UNITED STATES OF AMERICA

248TH GENERAL MEETING OF THE

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

Thursday, December 4, 1980

1717 H Street, N.W.,

Washington, D.C.

The meeting came to order, pursuant to notice, at 8:30 a.m., where were present:

ACRS MEMBERS PRESENT:

MR. MILTON PLESSET, CHAIRMAN
MR. J. CARSON MARK
MR. CHESTER P. SIESS
MR. STEPHEN LAWROSKI
MR. MYER BENDER
MR. DADE W. MOELLER
MR. WILLIAM KERR
MR. MAX W. CARBON
MR. WILLIAM W. MATHIS
MR. HAROLD ETHERINGTON
MR. DAVID WARD
MR. J. C. EBERSOLE
MR. PAUL SHEWMON
MR. DAVID OKRENT

DESIGNATED FEDERAL EMPLOYEE:
MR. Raymond FRALEY

8012090098

T

P R O C E E D I N G S

MR. PLESSET: The meeting will now come to order.

This is the 248th meeting of the Advisory Committee on Reactor Safeguards. During today's meeting, the committee will meet with the NRC staff and Metropolitan Edison Company to discuss matters relating to the restart of Three Mile Island Unit 1. It will discuss an proposed interim ACRS report to NRC regarding new safety concepts for future nuclear plant designs. Also it will discuss the status of generic items applicable to light water reactors and hear NRC subcommittee reports on safety-related matters.

On Friday the committee will hear reports on and discuss waste management and disposal activities; recent operating experience, particularly the October 17th incident at Indian Point 2, during which a large quantity of service water was released into the containment; meet with the NRC chairman and Commissioners regarding containers for shipment of radioactive materials; the proposed NRC long-range research program; and general design criteria for LMFBRs. And then we will have a discussion with Vepco and the NRC staff regarding the operation of North Anna Nuclear Power Station Unit 2.

On Saturday the committee will discuss the proposed ACRS report on BWR hydraulic SCRAM systems, Three

Mile Island Nuclear Station Unit 1, NRC waste procedures, and new safety concepts for future nuclear plant designs.

The meeting is being held in accordance with the provisions of the Federal Advisory Committee Act and the Government in the Sunshine Act. Mr. Fraley is the designated federal employee for the meeting.

It may be necessary for the committee to hold one or more closed sessions for the purpose of exploring matters involving proprietary information.

A transcript of portions of the meeting is being kept, and it is requested that each speaker identify himself or herself and speak with sufficient clarity and volume that he or she can be readily heard.

We have not received any written statements or requests to make oral statements from members of the public regarding today's session.

The first item on today's schedule is a report by the chairman, and I will now make that report. And it will be very brief; I have nothing particularly interesting to report.

You may have noted, however, an interim report from the president of the oversight committee of which you all received copies of this morning, and you might want to look at that. I can make a comment on it, but I will refrain from doing so. We have a rather lengthy session.

Mr. Fraley wants to make a comment.

MR. FRALEY: As you know, at each meeting we try to mention to you any honors received by ACRS members last month. And Dr. Plesset was invited to and did present the Robert Henry Thurston Lecture to the AMSE meeting, and this is an opportunity for a leader in science and engineering, in pure and applied science, to present to the Society stimulating thinking on some subject of broad technical interest to engineering. Unfortunately, we don't have the benefit of those stimulating comments, but we have Dr. Plesset here. I am sure he will contribute to the discussion during this meeting.

Congratulations.

MR. PLESSET: I didn't expect this kind of accolade -- not "accolade," I would say.

(Laughter.)

MR. PLESSET: What resulted [illegible] I [illegible]ot a piece of metal which I put in my bag, and this [illegible]ause[illegible] [illegible] to be held up. It showed up on the X-ray scan, a[illegible] [illegible] [illegible]ad to take it all apart. That was the biggest fallout from that.

(Laughter.)

MR. PLESSET: We are going to consider this morning the report of the ACRS subcommittee on Three Mile Island Nuclear Station Unit 1. I would like to call on Dave Moeller, chairman of that subcommittee, to take over, please.

Dave, would you do that?

MR. MOELLER: The TMI-1 subcommittee met to review the current status of this nuclear power plant on Friday, November 28th, and Saturday, November 29, 1980. Previously, a subcommittee meeting on the same review had been held in Middletown, Pennsylvania, on January 31 and February 1 of 1980, at that time, with Harold Etherington as chairman. Attending the subcommittee meeting just last week were Bill Kerr and Jerry Ray, members of the ACRS, plus the following consultants: J. Buck, I. Catton, M. Keyserling, W. Lipinski, and Z. Zudans. Drs. Buck and Keyserling are human-factors experts, and I am sure the members of the committee are thoroughly familiar with the areas of expertise of the other consultants that I have mentioned.

A summary of the major findings and conclusions during the subcommittee meeting, plus the schedule for today's meeting this morning, review of the situation, these things are included as loose handouts. And also in your notebook is a letter on the TMI-1 plant from Mr. Marvin Lewis, a member of the public. And then, in addition, a notice you have just been handed, a letter from GPU to the NRC chairman, dated December 1, 1980, again applying to the restart of the Three Mile Island Unit 1 facility.

A detailed NRC staff summary of the status of various licensing actions pertaining to TMI-1 is given in the report NUREG-0680, which, in essence, is the SER for this plant. For purposes of restart, TMI-1 is being treated by the NRC as an NTOL, and we reviewed it at our subcommittee meeting with that approach in mind. At the time of our meeting and because the SER was written last June, the NRC staff did not have an up-to-date list of outstanding or unresolved issues. They have promised to be able to present such a list to us today.

