, testing long-term exposure to environment that included sulphur, included the very same corrodent we believed was responsible for the damage. We had done periodic eddy current examination of tubes that we called ISI tubes that had no low level damage. We have looked at those and we have concluded that nothing is growing that is causing corrosion damage. There is no change in known existing indications that have gotten bigger due to corrosion damage. There is nothing from the corrosion test program. We stressed the tubes. We put sulfate in some. That did cause some damage. We put sulfate in others. We loaded them. We heated them up. Cooled them down. We pulled out C rings every month to take a look at them to see if anything was occurring to those tubes. Those are actual tubes removed from the steam generator. These were tubes we pulled.

MR. LIAW: If you have to, can we see your data?

MR. GIACOBBE: You have it. It was the TDR that you didn't get a chance to look at.

MR. CHENG: You haven't pulled any tubes since you discovered this new batch of --

MR. GIACOBBE: No.

MR. CHENG: One question I have is, how do you know? You have discovered now it is simply the old one and just manifested by eddy current testing. I can't believe that. How do you know no progression in the depth? How do you know?

MS. GRAHAM: We left a number of approximately 85, less than 40 percent, through wall indications in service. None have grown. In addition to that, we have certain information that we are familiar with --

MR. CHENG: That is also IGA, too.

MS. GRAHAM: Some of it was not.

MR. LIAW: You say none of them have grown. Based on what data?

MS. GRAHAM: Eddy current.

MR. GIACOBBE: The reproduceability of the eddy current signals from previous examinations. One of the reasons why we left those in there was to in fact give ours a base line against which we could go back and say, "I know I have an existing defect, I want to watch and see what happens to it." We did just that. We kept an eye on those indications and nothing has changed on those. We went through two hot cycles.

MR. LIAW: You don't know stress conditions, though.

MR. GIACOBBE: We stressed those pretty good. We deliberately applied cooldown stresses to those tubes.

MR. CRONEBERGER: What we were trying to do in testing that took place in September of 1983 was to try to cool down the generators to try to apply stresses on the tubes which was substantially beyond that which would be seen during a normal cooldown. We attempted a normal cooldown and saw, as I remember, a delta T, tube to shell, on the order of 30 to 35 degrees.

We wanted to see if we couldn't cool it down at far more substantial delta Ts. We wound up to achieve that cooling down using EFW, emergency feed water, and did achieve delta T during those cooldowns of 110 degrees or thereabouts. We deliberately put the generators through as significant a cooldown as we had the capability of doing.

MR. JOHNSTON: Let me ask a question in a slightly different way. Let's assume for the moment that the degradation has stopped before you ran the test you just described, your eddy current test couldn't find it because the volume was too small. After you ran this heat-up experiment and cooldown, you are now able to detect them because you opened some grain boundaries up and you lost some grains and stuff like that. Now you can detect them. So you went from practically a zero indication or something in the grass to a 70 percent or whatever you have got; you essentially had a step function.

I think you are making the assumption that you have found all of it. Forgetting the argument about whether you are making any more or not, how can you know that you have found all that there is? All you did is find some fraction of what was already there because you enhanced its presence?

MR. WILSON: I have to agree with you 100 percent. The only thing that you do know is what you see with eddy current. What you don't see, you don't know, but I don't know if the TMI generators are any different than any other generators in that regard.

MR. LIAW: I wouldn't say that.

MR. WILSON: How do you know what is there when you can't see it?

MR. JOHNSTON: It is difficult for you to take the position that there can't be any more of it.

MR. WILSON: No.

MR. JOHNSTON: You are asking us to make a judgment that says, "Hey, your calculations, which are based upon what you presently have seen, are going to be valid for what you might find after the next cycle."

MR. WILSON: We are not suggesting there isn't anything there that we can't see. For all I know, there probably is. There probably is for other generators. But what you are asking us to define is almost like asking somebody, "Why don't you have cancer? You don't have any symptoms, how come you don't have it?"

MR. JOHNSTON: We have seen the symptoms.

MR. WILSON: All we can see in terms of symptoms is what we see when we eddy current the steam generator.

MR. LIAW: More than that. You go to the lab and look at it.

MR. WILSON: We have done that.

MR. LIAW: Not this time.

MR. WILSON: We have before. We have looked extensively.

MR. LIAW: You didn't have a symptom then.

MR. WILSON: If you do have that extension, you again look at the percent of through wall; and what you are going to do is if it does propagate, you would pick it up on leakage.

MR. LIAW: If you don't penetrate, you don't see the leakage.

MR. WILSON: You are making the argument it is going to penetrate?

MR. LIAW: How could I say that?

MR. WILSON: I am lost.

MR. JOHNSTON: The point that I was trying to make is that the calculations that you make, assuming single isolated 2/10ths of an inch-long defects, if there are indeed single isolated 2/10ths of an inch-long defects that never get close to one another, your stuff will hold up. But we have the possibility that we have to be considered that there are a bunch of them that are still in there which we cannot detect very well. We don't know what the density of the pits are. We have got an idea now. There is possibly a higher density of pits. We don't know how close they are and how much real load-carrying capability there is at the present time until there is a little bit more experience.

That is where I think it makes it difficult for us to simply buy a set of curves that says, yes, if they stay separate, everything is okay. It is probably true. But we have no way of knowing whether they are going to stay separate.

MR. WILSON: Then how can you buy what is currently in the tech specs?

MR. JOHNSTON: The tech specs say any time you can find 40 percent, fix it.

MR. WILSON: It doesn't say there isn't something there you can't see.

MR. JOHNSTON: Of course.

MR. WILSON: What we are saying is those margins are greater than what is currently in the tech specs, whether they are there or not. It can be there under the current definition of the tech spec. It can be there now. That argument hasn't changed.

MR. JOHNSTON: But the ordinary basis of the tech specs is a relatively well-defined system in which you think from the basis of your examination you have a pretty good idea of what the extent of the corrosion is, what the mechanism is. What the density of the pits are, if you like. What the length of the crack is. This kind of stuff. I guess my point is, we don't really have some of that kind of information in this instance because it is of such a nature that it is more difficult to do the eddy current testing because of the volumetric setup of some of this material.

MR. WILSON: The current eddy current testing, it is roughly 170 times as sensitive as what was being done for the plant under the tech specs. I don't know how we conclude that. What we know from that testing is less uncertain than what we knew before.

MS. GRAHAM: I think it is important to recognize that in TR 008 we presented what we found to be the threshold detectability of the eddy current probe, that we always recognized, both us and the Staff, that there was a size of defect, any number of which we would be unable to detect. And these curves that we are now seeing up here were used to support justification of that threshold of detectability.

The indications that we are seeing now, at least 95 percent of them, fall right along that line. They are things which we would not have expected to see in the past but now we are seeing, kind of leading us to believe that what we are seeing is this approved threshold of detectability moving downwards.

So ow our actual threshold is lower. So what we are really proposing here is to say, in the past you agreed we didn't even have to look for these indications; that the eddy current program we had was able to see enough. Because our eddy current program is better for this type of indication, we are now finding things we didn't even have to look for. Now we would prefer not to take those tubes out of service.

MR. CRONEBERGER: Maybe just to reinforce that point a little bit, the major eddy current testing was done prior to the expansion repair on the joints. We did on a selected number of tubes perform eddy current testing after the Connecticut expansion of the joints. We have, as a result of the new findings, gone back to that post-Connecticut expansion test data and we see something now; and in fact, where the NDE people were shown where to expect an indication, have been able to go back to the old tapes and identify low amplitude signals, basically in the background noise, which have the same phase angle as that we are finding today.