The licensee, however, did present such a list at the subcommittee meeting. According to him there are nine items outstanding. And of these, three are in the process of resolution, with six remaining to be discussed further. The six unresolved issues were as follows, those that were mentioned by the licensee: first, the financial status of the company; second, what the QC list termed was the "sensitivity of the differential pressure transmitter for indicating the pressure of the valves of the PORV on the pressurizer;" fourth was the RC pump services during reactor building isolation, particularly to assure that only the right things were isolated and that central service was not; five, the pressure vessel water level indicator six was the reactor pressure vessel thermoshock.

One of the major impressions that I received from the subcommittee meeting was significant way in which the licensee has turned the Met Ed group around. The organization is presented to us, and, indeed, the individual representatives and spokesmen for the licensee showed that they are strongly safety-oriented. They are not only addressing the key issues raised by the NRC, but in some cases they are giving -- in most cases, they are giving them independent reviews in-house and, in some cases, they are setting stricter standards for themsleves than those required by the NRC.

Examples of what I mean by the "turnaround" include the following: first, the quality of the key upper echelon personnel who have been brought into major leadership positions within the organization; second, the setup they have for reviewing LERs and keeping up to date on operating experience within the industry; third is the in-depth CERL training program that they have established for their operators and associated plant personnel; fourth is their applications of computer technology that they have developed to help the operator know exactly what is the plant status following a trip or during a transient.

This includes CRT display in color. And to quote several of our consultants who are familiar with this area, they said it was "better than what is being done at LOFT." And one consultant even used the word that it is "magnificent."

At the end of the first day, we itemized those problem areas we thought would be of interest to the full committee. And these issues then, at the end of the first day of our subcommittee meeting were: One, the status of the open issues, particularly to get the NRC staff to give their list. Secondly, the managerial and staffing changes that the licensee has implemented; we thought you should hear about that. Thirdly, the training program they have established. And fourth, we thought you should hear something about the applications of human factors that they have considered in the redesign of the TMI control room.

We have asked the staff under the first item I mentioned, in addition to citing the open issues, to give us a detailed listing of the various supplements to the SER that are in process, the subjects to be covered in each, and the target dates for publication of each of these.

I might mention, too, that FEMA is reviewing the emergency plan for the facility, and they will be issuing a report which, although coming from another federal agency, will in many ways simply for us be a supplement to the SER. We will need to look at it and see what they have said. Of course, the staff will do the same.

Following the second day of our subcommittee meeting, we again polled the consultants and ACRS members present to find out again what the key issues were which should be brought to the attention of the full committee.

Those items were as follows: first, the RPV thermal fracture mechanics; secondly, operating experience, including the feedback of LERs; and the ties of the licensee to NSAC and INPO; thirdly, the reactor diagnostics again to have you hear about the CRT displays of plant transient conditions; and fourth, the consequences of DC power failure. Jesse, we asked them specifically to address that today.

Five was the explanation of the treatment of the pressurizer heaters. What I mean there is the licensee stated in one place that these are not necessary for safe reactor operation, and yet in another place they go into extensive deliberations on how they will assure emergency power to the pressurizer heaters. That seemed a little twisted. One battling the other, in a sense.

These comments probably could be addressed as well to the staff, but they treated the heaters in a major way but they never talk about the sprays. And we felt that maybe the sprays were as important as the heaters in certain situations. So we have asked them to look into that today or to tell us about it today.

The subcommittee did hold a closed session on security. We are hoping to handle this area so that it would not have to be covered again by the full committee. And as a result, not formal presentation is scheduled today on security, plant security. But obviously, if you have questions, they are ready to respond to them.

Other questions that should be mentioned include: One, there has been some confusion relative to which questions or issues are being applied or raised relative to TMI-1, which of these are unique to that plant and which are generic. And that is not always easy to keep clear in your mind, and I think both -- well, the licensee has clearly pointed this out and the staff has acknowledged it.

Secondly, which requirements are strictly restart items versus which should be completed by a certain date. This is analogous to my first item. For example, can TMI-1 always simply meet the target dates enumerated for other plants, or must they have the changes completed prior to restart even if the date for implementation on other plants is after the proposed date for the restart of TMI-1. As I say, we hope to get some clarification on that today.

In response to comments that Dr. Okrent had made, we asked several questions, and I will tell you the questions and the answers we received. Number one, "What is the licensee doing relative to degraded core cooling? Are they looking at filtered vented containment and so forth?" The answer is: "No. They have done nothing on this up to the present time."

Secondly, "Should TMI-1 be evaluated relative to high population density similar to the approach used by the staff for Limerick and Zion and Indian Point?" The staff said the population at TMI, the density, was a factor of three less than that for these other plants and that they have not gone into such a review for TMI-1.

Thirdly, "What is the relationship of TMI-1 relative to IREP?" And the answer to that was that TMI-1 has not been selected for this type of review. Crystal River was the first plant selected for this review; and that, they said, was a research effort. The next phase will include four more plants, including one B&W plant, but not including TMI-1.

Fourth -- this is not a question that Dr. Okrent asked but it is one that I thought you would be interested in. The current plans on TMI-1 do not call for the reactor pressure vessel head to be removed prior to restart. Therefore, the reactor could come back on line without the fuel that will have sat there for roughly two years by the time they restart, having been closely examined. The licensee has indicated, however, that they have been very careful in maintaining the water primary coolant water chemistry and that they do not think this is a major point.

Number five, compliance with Reg Guide 1.97. We attempted to go into that in detail, but we found there is confusion here due to the status of revisions of Reg Guide

1.97, particularly the letter which the committee wrote on the subject last month. They did enumerate 12 areas of current disagreement with Reg Guide 1.97, and these are enumerated in the summary of the subcommitee meeting, prepared by Richard Major, which was a loose handout in your notebook.

The sixth, although not from our list, there was much discussion about mixing of hydrogen within the containment, whether such mixing can be assured following venting through the pressurizer or through the new remotely operated valves that will be on the top of the candy canes and perhaps through the RPV vents following an accident.

There was a question about whether the way in which the gas would be released into containment would enhance mixing or whether it would let it pocket in localized higher concentrations. Several of our consultants discussed the fact that the upper dome, upper portion of the dome of the containment seemed or could be viewed as an area in which little mixing would take place and might present problems.

Today what we are going to do is go through the items that I have mentioned that the consultants and subcommittee thought were worthy of your attention. I would say that my concept of today's meeting is that it is a progress report. I am hoping that after the committee has heard this progress report, that they will be willing to discuss what they consider to be the issues, and that we might prepare a written report to the NRC chairman, presenting the status as we see it of the restart of TMI-1.

I believe such a report would be very helpful to both the licensee and to the staff. It would not be a sign-off; it would simply be an enumeration of what we consider to be the major points and where they should place their efforts.

At the subcommittee meeting, as I mentioned, both Mr. Kerr and Mr. Ray -- who is not here -- both of them were at the subcommittee meeting. So, Mr. Chairman, I would like to call on Mr. Kerr for comments, and then I would also like to ask Harold Etherington if there are any items that he wanted to mention from his subcommittee meeting earlier this year.

Mr. Kerr.

MR KERR: I have no additional comments, Mr. Chairman.

MR. MOELLER: Then Mr. Etherington.

MR. ETHERINGTON: The previous subcommittee meeting was held about 10 months ago, and Dr. Moeller's report supersedes and updates, I think, everything that was discussed at that meeting. So I have nothing to add.

MR. MOELLER: Thank you.

Then, Mr. Chairman, I have two -- let me ask are there questions and comments from members of the committee on it? Dr. Okrent?

DR. OKRENT: You indicated that this is an interim review. When do you anticipate that the staff and the utility would be ready to come in to the committee for what they would hope would be a final review by the committee? And what do you see are the matters that remain between now and then?

MR. MOELLER: The licensee stated at the subcommittee meeting that they were hoping, you know, to have the committee write a final sign-off letter on the plant for restart. What I am saying here is these are my opinions, and those that I believe are supported by the subcommittee members, that this at best could be a progress report. The schedule date given to us by the licensee for restart of the plant was, as I recall, August of 1981.

I think what we need -- we will need certainly another subcommittee meeting, in my opinion, to review, as you said, whatever these essential issues are before we can wrap the thing up, if indeed we do. I believe personally that we need the supplements to the SER which are in progress. We need to have those in hand to see them, to read them and digest them. We also need to hear today and perhaps subsequently from the staff what they consider to be the current status of the plant, what are the remaining issues to be resolved. We did not obtain that information from the staff at the subcommittee meeting.

I think the major issues will be the list that I mentioned at the end of the first day and at the end of the second day that we enumerated because we were wanting to bring to the attention -- not in every case -- but we wanted to bring to the attention of the full committee those issues that we considered to be perhaps unresolved at this stage, plus some of the items that we are asking be brought to your attention this morning, what we consider to be significant accomplishments on the part of the licensee. So they are not all negative. Some of them are. And those would be the ones that we would want to resolve before we complete our review.

Is that helpful?

MR. OKRENT: Sort of. On the agenda, is there today a time for other questions? It wasn't clear to me.

MR. MOELLER: Certainly. There always will be. Right.

You have, incidentally, two agendas. One is the one that is in your notebook, which is the proposed agenda that we came forth with, and then we have handed to you loosely with a letter of December 1 from Mr. Wallace, a PWR license manager at GPU. We have an agenda that the licensee has proposed. They are essentially the same, and we will probably follow the licensee's agenda, because this is what would make it most convenient; this is the sequence that is most convenient for them to follow. And in line with our policy of always making it as favorable and simple for a licensee, we will follow their agenda.

Are there comments or questions?

(No response.)

MR. MOELLER: Well, if there are none, the people who are here -- Mr. Silver is here for the NRC staff and will be chairing and organizing and handling their responses. And Bob Arnold is here from Met Ed, or GPU, and he will be coordinating the licensees' responses, ably assisted by Phil Clark. If that is the situation, we can go on into the formal review of the restart. Is that all right? We'll just go right into the sequence. Let's begin then.

Item 1, looking at the agenda proposed by the licensee, begins with NRC staff. And we will first have a review of the open items in the SER. Harley Silver.

We will, of course, give the GPU group a chance, when they first appear, to not only comment on what the staff says but to comment on my opening statement.

MR. SILVER: Good morning.

(Slide.)

What I have done on the first two tables is to rearange the open items on the status of the -- not rearrange; I listed the items differently, and I show what is the current status of each of these items. I did, of course, listen to Dr. Moeller's description of the open items as presented by the licensee last week. And indeed, these are among the open items and are quite possibly the principal ones at the moment. But we did arrange or list the items which are perhaps many of them not major in the SER.

Some of the licensee lists open items are not shown as open on ours because they were not open. For example, the containment isolation of the reactor coolant pump services was not at the time of the writing of the SER considered an open item by us. We simply took a position that they should be isolated. We did note, however, that we would reevaluate this as we went further along in our deliberations on the need for the pumps themselves. And in fact, we are reconsidering these requirements right now. So, in effect, they are open but not on this list.

Would the committee desire that I read down each one?

MR. KERR: Mr. Silver, from what you have said, I am not sure whether that is the current list of open items or not. Is it?

MR. SILVER: This is the current status of the list in the SER. There have been additional requirements since then.

MR. KERR: I thought what we were promised at the subcommittee meeting was a list of open items as of this time. Do we get that later?