MR. WILSON: I think one thing about the eddy current exam that I would like to give you some feeling for, in terms of the voltage change, when we went sometime before to what it was now, is very, very trivial. It is still just in the 1- to 2-volt range, and 1 volt is kind of like the mud. So it is really people looking still at the mud or something that just pokes its head out of the mud, and then they go back and examine that in detail and conclude it is a defect. There are not, except for things we have plugged, which were just a few, voltage signals up in the 6, 7, 8-volt kind of range.

MR. JOHNSTON: Isn't that, what you are saying, is it not that either the defect was there and you are saying you can see some detection of it and it was at its current depth, whatever it was, 40 percent plus, and it didn't grow, but it has got such a -- because of the nature of the crack in there, the pit, you can't see it very well, that is part of our problem? Or you are put in a position of saying the thing was really small and it has grown in the last couple of cycles? I tend to agree with you, that is not the case. You are put in the position of saying the signal was very small and we could hardly see it. Otherwise, you have got to say it was already big but you couldn't see it.

MR. WILSON: The signal was small and we could hardly see it. The signal today --

MR. JOHNSTON: But the crack was still there. The pit was as big as it is now.

MR. WILSON: That is right. With no void.

MS. GRAHAM: Our threshold of detectability always acknowledged that there were, that for a short enough arc length we wouldn't be able to see 100 percent through-wall indication. And so we would expect to find a whole range between 40 and 100 percent with decreasing arc lengths that we would not have been able to see in the past. That is what we believe we are seeing now.

You might remember this from our past presentations. This is a continually recurring slide. It is in TR 008, figure 9-2. It talks about where our threshold of detectability was. That line just continues straight across through 100 percent through-wall.

MR. LIAW: We are talking about degradation from inside?

MR. WILSON: Yes.

MR. LIAW: Refresh my memory. I was not here at that time. What was the mechanism?

MR. WILSON: The original mechanism which caused leakage of the generator four years ago was a sulphur-induced intergranular stress corrosion crack.

MR. LIAW: Not because of the tube expansion?

MR. WILSON: No. We did the expansion as the repair of the failure.

MR. LIAW: How does that relate to the area of transition?

MR. CHENG: He is asking the location of the current indication, between the 15 and --

MR. WILSON: The original corrosion problem was high up in the tube sheet, but some of them went clear down to 15, 16. The transition of the original expansion, lots of defects there.

MR. CRONEBERGER: Originally we had an inch mechanical role and a substantial number of the indications were in the transition on that mechanical role. Now with the Connecticut expansion, we have either a 17- or 22-inch joint rather than the inch or inch-and-a-quarter joint that we had before. To my -- so we are not looking for any defects within the joint. To my knowledge, we don't have a preponderance of defects in the new transition zone.

MR. GIACOBBE: There is none to my knowledge. They are all below the upper tube sheet or at the upper tube sheet.

MR. CHENG: Earlier, when you did Connecticut expansion, there is a free zone. How many inches free zone?

MR. GIACOBBE: Six inches.

MR. CHENG: Did you see any change this time after that?

MR. WILSON: No.

MR. CHENG: I would expect this is before --

MS. GRAHAM: There is no consequences anyway, because it is not possible. Even if you have a complete severance there, there is nowhere for the leakage to go. The flow would be shown.

MR. WILSON: And secondly, the sensitivity in the tube sheet is way, way less than in the free span.

MR. CHENG: So you probably wouldn't detect it. Why only see it in just free span?

MR. MC CRACKEN: I don't doubt that there is some pitting up in the tube sheet.

MR. YOUNG: From an operational point of view, previous cycles, do you expect to see more indications as time goes on, or do you foresee what that what you have now is going to be a bounding amount of indications with less indications, or will it continue?

MR. WILSON: I think the answer to that is clearly speculation. But I would speculate that if you run the plant for some period of time, you would probably see a few more.

MR. LIAW: That is where I have difficulty. I am thinking, once the plant goes into operation, what kind of regular degradation may continue? He is saying, he is speculating, may have some but cannot quantify it. He expects few.

MS. GRAHAM: We expect some to become visible.

MR. GIACOBBE: You have to remember that there are --

MR. LIAW: Let's don't draw the line.

MR. WILSON: That is the whole issue.

MR. LIAW: My boss is correcting me. Either physical or detectable. We don't know. Because I don't think science is that precise in terms of detection and when the thing started. Agreed?

MR. WILSON: I don't think you can get a guarantee on anything. We can't give you a guarantee nor can anybody else.

MR. LIAW: Therefore, my concern is, when one is talking about some percent out of 36 million, how much more you have left there? You have something going down because of uncertainty or something that we don't anticipate at the moment, that can, very, very fast.

MR. WILSON: So it goes. You cover it by leakage in the generator.

MR. LIAW: Number 2 involved, though. Number 2 involved. If you talk about something that --

MR. WILSON: Whether it is one tube or 6000 tubes, you are covered by a leakage spec which says a 10th of a gpm.

MR. LIAW: In the chapter 15 analysis the steam generator tube licensing basis one tube rupture.

MS. GRAHAM: Are you postulating some unspecified failure mechanism occurring in the future?

MR. WILSON: The rupture of the tube, which is the licensing basis, as I understand it, has to do with a defective tube which they didn't have, principally a main steam line break which presses the tube and causes rupture.

MR. LIAW: You have a defective tube here.

MS. GRAHAM: I am an engineer.

MR. WILSON: Let's talk about the way a plant is licensed. It is based upon having a tube with some defect in it which then, if the plant sees a main steam line break, ends up in rapid depressurizing and cooling and tensile loading the tube, because the tube is cooled faster than shell, you stretch the tube and you rupture it. Then you get a double-ended tube rupture. That's the licensing basis for the plant.

All this work he is describing to you here is that same kind of mechanical analysis looking at rupture of the tube with defects. And the curve showed that with 70 percent through wall, up to 45 degree arc length or whatever it is, 2/10ths of an inch or something, the safety margin for that design basis accident is greater than currently allowed in the tech specs. That is what it shows.

MR. LIAW: What you are asking us to approve is redefine what are the defective tubes? What "defective" means?

MR. SILVER: Yes, that's right.

MR. LAINAS: What did you just say about margins, that the margins are more now?

MR. WILSON: The margins which resulted from loading applied by main steam line break with the defective tube. Currently the tech spec is based upon a defective tube, 39 percent or 40 percent through wall, 360 degree arc length. You get a main steam line break and you stretch it. That has some margin in it. What we are suggesting here as a modification of that is for things of lesser circumferential extent, specifically 2/10ths of an inch or whatever it is, and 70 percent through wall. That margin due to tensile loading from the same dent is greater than what is currently allowed by the tech specs. I think that is irrefutable.

MR. LIAW: You know what happens in the pipe crack. They are saying they can measure the length of crack so well, therefore they can realize that part of strength.

MR. LAINAS: I can't see how I have increased margin.

MS. GRAHAM: We have increased -- we have a greater margin over the licensed margin. The licensed margin is that margin associated with the largest defect allowed in service under the current criteria. The largest defect allowed in service right now is something that is 40 percent through wall and all the way around. And because of the cross section of metal that is left there and everything else, there is a certain license margin associated with that. For a smaller defect than that, you have a greater margin than that. What we are looking at is changing the criteria so we maintain the licensed margin throughout, rather than using an arbitrary value for through wall.