MR. SILVER: I have not had the opportunity, nor do I believe has any other of the staff, to examine the NUREG-0737 items or, in some cases, the 0694 items, to ascertain what the actual status is at this moment. As far as the 0737 items, the licensees, as are all licensees, is required to respond, I guess, about the middle of December. We have not, of course, seen that response.

MR. KERR: I don't understand your answer. I thought open items referred to those -- well, I guess I don't know what the status of the open items is. And how can we tell? Or should we as a committee not know?

MR. SILVER: There is no reason you shouldn't know, obviously.

MR. KERR: Maybe I should rephrase my question: Do you think there is anyone who knows what the open items are at this point?

MR. SILVER: The total list of items which are not resolved of the items in the order and items which have subsequently been added, not with total certainty, I would have to say at this time.

MR. KERR: Thank you.

MR. SILVER: Insofar as the SER items, would it be desirable to read down this list?

MR. MOELLER: I think so, yes, briefly on each one.

MR. SILVER: There is an analysis of anticipatory fill due under Bulletin 79-05B, which we are awaiting the licensee submittal on. I have indicated on this list whether the item as it is is in fact a restart item. And as you will see, most of them are.

There is a checkout procedure due on reactor anticipatory trips, which will be validated during the start of checkout. That is not an item which we expect to have now or to be able to write off now, in any event, until the checkout for restart is underway.

There is a general requirement for tech spec changes. The licensee has in fact submitted draft tech spec changes which are being reviewed by the staff. There have not been, of course, formal submittals by the licensee for tech spec changes which would require license amendments.

Inadequate core cooling procedures are in review at the moment. A test exercise required as part of the emergency planning requirement. And that will, of course, be done prior to restart and has not yet been redone.

The emergency plan is in fact being reviewed at this time. And when I discuss the schedule for SERs, or supplements, rather, I will again discuss that. As far as the order is concerned, the direct requirements of the order, the only open item is the exercise. We are reviewing the licensee's plan in accordance with NUREG-0564, which is, as I said, well underway.

The detailed design of the filter under the separation of the units order item is scheduled by the licensee, as I understand it, in the middle of next year. This does not involve an actual implementation but receipt and review of the design prior to restart.

The plans for low-activity storage, solid rad waste. The licensee has submitted some information which, it appears, is not adequate. And we will indicate shortly what we will require, what additional information we require.

The management item has changed a bit. Let me explain that for a moment. We have issued, I believe it was last Friday, a supplement No. 1 to our evaluation covering our reevaluation of the licensee's management capability. This was a Xeroxed version. Unfortunately, the number of copies we were able to make was rather limited, and I think the ACRS has not been supplied copies. I do have half a dozen copies or so, which I will be glad to distribute. It is a fairly lengthy document, in any event.

These items are a condensation of the items that we now feel are open in the licensee's -- in the management area.

MR. KERR: Do "unlicensed personnel" refer to unlicensed personnel in management?

MR. SILVER: No. All unlicensed personnel on the station, in the station.

The long-term operator training has to do with verifying that indeed there are plans for training operators beyond the operators that will be needed for restart and for the immediate future.

Facility procedures again is essentially a continuation of an existing item. We had a rather long list of procedures. We had not reviewed it, and it is much shorter now.

Health physics. Many of these items are a result of an extensive inspection performed by I&E at the site this past summer. And there are a number of items contained in this. The Q list, as was mentioned by Dr. Moeller, is another item.

MR. KERR: It wasn't clear to me whether you said as a result of your recently issued supplement these are still open items or whether some of these had been covered in the supplement.

MR. SILVER: These items are open as a result of our review of the licensee's current plan. I understand there is an amendment due any day now which, parts of which, may in fact close out some of these items. I really don't know if that is so or not.

MR. KERR: Thank you.

MR. SILVER: Order item 7 in the original order of the Commission is a financial item. And the open item there is receipt of a revised financial plan from the licensee which, if I remember, is due fairly soon as well -- but again, based on verbal commitments from the licensee. I don't know when that is due or when the item will be closed.

MR. MOELLER: Could you take this first page of open items and group them several ways for us? Which are really significant? Which are in contingence where there is basic disagreement? And which simply are a matter of further review to just be sure all of the loose ends are covered?

MR. SILVER: Let's try the last first, eliminate the fairly simple ones or the ones which we would not expect to have a result now in any event. These include, in general, procedure items: the tech spec changes; perhaps in this case, the inadequate core cooling procedures -- I can't tell whether it is in dispute or misunderstanding between the licensee and ourselves -- but the item is being discussed. Further meetings will be scheduled. I am sure it is easily resolvable, but it has not yet been resolved.

These are items where essentially we want to see long-term designs to convince ourselves that in fact the item will be taken care of when it needs to be and are not in themselves a requirement for a restart.

The management issue, in general, of course, is one the Commission seems to be quite interested in, and I am sure we will hear more about this from the licensee today.

MR. MOELLER: It is mainly a case of reviewing the plans? It is not that they are objecting?

MR. SILVER: I see no intrinsic dispute.

MR. MOELLER: The only item on the first page that really may give problems is the inadequate core cooling procedures.

MR. SILVER: I think that's correct. The financial situation, of course, is obviously an ongoing problem.

MR. PLESSET: Would you explain the very first item? What does it mean: "The analysis of anticipatory fill"?

MR. SILVER: As I recall it, we requested the licensee to further analyze the possible difficulties of anticipatory filling of the steam generator as to whether or not that will or can cause additional problems.

MR. PLESSET: I still don't understand it.

MR. SILVER: My recollection is somewhat hazy. I am not sure there is anyone here at the moment on the staff who --

MR. NOVAK: I think, Dr. Plesset, the point was whether the natural circulation characteristics of the plant would be markedly changed if you went to a water solids secondary side of the steam generator; in other words, if you filled the steam generator, how are you affecting the natural circulation flow characteristics?

One of the concerns in the earlier bulletin was this. If you look on the left-hand side, I think it is 7905-B1. It is one of the things we were immediately interested in at that time, was to better understand the behavior of the plant under natural circulation where the level of water on the secondary side could go above the normal level.

MR. MARK: This is in no way special and specific to TMI-1?

MR. NOVAK: No. It would be generic to a once-through steam generator.

MR. SILVER: Many of these items, of course, are applicable to many plants; in fact, all plants. There is a benefit to having the deputy director of the task force present.

(Slide.)

Continuing the list of open items, the first item involves procedures having to do with the pressurizer valves. And again, we are awaiting revised procedures there. Valve position indication, which I believe is one of the items GPU has indicated.

MR. KERR: What is the significance of No. 8?

MR. SILVER: It's the date, August 9th order, and the corresponding number in the safety evaluation. These, of course, are the Lessons Learned numbers. And, of course, there is another set of numbers having to do with NUREG-0660, which is not indicated here.

Our concern on this one is the ability of the position -- they are not position indicators, but really flow indicators -- in the safety valve tailpipes to indicate that the valves are indeed open. And if there is two-phase flow present, we feel the licensee is not fully justified that these elbow taps will in fact indicate a flow or a flow which will be of fairly low velocity in this situation.

Inadequate core cooling, the wording of this -- there may be an error here in fact. I am n t sure that there is an open item having to do with existing instrumentation, but rather with the item basically involving the reactor water level instrumentation.

And the licensee, of course, has taken the position that such a device is neither desirable nor necessary. And ours, of course, comes down on the other side of the fence, basically.

Containment isolation, this item dealt with receiving additional detailed design information rather than the one indicated by the licensee. But in fact, the question of reactor coolant pump services isolation is again open.

Systems integrity has to do with the leak test of this involved leakage measurement procedures, as I recall. We are still awaiting receipt of those.

Plant shielding in the event of introducing radioactive materials into lines not normally handling such fluids is in progress. I don't think the licensee felt it was complete, and we are probably going to say it is not, as well. This is a multiphase task, and we can probably improve our report on it but, again, probably not completely.

The next item has to do with essentially a long-term -- detailed design of long-term modifications. And we understand, from the licensee, that we can expect a submittal in January.

The post-accident sampling system, the licensee has not fully justified use of the existing system until the long-term design is implemented.

As far as radiation monitor range, the licensee's intention is to use the long-term system as defined in the Lessons Learned report prior to restart. If indeed there is a delay in receipt of equipment, the procedures have not yet been submitted, will be used. The matter of procedures and training of personnel having to do with iodine measurement have not been received.

The review of analysis for inadequate core cooling and review of the procedures is in progress.

Procedures connected with the onsite technical support center are in progress, as well. This mysterious nomenclature refers to the additional item 4, having to do with high-point vents in the reactor coolant system. We have requested a detailed design and analysis of the conceptual arrangement proposed by the licensee. We are told that is scheduled for July.

The licensee has committed to installing hig-point vents in the candy canes and the reactor vessel head, although I think there is a question of whether the head vents will in fact be installed prior to restart. As far as the licensee is concerned, there is a question.

MR. LAWROSKI: With respect to item 2.1.8.a, does that include also sampling and checking out of the containment samples?

MR. SILVER: Yes. This is primary water containment liquid.

MR. LAWROSKI: One of the things that was very bothersome was erratic numbers obtained for oxygen in hydrogen contents. It made it difficult to make a meaningful calculation. I wonder what had been done, so far as you can with the system, whether oxygen was reading 21.9 but not waltzing all over the scale.

MR. SILVER: I don't think I can address that now, but we will certainly examine it.

MR. MOELLER: I think the licensee can comment.

MR. LAWROSKI: .9, I should say.

MR. MOELLER: Of the ones on the second page, which ones are significant?

MR. SILVER: Again, let me start at the top. Procedural items. I think this one is significant, but, again, I would imagine that an analytical justification can be presented and simply has not yet been. The question of reactor water level, I believe, is a significant one. Containment isolation, certainly we would want to see the detailed design, and in fact, if the reactor coolant pump services -- well, that position is in dispute and should be resolved quite shortly. I am not saying I expect that it should be resolved. It will be resolved prior to restart. This is a procedural item that I think fairly significantly differs from the general run of procedure requirements. The plant shielding, I think we would want to see more information prior to restart than we have now.

MR. LAWROSKI: When did you ask for more?

MR. SILVER: In the safety evaluation is a statement of our position. And that, of course, was in June. The licensee submitted revised or additional information within the last month or two; I don't remember the exact dates. And again, it is a phased program that the licensee has defined for us. So I think they are aware of our requirements.

MR. LAWROSKI: The thing I have in mind is wondering how many of these things -- they were requested only relatively recently. One could have expected reasonably to have been asked such questions a lot earlier.

MR. SILVER: I think that is not the case. I think there is no question about the requirements.

MR. LAWROSKI: Frequently, the NRC staff doesn't say, "It is going to be this way," until a lot of time passes, and then suddenly they get their letter out.

MR. SILVER: Yes, that has happened.

MR. BENDER: There are a number of things on here that came out of the TMI accident experience. If I were to go down through that list and ask how many of these requirements are not imposed on operating reactors, could you give me an answer?

MR. SILVER: A great many are.

MR. BENDER: I didn't say how many are. I want to know how many are not.

MR. REID: Those requirements are -- in fact, the nomenclature on the 2.1 items come from 0578, which is a category A Lessons Learned requirements, which are and have been imposed on all operating reactors.