MR. CRONEBERGER: Again, looking at it in pieces, what we have shown here is a curve which is the proposed plugging criteria. What I have here, again, is the curve which is the old curve that we had submitted back in '83, I think it was, which are the defect sizes, depth and arc length, which would be our prediction as to the limiting size: Bigger than that would fail during the main steam line break, at least using the generic B&W numbers. So you see that up here, this line which is 360 degrees, our evaluation suggests that the criteria may be a tad unconservative.

But if we looked at the more typical 180-degree defect as let's say an upper bound, which is right in here, just a shade under 1 inch, you will find the margin between the plugging criteria and the main steam line break line. You will find that as you proceed down this curve here, you always have at least that margin between the plugging criteria and the prediction of the critical defect for main steam line break. Then you wind up having -- that is one-time loading only, that we are trying to maintain the same margin that the criteria would have permitted if I go no more than 180 degrees. If I go higher than that, we would suggest there is no margin in the existing tech spec.

If I look at the fatigue damage as evaluated by ASME section 3, again, using the 40 percent plugging criteria, I see that I have about 10 percent of the wall thickness as margin.

MR. LAINAS: If the current tech spec would be a vertical line, straight down, it seems to me that that gives you more margin than what you are proposing now?

MR. WILSON: Absolutely not.

MS. GRAHAM: It gives you more margin for an individual defect. If you hypothesize a defect at 70 percent through wall with a short arc length, certainly you are decreasing its real margin, but you are not decreasing it beyond the licensed margin associated with a licenseable tube.

MR. CRONEBERGER: I think in terms --

MR. MC CRACKEN: At 40 percent --

MR. LAINAS: You are keeping the factor the same, but in fact the margin is decreasing?

MR. WILSON: No, sir.

MR. LIAW: It has decreased?

MR. WILSON: No, sir.

MR. SILVER: For a particular crack it will have decreased.

MR. LIAW: The actual margin has decreased.

MR. LAINAS: The actual capability of that tube is decreased?

MR. LIAW: No question about it.

MR. LAINAS: That is the question.

MR. CRONEBERGER: It is either --

MR. MC CRACKEN: Use some numbers. If you have a tube with a 40-degree circumferential defect, 360, that tube, say, fails at a tensile pressure of 6000 pounds --

MR. SILVER: You meant 40 percent --

MR. MC CRACKEN: 40 percent through wall, 360 degrees. It fails at 6000 pounds. If you take a tube beside it which has a 70 percent through-wall defect but only covering 2/10ths of an inch, the other, the remainder of the 360 degrees is still intact; that tube has more metal remaining than about the one that had the 40 percent through-wall defect. Therefore, it will take more pressure to pull that tube apart. That tube will not come apart at 6000 pounds. It will come apart at some amount higher than 6000 pounds. So the margin to tube rupture --

MR. JOHNSTON: You don't allow for any cutting to take place?

MR. MC CRACKEN: You are assuming it is going to have a hole in it.

MR. JOHNSTON: You just said it did.

MR. MC CRACKEN: That tube with the 70 percent through-wall indication with smaller arc length has more margin to tube-rupture than did the one at 40 percent, 360 circumferential.

MR. LAINAS: Suppose I had a through wall of 40 percent with only a 20 percent arc length. By previous methods, would that have come out of service? Let's make it higher than 40 percent. 42 percent. Would that come out of service?

MR. MC CRACKEN: Yes.

MR. LAINAS: Well, the older criteria is more stringent.

MS. GRAHAM: That wasn't the limiting indication.

MR. MC CRACKEN: The criteria is not 40 percent.

MR. CHENG: 360 degree, you cannot make a comparison.

MR. LAINAS: In the higher range, there is no change?

MR. MC CRACKEN: No.

MR. LAINAS: I will talk to you later.

MR. WILSON: The minimum margin we are allowed to operate in this generator, and it is the design basis and licensing basis for the generator, is a crack of 360 degrees circumference and 40 percent through wall. Whatever that margin is is allowable and is licensed on it, as is every B&W plant and probably every other plant in the country.

MR. LAINAS: If you give credit to the detectability of your systems to be able to detect these kinds of different arc lengths.

MR. WILSON: And we have demonstrated that and to my knowledge that has been accepted by the Staff.

MR. GRAY: This is Gray. Would you today, under today's tech specs, plug a tube which which has 50 percent through wall indications but only 2/10ths of an inch arc length?

MR. WILSON: Under the current tech specs without analysis and acceptance of something otherwise by the Staff, we would have to plug that defect.

MR. LIAW: On the proposed criterion, they would not have to plug.

MR. CRONEBERGER: I would submit for the example cited, I do not believe we or anyone else would have seen that defect. I don't think we would have seen a 2-degree arc defect by eddy current.

MR. LIAW: In fact, in early days, when Staff reviewed the Westinghouse, the basic assumption was the tube was uniform thin down to 13 or 22 mils. That was analyzed for the whole spectrum of loading. So what you are saying is that the licensing basis has not been -- it is not quite a true statement.

MR. WILSON: I thought you just said -- I don't know what Westinghouse does. Presumably you talked about a 360-degree arc neck down.

MR. LIAW: Not neck down. Whole thing down.

MR. WILSON: However you wanted to describe it. But a 360-degree kind of thing or whatever. That is right.

MR. LIAW: Because of the more sensitive eddy current that you are able to detect any degradation distribution around the circumference.

MR. WILSON: It is important.

MR. LIAW: You can take credit for that. But even that, I still don't believe you can manage it that close with what you are proposing there.

MR. CRONEBERGER: Please understand, on the application which I believe was discussed in the TDR, we have arc lengths shown here which are what the analyst used. But the actual arc length was ascertained by the use of an 8 by 1 absolute probe. So all you really know in your inspection is that on that 8 by 1 absolute probe, I have seen it on one coil or I have seen it on two coils or whatever the number of coils are, and the actual application of this criteria is such that if in fact I see it in one coil, arbitrarily it said that in fact that represents a 45-degree arc length defect. So that you don't really play around down here in the hash, your smallest defect is an eighth of just approximately two inches, which is really down --

MR. WILSON: Where that curve breaks, the proposed plugging is two coils.

MR. CRONEBERGER: So all you know is the number of coils that you have seen on the probe, which is either one coil, two coils or typically three coils which is up here.

MR. WILSON: And there is no uncertainty in that on eddy current. That is absolutely factual. It actually has been demonstrated. We have submitted the results to the Staff. As far as I know, the Staff and your experts at Oak Ridge and elsewhere agree with it.

MR. LIAW: I agree, and I believe all experts in the world can agree with you. The question is more fundamental. With thin tube like this, the fundamental crack propagation behavior is what you think is a leak before break. That is why I asked you earlier why you did not address GDC 32.

MR. WILSON: I thought we were talking about rupture under design basis accident.

MR. LIAW: You talked about leak before break here.

MR. WILSON: I would also maintain that if the crack even propagated that one coil, for example, and propagated clear over to 100 percent through wall, it would leak. We would shut down and fix it.

MS. GRAHAM: If you wanted to look at the evaluation that was done of our work on that, that is also in that Brookhaven TER.