Now, if you recall, those again were a phased implementation program. Many were due January 1, 1980. Some of those are in that category. Many of those were also due January 1, 1981. Some of the January 1, 1981, requirements are still January 1, 1981. But some in the latest requirements for the action plan have changed in schedule to a later date. So I would say all of them have been required of operating reactors, but the timing of some of the longer-term ones may or may not be related to restart.

MR. BENDER: I didn't understand that last statement. The timing may not be related to restart?

MR. REID: I mean, in the latest action plan, NUREG-0737, the implementation requirements for operating reactors, some of the January 1, 1981, requirements of 0578 may now be due beyond the projected date of TMI-1. However, these requirements were requirements under the Commission's order for TMI-1.

MR. BENDER: I am not quibbling about that. It seems to me that there should be some consistency in the Commission's policy, and I am trying to find out whether there are inconsistencies. And I am not sure that I have learned, but I will not try to explore the matter further.

MR. MOELLER: Mr. Chairman, I think to wrap up this stage of the staff's presentation we should ask them for a written report summarizing this item, because I think this approach has been inadequate. I think that Mr. Bender is absolutely correct.

It must be extremely confusing for a licensee to try to figure out which requirements are due on what date. For me, as Subcommittee Chairman, I would like to see a listing of the requirements.

I thought the NUREG-0680 did a good job in showing everything required. But I would like to see a list of the requirements that are still open on this plant, what the source of each of those requirements is. I would like to see them divided into those that are significant and those that are not significant. I would like to see them further divided into those which are in contention and those which are simply a process of reviewing more paper to just simply assure that the item is resolved.

I think we should request this in writing, because unless we have it as well as a statement at the beginning of the listing of what is the staff's policy, as Mr. Bender has requested -- because only then can we really tackle this situation or this plant status and really come to any sound conclusions.

I think when you hear from the Licensee you will find that they have very diligently attempted to group these things in a meaningful way. I find this review here far from what I need as Subcommittee Chairman.

MR. PLESSET: You have heard Dr. Moeller's request. How long would it take to give him what he wants, this written report, in other words?

MR. REID: Well, let me give a little bit of the background. I think part of the difficulty in defining what we mean by open items is that there are four different sources of open items.

First, there is the Commission's order. Mr. Silver was addressing those items that are open related to the Commission's order. Within that, within the Commission's order the referenced the bulletins, NUREG-0578; and also laid out some other specific requirements: the emergency planning, management, financial, that sort of thing.

Now, in addition to the Commission's order -- these are the open items in the SER, and that is what the SER-0680 addresses. There are the additional requirements, which have been defined as those required of an NTOL. Now, the requirements for an NTOL do overlap many of the requirements that are in the Commission's order. Those requirements have been identified in a letter to the licensee dated November 25th. That is in the process of being distributed.

That represents a total of about 15 additional requirements. Those are -- that would be required for estart.

A third source of requirements is the action plan requirements under 0737, NUREG-0737. Many of the action plan requirements also overlap those of 0694 and the Commission's order. The action plan requirements, however, are dated requirements, and those that would be required for restart will be those for which the due date for all other reactors occurs before the restart of TMI-1.

We can list the dated requirements based on the anticipated date of the restart of TMI-1, say August of 1981, as open items or not. In other words, I think we can list those. If we assume other dates, then the list will vary. So that will always create some degree of confusion with respect to the restart requirements for TMI-1.

MR KERR: I think it is assuring, reassuring, perhaps, to learn why we are so confused. It would also be helpful if we could be given some information that would unconfuse us. But perhaps that is asking too much.

MR. PLESSET: It might be asking a lot, but I think it is something we ought to try to get anyway.

Do you see the point of Dr. Moeller's request?

MR. REID: Yes, I see the point, and I think we should be able to provide that in, say, two weeks.

MR. MOELLER: Simply, I would urge you to choose a date. Choose August the 1st, September the 1st, whatever it is, tell us what the date is and tell us what will or will not be required.

MR. BENDER: I don't have any argument about two weeks. It sounds to me like the staff is confused. If it is going to take two weeks to tell us this kind of information, you probably don't know it. And I would like to know whether you really do know it or not.

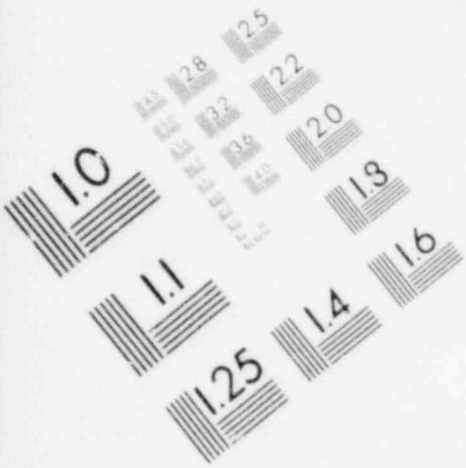
MR. REID: I think we know the requirements.

Let me add one additional factor. In the clarification document, NUREG-0737, some of the requirements that are defined there by the numbers listed there have been changed from those that were listed in 0578. We are going back to review those requirements to determine whether or not they need to be -- we need to reassess any of the assessments we have previously made on TMI-1, so that they will meet the same requirements as any other operating reactor.

We have the listing of all of the requirements out of NUREG-0737, the first column -- I just want to show you that we have performed such listings. On the left is a group of requirements that is included in the Commission's order.

The second column, which is a shorter column, is those additional requirements out of 0694. And on your right are the dated requirements out of NUREG-0737. Now, we could give you that list right now, but we have to back out then all of those that are open in the left-hand column, and that is the only work we have to do.