MR. LIAW: Excuse me. I think I will. You don't have to remind me. I think fundamentally you have some problem there. Staff made a mistake, in my judgment. The fatigue crack growth rate is tested as a function of the stress intensity factor. With thin tube, you fundamentally have a stress condition. Therefore, this theory doesn't work.

MR. WILSON: You give me any theory you want us to use, we will accept any theory whatsoever or any safety factor; I believe the minimum margin will calculate at 360 degrees, 40 percent through wall, which is the design basis of the generator. You pick the theory, you pick the margin, you pick anything you want. That is where it will come out. I haven't proven that, but I believe it.

MR. LIAW: That stress criteria is nothing more than a guide.

MR. RAJAN: On that ASME section 3 code, that seems to bend up backwards. Is that a sketch --

MR. CRONEBERGER: That is really what the analysis resulted in.

MR. WEEMS: As you look at different size cracks, you get more and less effects due to bending of the tube. As the crack goes 360, you get less effects due to bending. So you calculate a higher allowable crack size.

MR. CRONEBERGER: If you think in terms of the geometric center line of the undamaged tube, that is the defect size. The actual centroid shifts. Sterling is saying that if I have got 360-degree defect, the centroid is the old center line of the tube.

MR. LIAW: Is that it or just simply a second biaxial state of stress starting to play? Basically you have something like the failure criteria like that, going like that.

MR. CRONEBERGER: I thought what you were trying to say was the difference between the center line of the tube and the geometric centroid of the damaged tube.

MR. WEEMS: As the main load is the steam line break load, this is very high load and tension on the tube. If you have a crack only on one side of the tube, and you pull on the tube, the tube tends to displace laterally a little bit and you do get some bending stresses. So as you assume a larger and larger crack in the analysis, approaching 360 degrees, then you begin to get less bending. So the effects of bending wind up, as they decrease, then you can show a higher allowable penetration for that larger arc length of the crack.

MR. SILVER: I think we are kind of wandering off the intended subject. Perhaps, Don, if you would finish your presentation.

MR. CRONEBERGER: I will do a summary of the license margin. Again the present maximum wall allowed by the tech spec is a 40 percent through wall. Indeed can be applied to 360 degrees circumferential extent. In this TDR we propose a repair criteria which is based upon the allowable percent through wall extent permitted, depending on what the circumferential extent of the defect is. The margin of the calculated curves is either greater than or equal to that for a 40 percent through wall 360 circumferential indication. So what we have been trying to say graphically in the preceding curve is that whether one looks at fatigue or whether one looks at the one-time access loading, the new criteria in no case contains a margin which is less than the minimum margin permitted by the original tech spec.

MR. SILVER: Let me make a suggestion. Since there are some people here who are not desperately interested in the technical review, perhaps we should get on to the procedural aspects of this thing. We can get back to the technical discussion later, if that is appropriate.

MR. WILSON: I think that is a good idea.

MR. CHURCHILL: Procedurally, the tech spec has language that is different than any of the other tech spec provisions in that it says right in it that the repair limit is 40 percent or such other limit as the Staff agrees on or reviews and approves.

MR. SILVER: That is not 100 percent true. It is generally true.

MR. CHURCHILL: I was referring to the other provisions of our tech specs. Generally you don't see that language tacked onto the end of it.

I wasn't aware of whether other similar tech specs had that language. What we have done there is we have written you a letter and said if you agree with us technically that the proposed repair criteria makes sense, we think legally it does not require a tech spec amendment. And literally by the words of the tech spec, it doesn't.

I am not sure what the Staff's position is on that, but if you read the language of the tech spec, we feel pretty clearly, procedurally it is not a problem. But we do need your approval. Obviously we are submitting our analysis. We need your approval in order for us to go to them. But that approval does not have to be in the form of a tech spec amendment. Consequently, we would not have to go through the normal procedural rigamarole and the time-consuming process that that might require. But we do need your technical evaluation and approval.

MR. LAINAS: You said you need our approval. If I wanted to get real specific on that, you don't really need approval, you want the approval. You are requesting it, from your point of view?

MR. CHURCHILL: You mean whether or not if we plug these tubes we would be up against a limit, is that your question?

MR. LAINAS: Suppose we took no action on it.

MR. CHURCHILL: If you took no action, we would have to plug any tubes with a defect exceeding 40 percent. That is specified in here.

Let me just read you the provision exactly. It is paragraph 4.19.4 A 6. I will read the last sentence.

"This limit is equal to 40 percent of the nominal tube wall thickness unless higher limits are shown to be acceptable by analysis and approved by the NRC."

So when I say we need it, in order for us not to plug these tubes we do need your approval. I am not suggesting that your approval is any less or any more than it would be if we needed a tech spec change. Not at all. It has to be technically analyzed by us and by you with the same kind of approval. It just doesn't technically require a tech spec change. I think it solves a lot of problems and saves a lot of trouble.

MR. SILVER: Your determination, then, is based entirely on the words themselves in the tech spec and the comparison with the rest of the tech spec or the uniqueness of this particular one?

MR. CHURCHILL: Well, logically I guess that is right. I mean the language is there. It doesn't appear elsewhere and it seems to make a certain amount of sense.

MR. JOHNSTON: How are you planning to handle this?

MR. SILVER: I think certainly --

MR. LAINAS: Let me say that first of all, we haven't come to a position yet to be able to give to you. The purpose of this meeting was just to get your views or to have your views clarified from your January 31 letter. So we are not prepared to give you a decision today.

MR. WILSON: Didn't expect you to.

MR. JOHNSTON: I had a question. I am interested in intent which to me is as important as the words. I am just wondering if in your search you have found any particular reason why we might have for two B&W type plants written anything in their tech specs that put it in the tech specs unless the higher limits are shown to be acceptable. That is a general procedure that we would have for any plant, whether it was B&W or whoever, any utility could come in and propose a change in the tech specs if they, if it is shown to be acceptable by analysis and approved by the NRC. So functionally, it doesn't sound any different than what I would think we would do with anybody that wanted to have their tech spec changed. The only difference is that is there any particular reason anybody can discover why it happened to be written into these particular tech specs at this particular location? Do you have any basis for figuring out why it happened.

MR. CHURCHILL: Yes. We did go back and look at that and I think Mary Jane has an answer to that. It had to do with the give and take in the discussions that were going on at the time that the operating license was issued and the tech specs were finalized and whether or not 40 percent was even appropriate for B&W tubes as opposed to some higher limit which was our position at that time.
Is that correct?

MS. GRAHAM: Yes. If you look at the date associated with our tech specs, it is summer of 1978. At that time there was nothing available with the Staff or really anyone else on a plugging limit for B&W plants. The B&W report that discusses compliance with reg guides is the BAW 10146 that we cite in Don's presentation. The the date of that report is 1980. And discussing with the people who are involved with the licensing of TMI in 1978 and with the people involved in Metropolitan Edison management that to the best of their recollection, Metropolitan Edison's position then was that there was no technical basis for imposing a Westinghouse limit of 40 percent through wall on B&W plants and that bar go such a technical basis, we didn't wanted to have that be our respect.

When we reached the point that we were going to startup and that this was a hard place, that this specification had not been resolved, we accepted a compromise position that in the interim we would accept 40 percent through wall, provided this clause was put into the tech spec that would allow incorporation of what was appropriate for B&W plants at a later date.

MR. WILSON: Let me try and clarify one thing. You said when you started out, tech specs of 1978.

MS. GRAHAM: 1978 is when we received the tech spec.

MR. WILSON: But the plant went in operation in 1974.

MR. CHURCHILL: Then I misspoke.

MR. GRAY: That was going to be my question. You may be thinking of TMI 2 which might have been about the time that this kind of a tech spec would have been discussed for that plant.

MR. WILSON: I am a little bit confused about the dates.

MS. GRAHAM: I don't know. I just got the summary in from other people. Whatever, there was some kind of a deadline that was reached. I was told that it was that.

MR. CROKEBERGER: I think I have got a copy of the extract of the pages that have this information. It is discussed in amendment -- the last change is amendment number 47. That amendment was issued 12/22/78. So there obviously were tech specs in place before that time. The only information on that page of the tech specs --

MR. SILVER: Not correct. There were no tech specs on the subject prior to that time.

MR. JOHNSTON: This was an amendment that imposed the tech specs as far as steam generators.

MR. SILVER: I have found a submittal of GPU's, dated November 12, 1976 which is the first time that I see the wording in the -- in your proposal. This is two years before the actual implementation of or promulgation of the tech spec.

MR. LAINAS: Was there a 40 percent in there before that? When did the 40 percent come up?

MR. SILVER: I think the whole business did not exist prior to amendment 47.

The initial --

MS. GRAHAM: There was approximately a four year discussion period with a lot of correspondence going forth.

MR. SILVER: With the industry in general. And your tech spec change requests 43, dated November 12, did include that language.

MS. GRAHAM: That was based on a letter you sent us in the summer.

MR. SILVER: I understand.

MS. GRAHAM: About that specific language. That was one of the things that was called out in the letter. And I don't have a copy with me.

MR. JOHNSTON: This sounds to me like it says we agreed to negotiate further as to what the tech spec would read without settling it and what we are doing now is negotiating what the tech spec ought to be. It sounds to me like it involves a change of the tech spec then.

MR. SILVER: I have the letter you are talking about. I don't see a specific reference to that.

MS. GRAHAM: You have an attached SER that talks about it.

MR. STOLZ: How would you propose to document and enforce the criteria will that you are proposing if it isn't in the tech spec?

MR. GRAY: Let me just pointed out one thing. That language, we can all read it in that tech spec, unless higher limits are shown to be acceptable by analysis and approved by the NRC, but what you are proposing are different limits for all tubes, most steam generators, for all time. What happens to that tech spec? What happens to that 40 percent limit in there? It becomes meaningless basically.

MR. CHURCHILL: It is superseded by the authorization letter for the new repair limit.

MR. SILVER: So you wind up with a tech spec without without the correct reference, the correct criteria or any reference in the tech spec itself to new criteria.

MR. CHURCHILL: That doesn't really matter because the licensing basis against which you would be inspected by OI is set out right in the program and easily checked. That is not really a problem.

MR. SILVER: I&E, you mean. One step at a time.

MR. CHURCHILL: Madam reporter, you made a transcription error there. I think it is just superceded by the authorization.

MR. WILSON: I don't know whether it is a correct analogy or not. I am uncertain. But the way I think we are examined or held to things which are not in the tech spec, like bulletins or things of that nature, are not necessarily reflected in tech specs.

MR. SILVER: But are there such things that are different from tech specs, that may be in addition to but are they different from?

MR. WILSON: I suspect for periods of time they are. I can't cite an example but I would be amazed if one could not find such an example.

MR. YOUNG: I can not show you any examples where we have come out against tech specs but we have added to interpretation of things in there that we enforce that came out of tech specs. Like the IFC program is not well defined in tech specs. But we do hold the licensees very accountable to his IST program and his ISI program. If the licensee does not follow that program, we have cited against the IST program.

You inspect against any and every commitment we make in writing.

MR. YOUNG: We can do that, yes.

MR. GRAY: I think you inspect against their following, implementing written procedures which are not in your license but are required to be generated and implemented by your license. I have seen citations for that sort of thing. I am not sure that that is either here nor there.

MR. LIAW: I think IST and ISI may not be an appropriate example. Because those items are required in the regulation.

MR. YOUNG: Hopefully this meeting, if you do allow them to do something, there will be a definitive criteria that the licensee will commit to. That is the Staff's responsibility to insure that there is a criteria that we can go out and hold the licensee accountable to.

MR. CHURCHILL: That is what we intend.

MR. WILSON: That is is that curve on the independent of this document. That would be figure 4.

MR. YOUNG: I would like to ask a question how we interpret the time approved by the NRC. My impression of that is the Commission, not the Staff.

MR. GRAY: I don't know -- it doesn't say the Staff. I don't know where really you get that interpretation.

MR. YOUNG: From the way we have interpreted things before when we have gone to the Commission for their approval.

MR. SILVER: I missed the front part of it part of it.

MR. YOUNG: How do we interpret the term "NRC"?

MR. SILVER: You mean as opposed to Staff?

MR. JOHNSTON: The period in which it was generated.

MR. GRAY: You will take a license amendment.

MR. JOHNSTON: Right, the original proof text, do a literary analysis.

MR. CHURCHILL: We weren't negotiating with

Seaborg at the time.

Joe, do you really have a problem with this, because we are not asking for any kind of relief as far as how you analyze this or approve it or anything like that. I am just trying to cut through some read tape which I think is unnecessary. It seems that the language would clearly let us do that?

MR. LAINAS: I think I can give you generally that for other plants that have this kind of tech spec that we have followed the amendment procedure. They have provided it by amendment. And you point out that there is at least a couple of plants that have this phraseology. The question that has to be answered is, what was the intent of this phraseology. You are looking it it from your point of view. But I am not sure that the interest tent was that it wouldn't be treated as an amendment.

MR. CHURCHILL: But does it matter?

MR. LAINAS: Legally it matters.

MR. CHURCHILL: Why. Because legally this language will hold up. Legally it says what it says. It is pretty plain.

MR. GRAY: Well, true enough except to the extent that you may be proposing to change the licensing basis generally. We think we can make some good arguements that this language wasn't intended to permit that.

MR. WILSON: We are not asking, to my knowledge, for any change whatsoever in the licensing basis of the plant.

MR. SILVER: I think that is a point worth repeating, I think you have said that certainly the 40 percent is not considered in itself to be the licensing basis. The factor of safety is -- margin to rupture -- is inch indeed the licensing basis. Your contention is that your current approach provides at least the same margin or a factor of safety so that you are not --

MR. LAINAS: As the minimum margin.

MR. SILVER: As the licensing base.

MR. LAINAS: As the minimum margin.

MR. WILSON: There is no minimum.

MR. LAINAS: You said it before.

MR. WILSON: No, sir.

MS. GRAHAM: The licensed margin is the minimum margin.

MR. LAINAS: But you have taken a selective set of conditions, 40 percent, 360 degrees.

MR. WILSON: That is what is allowed in the tech specs.

MR. LAINAS: That is right. That is the minimum margin that is allowed in the tech spec.

MS. GRAHAM: That is the minimum absolute margin and therefore it is equal to the license margin. We are not can look to go change the license margin.

MR. LIAW: I don't think you are talking about the same thing here. I think rules for Point Beach, Point Beach one day had a problem with IGA of thickness through sheet. They were plugging every indication. We did not force them to do it. But they proposed that and Staff accepted, to plug at every indication. When one has questions on the ability to quantify the eddy current signals --

MR. WILSON: You keep saying that.