MR. BENDER: I hate to extend requests that seem like they involve a lot of work, but I think it would be very useful if the staff would take one selected example from some other place than TMI and give us the same information concerning one exemplary plant of the B&W class, just so we can see what the relative treatment really is for



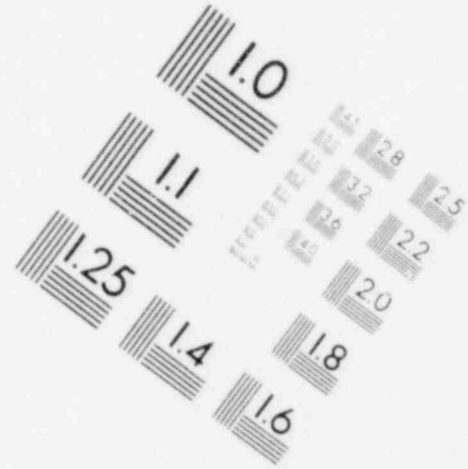
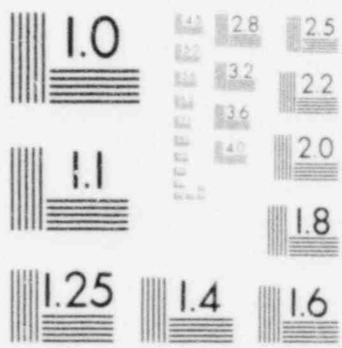
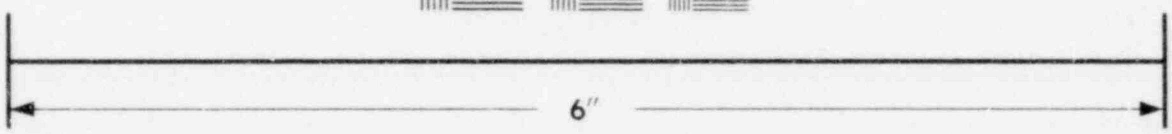
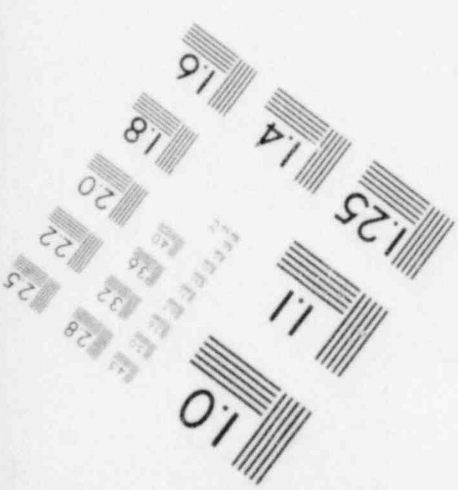


IMAGE EVALUATION TEST TARGET (MT-3)







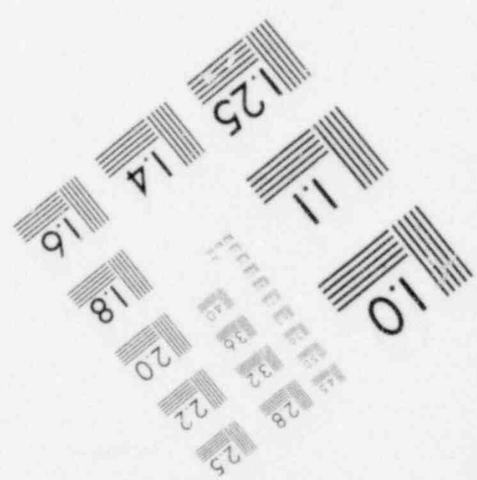
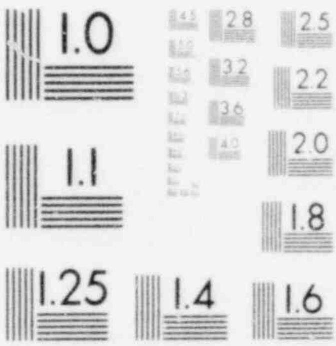


IMAGE EVALUATION
TEST TARGET (MT-3)



6″

another operating reactor.

I think we would know a lot more than just having a current list. And if I could ask for that, Mr. Chairman, I think it would be helpful to us.

MR. PLESSET: I think that would be useful. I would hope, since you are going to take two weeks, that the list would be self-contained, we wouldn't have to go to the library and read off the various NUREG's what each item really meant. That would help.

MR. SILVER: Surely.

MR. PLESSET: That's for both lists, both for the general B&W plants and in particular for TMI-1.

MR. REID: Yes. That's why we didn't plan to present that slide. It is only an indication of bulk, not an indication of substance.

MR KERR: I am glad to have seen that slide. That makes things a lot clearer to me.

(Laughter.)

MR. MOELLER: Mr. Chairman, we are slipping on time. Could we quickly do the other items, the ASLB contentions and the schedule for the supplements?

MR. PLESSET: Yes.

MR. LAWROSKI: What about the integrated control system for this plant? Is it similar to Crystal River or Rancho Seco?

MR KERR: It is a standard integrated control system for B&W plants, so far as I know. And there may be some differences in detail, but I think it is significantly the same control system.

MR. LAWROSKI: Then it has been looked into from the standpoint of occurrences at Crystal River and Rancho Seco?

MR KERR: I can't answer that question from personal knowledge.

MR. SILVER: They responded, the licensee responded, to a bulletin issued to all plants.

MR. LAWROSKI: Has he? Are you satisfied with the response? I didn't see anything on that.

MR. SILVER: Again, this applies to basically the August 9th order. Again, that would be in the category of items applicable to all plants, as opposed to those required specifically for TMI-1 restart.

MR. MARK: I believe there has been some overlapping with 0578 mentioned in the order and 0737, which in some respects supersedes 0578, let's say as the date for item X. Which date takes precedence with respect to TMI-1?