MR. LIAW: You cannot quantify. Somebody was saying something about this absolute minimum.

MR. WILSON: I think what we have done eddy current wise, I don't know for a fact but maybe somebody else here does is totally than what Point Beach did. I think allotted of things have happened since 72 or 3 or 4 or 78 when Point Beach did it. One, the eddy currents examination technology is substantially improved. Like I said, we are examining the generators now with a sensitivity exceeding 100 times what we could have and were doing under the tech specs. If we examined under the technique which the plant used for the first five years, a third to half of these things, we wouldn't even see. We wouldn't even be here discussing them.

So I don't think it is fair to argue that because one does a better, more definitive eddy current examination, you should necessarily not take that into account in setting repair limits. The more facts you know about what you have got, it seems to me the more precise you can be about repair plugging limits. If you couldn't see anything, I would agree with you. Don't worry about it. But I think there is no question that we have definition now which was just not available five years ago.

MR. JOHNSTON: I would like to come back to the intent. I don't know, if I heard it, if what we have in here was a product of a compromise because we wanted to impose a 40 percent limit and you folks didn't wish to receive such a number, and it was simply put in there as an essentially a statement to leave it open for further discussion, you know, subject to agreement and acceptability of analysis, I don't see where there was anything in here that would suggest that we would procedurally do anything different. We were going to negotiate possibly a new number. But if we accept it and approve it, wouldn't the presumption be that the tech specs would be changed then to reflect that new number? Isn't that what you would wish to have happen? That is how I would read it? You really left it open for further negotiates. But once the negotiations are done, you treat it like you treat any other change which would be a regular change to the tech specs.

MR. CHURCHILL: As far as our preference as to whether that 40 percent -- assuming that the new repair criteria were in, our preference on whether that 40 percent sentence remained in there, we wouldn't care one way or another.

MR. JOHNSTON: Sure you would. You would say, let's get the tech specs changed and have it reach 70.

MR. CHURCHILL: It doesn't matter to us as long as we are allowed to do it. We don't care whether it is a letter in the file or whether the tech spec is actually amended.

MR. WILSON: We would be inspected against what we submit and prove by the Staff. I don't know -- would you inspect against something else.

MR. YOUNG: Unless there were a conflict.

MR. CHURCHILL: I think that the real issue here, the real important issue here is whether what we are proposing is acceptable, whether or not you call it a tech spec change or not,. If it was technically acceptable, I think it would be a shame and and unnecessary waste of time and regulatory resources to have to go through to the tech spec procedure if it wasn't necessary.

The key issue which requires more review obviously based on the discussion here is whether or not you find this an acceptable proposal. There is one aspect of it that we didn't touch on. I don't think I can but I would like to ask somebody here to. That is, we are assuming that the conservative thing and the best thing to do when you have a tube in belt is to plug it. I am not sure that is true. I think there are some pros and cons if you are looking at an overall safety picture whether whether or not you should go and have a knee jerk reaction to plugging a tube that you think is suspect. I think there are some disadvantages to plugging. You were talking about other types of margins.

MR. WILSON: I think there are two or three or four down sides to that we see. One is, obviously, as you plugs tubes you remove them from service and the generator capability is less. This has to do with this operation of the plant. Secondly the generators are the prime heat removal device under accident conditions. They are it fundamentally, first past through. The more tubes you plug, the lower that margin becomes.

Third thirdly, we have to put people in the generator to plug these tubes. If it is unnecessary, we are accumulating man-rem on people. We have accumulated already in the generators 1600 man-rem. We are not too keen about just running people people through the exercise of picking up radiation. Fourthly we think it is advantageous to leave these kinds of defects in service simply from a diagnostic point of view because we are shutting down already or I guess to be issued under a license amendment 90 or 120 days after restart for a complete reexamination of the generator and these tubes would be part of that inch service inspection. And you get, you get further insight as to exactly what this is and I think confirmation of what we said. So there are down sides to just randomly and unnecessarily plugging the general generator. We don't think sit a good practice.

MR. LAINAS: Following your criteria, how many less number of tubes do I have to plug?

MR. WILSON: Roughly 2200.

MR. SILVER: What is the total number? The number I think has changed since your --

MR. WILSON: The total number of plugged now --

MR. SILVER: The total number that exceed 40 percent?

MR. WILSON: I think it is about 300.

MR. CRONEBERGER: My recollection was it was about 300. Right now we have 90 in An and 10 in B we would plug using this criteria. I believe the number was something like 50 in B and the other 250 or 260 in A.

MR. WILSON: It was about 300 tubes having some measurable greater than 40 percent eddy current indication, which under the old criteria, you would plug them all, under this criteria you would plug approximately 100, plug and or stabilize.

MR. LAINAS: Right now, using your criteria, how many have you plugged in A and how many in B?

MR. CRONEBERGER: 90 in A, 10 in B. That is in this go around.

MR. LAINAS: How many would you expect to plug if this was given approval.

MR. WILSON: 90 in A and about 10 in B.

MR. YOUNG: Basically the licensee has completed plugging tubes that they would plug under the new criteria. What remains to be done is the tubes that fall under the new criteria that would be allowed to remain in service that have indications greater than 40 percent. There is approximately 240 to 250 tubes in that group.

MR. WILSON: I don't remember the exact number -- it is most in A.

MS. GRAHAM: It is approximately 75 or more in B and the rest of the additional ones are in A.

MR. LAINAS: Like 225 in A?

MS. GRAHAM: Approximately.

MR. WILSON: No, that is too many tubes.

MR. LAINAS: Would you take 200. About 200? Something like that. That is not quite important.

What I guess I am trying to do is get a feel. We have made some points here about we don't want to plug more than we have to for any number of reasons which you pointed out. This gives me sorted after feel.

On a general basis, do you have any idea -- I think there was a total of more than 1100 that are plugged --

MR. CRONEBERGER: Originally the plugging was approximately 1200. The 900 in A and 300 in B.

MR. LAINAS: So now you are close to 1500, I think total?

MR. WILSON: We are close to about 1300 total plus the roughly 200 that this criteria would exempt from plugging.

MR. LAINAS: If you used your criteria, do you have any idea how many tubes you wouldn't have had to plug?

MR. WILSON: I don't think we have examined that.

MR. LAINAS: The significance of this criteria I guess is --

MR. WILSON: If we had used this criteria two years ago or three years ago, what would the number have been?

MR. CRONEBERGER: I don't know the answer to that.

MR. WILSON: I don't think we know.

MR. JOHNSTON: How close are you getting to your, say your ECCS number? How many more tubes could be plugged before you began to run into the ECCS problems?

MR. WILSON: We have analyzed for 1500 informally 1500 -- is that total or per generator?

MS. GRAHAM: That was total.

MR. WILSON: But informally we have analyzed 3,000 with 3/4 of that in any one generator. So we haven't submitted that to you, but it is a number like that.

MR. JOHNSTON: So only about a third of that?

MR. WILSON: About half in generator A.

MR. SILVER: You have a map of the, perhaps we have this on the tubes that have been plugged so far, but I don't recall seeing it, a map of the tubes that have been plugged and of the tubes, the 300 tubes that we are now discussing. I guess I am trying to get a feel for how many -- are there conglomerations of tubes? We think they are pretty uniformly spread around the outer circumference of the generator without any particular angular dependence and into 15 rows deep.

MR. CRONEBERGER: We had defined 15 rows deep as the periphery. There were in A, a few scattered defective tubes inside that periphery. The great majority of them were out of that periphery. If there was a bias, it was a bias towards the outer rows. There wasn't any bias as to what the -- conversely in B the only defective tubes we found were in that outer periphery.

MR. SILVER: Are these fairly uniformly distributed?

MR. WILSON: No angular dependence.

MR. CHENG: Do you have the breakdown of 250 tubes you are talking about here, how many tubes are in which range, 61 to 70, how many -- something like that?

MR. WILSON: We have it but not the details here. Almost all of them are one coil in circumferential extent and they verify 40 percent through wall to 70 percent with with the preponderance, I think 40 to 55 percent.

MR. CHENG: Majority in 40 to 55 percent.

MR. CRONEBERGER: Yes.

MR. CHENG: Mostly you are talking about one to two coil.

MR. CRONEBERGER: Yes.

MS. GRAHAM: As far as I know we only had one three coil indication in the entire inspection.

MR. JOHNSTON: Are we ready to started talking about some other stuff?

MR. LAINAS: I would like to pursue the legal aspects. I notice that you made a statement that there is no change in the licensing basis. I guess implicit in your submittal that is true. But I notice that you didn't reference -- I don't have my code of federal regulations here, but you didn't reference any -- there is a section there on tech specs where it defines LCOs and it defines limiting conditions of operation. You didn't refer to that and give a basis as to why this particular change is not needed. There were words which I don't remember exactly on LCO or requirement for an LCO. Maybe I am going beyond my expertise here. Again, I am just looking from a legal point of view to have some common understanding here as to whether it meets the regulation or it does not meet the regulation.

MR. CHURCHILL: Our argument is really very simple. It is the wording of the tech spec. I don't know of any requirements anywhere else that would suggest that that is not enough.

MR. LAINAS: Like I say, there are certain definite issues. There are certain definitions for an LCO in the regulations.

MR. CHURCHILL: 50.36.

MR. GRAY: But it doesn't help very much. It says licenses shall have technical specifications in addition to the operation. It says it will have them which defines the --

MR. LAINAS: What goes into an LCO?

MR. GRAY: In the most general terms. I don't believe so. We have looked at these in the past.

MR. SILVER: I don't hear any other discussion on this. I am not sure whether we haven't exhausted it.

MR. CHURCHILL: One other point. Maybe this is silly. Was there ever a question of whether these plugs could be removed later. My understand go is that while they are designed to be removable plugs, they are not designed to be removable plugs for the purpose of putting a tube back in service. So if we plug an extra 200 plugs, as far as I know right now, that means those tubes are gone.

MR. LIAW: I have refrained myself from asking making technical comments but since you are a lawyer, let me respond to what you say.

If we sit down and discuss technical question across the table right now, we will probably tell you, as you say, put it in plugs now until next reviewing cycle when you have your contractor ready to -- I would not see much objection from the technical Staff to let you do that. So you satisfy concern both for Staff and for yourself. Try to save those tubes. And our position is that actually we have taken with record to arc saw one, same generator like yourself,. We were satisfied with the results. Why don't you consider that instead of coming here arguing about 70 percent or funny looking charts.

MR. WILSON: I would answer that in a number of ways.

MR. LIAW: Let me continue.

MR. WILSON: You don't want an answer?

MR. LIAW: We have been exchanging information from some major B&W company. The trend seems to go the way that you repair it rather than correct it particularly in your generator, I understand my colleague, Mr. McCracken, told me that once you plug a tube you tend to tend to create a place where moisture rises up to a super hot region.

It seems to me to make more sense that to take corrective action earlier and plug it, leave it, and one shot. Have you ever considered that?

MR. WILSON: Do you wanted me to talk now?

MR. LIAW: Yes.

MR. WILSON: Let me go back and philosophize just for a minute though. One of the things that I think licensees in general have been criticized very heavily by the Commission is I don't expect anybody to take responsibility for you. You ought to do what is right. We have heard that time and time again from everybody on the Staff and the Commission. I think it is a correct thing to do. We think we have an obligation to analyze what we have got, to look at it, to come to a technically, operationally and safety sound conclusion and to propose it. That is what we have done. We think it is technical sound.

In the long term, as we look down stream, you are indeed correct. We may wanted to shift when we think there is an acceptable sleeving process I am not sure we believe that there is one now. It is experimental, as I understand it, in arc saw. It is a leak limiting sleeve. It is not a leak tight sleeve. So I think as every operator of a PWR looks down towards its license life, they are all asking themselves, what is going to happen, what are we going to go get into and where are we going to go, all the way up until steam generator replacement. Some people have already been driven to that point. We are examining that as well as everybody. But those things are very traumatic. They are very, very expensive in man-rem. They are very, very expensive in other ways. There is no certainty that they are permanent repairs. We would like, you know, to do technically and operationally and safety what is sound as we go and recognize that we may get to exactly what you said.

MR. LIAW: You talk about philosophy. What Commission said against you as operator, just like Aurora, I always heard this argument about the as the basis for not doing anything or not inspecting anything. I have never seen anybody come in here saying I am trying to do something so I can save man-rem.

MR. WILSON: I want to correct you on that, we do try to save man-rem.

MR. LIAW: We have been reviewing this for years. A steam generator, I personally have been involved on this issue since 1975. There always seems to be the type argument used for not doing anything.

MR. WILSON: I just take absolute exception to that.

MR. LIAW: You are entitled to your opinion. Please also understand that I am entitled to mine.

MR. WILSON: I think you are, but in our repair work and what we do inside a radiation areas, we work to minimize exposure to our personnel.

MR. LIAW: On the repair, for example, I just saw Robinson number. They completed a job, estimates something like a 2270 man-rem. They complete at something 1070. Point Beach unit 1, even less than that. How many man-rem have you spent to repair the thing.

MR. WILSON: I told you about 1600.

I don't know what Robinson is doing or anybody else.

MR. LIAW: Don't tell me that. Industry have certain disease going down and you are not aware of what is going on in the whole industry.

MR. WILSON: I don't know if we have the same disease Robinson has.

MR. LIAW: Robinson was simply replacement of steam generators.

MR. WILSON: We are not replacing steam generators.

MR. LIAW: You say replacement of steam generator is costly in terms of dollars and in terms of man-rem. You say something is 1700. I am saying Robinson only spent 1070. Point Beach unit 1 less than that. Five years ago Turkey Point spent 50 or something.

MR. WILSON: And if we had to replace ours I am sure we would spend a 1000 or 1500 also. But we sure wouldn't like to. And we sure wouldn't want to spend 3,000 instead of 1000.

MR. SILVER: I think there is no point to continue this.

MR. LIAW: I know that. But talking about philosophy.

MR. SILVER: Is there any other discussion on the -- I forgot what we were talking about. -- on the question of license amendment or no?

MR. GRAY: Do I understand that -- I understand your point about desiring not to unnecessarily plug tubes and desire to save whatever it is that you save, whether it be dose commitments or money or margin, thermal margin in some other area, that sort of thing. If on the other hand you were required for the time being to abide by the present tech spec limits, if, for example, the NRC approval were not forthcoming to your proposal, were not forthcoming any time soon, what sorted of situation would you be in with regard to your plant right now? Could you plug without --

MR. WILSON: You mean the 200 tubes. The answer is yes. But we don't believe it is a prudent, it is an operationally sound or a safety sound position to take.

MR. SILVER: The reasons are the ones that you spoke before about the down sides of --

MR. WILSON: Sure. You remove heat transfer capability from the generator. And while it still meets the margin design basis, you are removing them.

MR. LAINAS: What brought this whole thing is the improvement.

MR. WILSON: Sure. We have an insight from ECT today which I guess if we were smart enough we even would have applied to some degree two years ago. But clearly we have it now and clearly we think it is prudent to apply it.

MR. JOHNSTON: What information do you have on the record with your inspection of the density. You mentioned the length of them. How many of these indications per square inch or per circumference or something like that do you have that kind after breakdown of the way you present the information?

MR. WILSON: I think we do.

MR. SILVER: Within a tube, you mean?

MR. JOHNSTON: Yes, within a given tube, what is the density of these things.

MR. WILSON: I think there is only one indication per tube. Some of those are --

MR. GIACOBBE: Some tubes have multi many indications. They may have two indications. They may have four indications. The majority have one. None of them would be considered clusterable, if you will, if that is what you are trying to get at. We looked at that specifically. I think done may even have some details. That was an issue we looked at, whether or not one should try to cluster defects. The analysis of that said, no, they were sufficiently removed analytically they would be treated as separate indications. So density wise, for the few numbers of minimum defects, you can assume that below the upper tube sheet, in the tube sheet region, that is essentially a different phenomena from the stand pointed of damage, we expanded all that and have taken that portion of the tube out. But below the upper tube sheet, the density is fairly low, on the order of maybe more like one per foot or something, if you wanted to even consider from the top of the tube sheet down to the 15 tube support plate.

MS. GRAHAM: We did in our plugging criteria, you might see the section where we talk about treating defects within I think it is a one-inch area as being an cluster. I looked at that data on Friday. There were approximately 11 tubes that were treated that way. What the data tended to show is you would have a 55 percent indication, three quarters of an inch away, totally unrelated you would have a 20 percent indication. What they would do is add up all the coils and treat them for plugging purposes. But for analytical purposes, clearly the two are unrelated and far enough a part not to be a problem.

MR. JOHNSTON: Is that in the submittal that you have provided us for review so that we can look at that aspect of it?

MS. GRAHAM: It is in Scott's report.

MR. LAINAS: Is that TDR 638. Is that the submittal that we have?

MS. GRAHAM: In 645 I believe they talk about clustering defects for purposes of plugging. I think that the data on what we have seen hasn't been finalized yet. I would expect that to be part of the submittal to close out this LER. But that hasn't come in yet.

MR. JOHNSTON: In terms of generating a list of things that we might need to have or wanted to have as part of our review, I would say that would be an important element that we don't yet have.

MR. SILVER: Fine.

We would intend to continue our review, this is not by way of shutting off the other discussion, but we would intend to continued our review and I expect we will have questions for you probably within a month, probably not sooner than that or not much sooner than that in any event. And as bill indicated, this would be probably be one of the questions.

MR. WILSON: To the extent you could give us those on the phone or otherwise, we could be putting that together right now and it would save a lot of time.

MR. SILVER: Well, you may have gotten an inkling of some others. You have one at least.

MR. LIAW: I think I could highlight areas, if you want it.

MR. SILVER: Let's finish the tech spec change or no discussion first. Are we done with that?

MR. LAINAS: What is the general schedule. Do you have a general schedul^? We can tell you when we can have additional questions et cetera.

MR. WILSON: For what?

MR. LAINAS: When do you need this?

MR. WILSON: Wnether is the commissioning go to lift the restart order?

MR. JOHNSTON: Do you wanted it before or after?

MR. WILSON: Roughly about the same time. Preferably a few days ahead of time.

MR. CHURCHILL: It is obviously tied to that because if we did have to plug more tubes, we would want time to do it without having to delay what might ordinarily otherwise be a restart.

MR. WILSON: We could plug the tubes in the same time it takes the plant to go ready to go.

MR. SILVER: So that there would be no lost time in effect?

MR. YOUNG: Are you still planning on working towards a 3/1 hot functional testing.

MR. WILSON: It is my understanding, our licensing people reminded me today, it is my understanding that we have general capability of going hot, at least we had it, of going hot on pump heat before but we did so under the basis that we declared the generators nominally operable in some way. I am not sure how it was done. I am not sure that not having plugged the 200 plugs, the 200 tubes we haven't plugged still qualifies under that. We would hope so and.

MR. WILSON: Like to take the plant hot on pump heat to run further tests.

MR. YOUNG: Our interpretation is the generators are not operable at this time unless you plug the tubes. That is from I&E's point of view.

MR. WILSON: I am not sure what happened before in terms of the Connecticut expansion because I don't think the Commission has ever said they are acceptable either.

MR. YOUNG: Now that you have new indication that have indications greater than 40 percent, by the definition of operability of the generators, if you do not take the tubes out of service then the generator is considered not operable. That is the reason.

MR. LAINAS: You are in for an approval.

MR. CHURCHILL: That does that mean we couldn't do hot functional.

MR. WILSON: He is saying we would have to get an understanding to do the hot functional test.

MR. SILVER: Barring some other agreement or something.

MR. WILSON: The question I was raising was not arguing what he said but the issue about we were allowed to go hot after Connecticut expansion. I am not sure the tech specs have been clarified yet totally on that being necessary to be approved before we declare the generators operable.

MS. GRAHAM: They gave us a tech spec change in order to be able to do that. What they did is they issued the original tech spec requesting the steam generators in parts so that they basically authorized Connecticut expansion as a repair and as a means of taking things greater than 40 percent through wall out of service only for purposes of hot functional testing.

MR. WILSON: We might then ask for that same thing to allow us to go to hot functional testing.

MR. CHURCHILL: Is that a safety problem?

MR. WILSON: No.

MR. CHURCHILL: On your other question, I don't know whether we are resolving that today. Are we going to go talk later?

MR. GRAY: I don't think my --

MR. SILVER: I think we

MR. GRAY: I think my talking to you would be helpful.

MR. SILVER: Feel free.

MR. GRAY: I have nothing to add.

MR. SILVER: I think we would probably want to reconsider -- I shouldn't say "reconsider," but consider our position and I think we could let you know very shortly as to where we feel the proper way to come down on this is.

MR. WILSON: In the meantime, any technical issues we would like to get a hold of as soon as we can.

MR. SILVER: We can do that.

Maybe it is time for a five-minute break.

MR. WILSON: We have a flight.

(Recess.)

MR. SILVER: Could I have your attention, please. Apparently I misunderstood the time demands of our visitors and they do have a plane at 5:00, which pretty much means they have to leave now. What I propose to do is to get a preliminary punchlist of questions or problems that that our reviewers have and discuss this verbally with the licensee as soon as we can and a formal list as quickly as we can. As I indicated, sometime between two weeks and a month. And thank you all for coming.

(Whereupon, at 3:35 p.m., the meeting was concluded.)

CERTIFICATE OF OFFICIAL REPORTER

This is to certify that the attached proceedings before the UNITED STATES NUCLEAR REGULATORY COMMISSION in the matter of:

NAME OF PROCEEDING: MEETING ON TMI STEAM GENERATORS WITH GPU

DOCKET NO.:

PLACE: BETHESDA, MARYLAND

DATE: TUESDAY, FEBRUARY 19, 1985

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission.

(sigt) Rebecca E. Eyster/sg

(TYPED)

REBECCA E. EYSTER

Official Reporter

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