MR. SILVER: This is a question that has not been fully resolved.

MR. MARK: The applicant can't help you resolve that very well.

MR. SILVER: Can or cannot?

MR. MARK: Cannot.

MR. SILVER: This is true. It should be a Commission staff decision.

There is a question, of course, of legality involved. The order is quite specific in referring to 0578. In general, the date changes in 737 are reliefs, and it is not entirely clear whether it is intended that that applies to TMI-1 or not. I am sure the licensee will think it should, and they may be right.

MR. MARK: I rather think it should. The only source of absolute decision would be some representative of the Commission itself.

MR. SILVER: Perhaps so. This has not been resolved, as I stated.

If I could go out of order one item and talk about our supplement, it might be a little simpler.

(Slide.)

We did issue, as I mentioned, a management supplement on November 28th. It presumably will require an additional supplement to close out those issues which are still open.

Emergency planning, we are expecting two supplements, essentially. The staff portion dealing with on-site emergency preparedness is expected on December

10th. That is a close thing, but should be on or very close to that date.

The FEMA portion dealing with off-site preparedness is scheduled to be published by January 5th. A supplement dealing with financial qualification is not specifically scheduled, pending receipt of the licensee's financial plan. Again, the last I heard that plan was scheduled for receipt, if I recall, this week or next. And we have committed to the hearing board that we will issue a supplement eight weeks after receipt of all information on the subject.

Again, this will probably not be a conclusive finding, because of the ongoing financial situation. But it will certainly be an update.

The financial qualification, again because of the lack of information at this moment, we do not have a schedule for that item. There are additional supplements or documents which are not directly related to the order, but which will be issued as follows:

A supplement covering the control room design, covering our review of the licensee's control room design from the human factors standpoint, will be issued in January. Environmental qualification of equipment, in response to Bulletin 79-01B, as I remember the number, is due in February for this plant and all other plants as well.

An evaluation of the licensee's response to the NUREG-0737, a letter which I believe is required -- a response is required 45 days after receipt of the letter; would put it about mid-December. That is not scheduled, of course, pending an evaluation of that response as to its completeness and so forth.

Are there any questions about this slide?

MR. MOELLER: There appear to be none.

MR. SILVER: Insofar as contentions, what I have done -- and this will be in several dissimilar-looking pieces, because they were assembled in different places -- I have been vacationing in central Pennsylvania lately -- I have listed the contentions more or less in the groups that we have previously identified for the Subcommittee, namely design and analysis --

MR. MOELLER: Excuse me. Do we have copies of that?

MR. SILVER: I'm sorry. I believe there are copies.

In any event, the arrangement is design and analysis items, separation of the units, management, financial and emergency planning, which encompasses the major subdivisions of the hearing.

Under design and analysis, which is somewhere in the middle of this, is about where we are in the hearing now, what I have done is simply listed the items in a sequence which had been recommended for the hearing by the licensee, from which we had departed somewhat. But the sequence, of curse, is not especially important.

The groups, again using grouping-type headings: natural and forced circulation. This nomencl ture, like UCS-1 and 2 and Sholly-3, is the number of the contentions for reference. You may want to read the contention in our testimony.

And the thrust of the contention itself is indicated by a relatively short phrase. Again, that is the thrust of the contention and not of anyone's testimony in regard to the contention.

Also, I have indicated Board questions in various places in this list, which essentially are akin to questions in the hearing. That is, the Board has raised questions which the parties are obliged to answer.

MR. MOELLER: On which of these -- roughly, could you give us a percentage breakdown on how many the staff has completed, where the staff has completed its testimony or its paperwork to support the testimony, versus those which the staff really is not complete on yet?

MR. SILVER: The staff has filed testimony, I believe, on all of the items on this page. And I believe essentially -- well, not quite all of the items in the design and analysis section on the next page. I can -- I will come to that.

We have not yet filed testimony on management items, on financial items, or on emergency planning items.

MR. OKRENT: When you file testimony to a Board, do you send copies to the ACRS?

MR. SILVER: Not normally. This is somewhat out of sequence. Normally an ACRS meeting and letter, of course, is complete by the time of the hearing.

MR. OKRENT: That wasn't my question.

MR. SILVER: I understand. We have not done that that I am aware of. We have one copy of the staff testimony with us. Is that correct, Bob?

MR. REID: Yes.

MR. SILVER: We will be happy to leave it here. Unfortunately, one is not much help.

MR. OKRENT: Mr. Chairman, I raise the question as a general point. There was considerable exchange of information between another Board and the staff on the question of reliability of A.C. power, and there were in my opinion important safety considerations involved here. I don't find it to be an adequate method of being informed in this regard to have to look at the periodic issuance of positions by the ASLB to see that they may have done something in this regard, and then to have to go back to see what may or ma t have been said.

I would suggest that we ask our Executive Director to develop some way of at least having the office obtain a copy of submissions by the staff to hearing boards that deal with technical safety issues, and then a mechanism for deciding whether or not all of the Committee members should get it, or at least they are made aware of it or something of this sort.

This is a whole arena of safety of which in fact we hear by chance. And I think this is in fact not the way it should be.

MR. PLESSET: Help me in one respect. We do not get these things?

MR. MOELLER: The NRC issuances, I presume, contain them, but very late.

MR. OKRENT: We may get the hearing board opinions. This is typically three to six months after it has occurred. But in fact, prior to this the fact that the Board has sent questions, in fact, you don't necessarily automatically know, or what the staff has responded to. I am referring now to safety questions.

MR. MOELLER: In this case the Licensee did provide us with a summary of the staff's position and the Intervenor or whoever raised the contention on each of these, which personally I found very helpful. It would have been much better, as Dr. Okrent points out, to have had the complete --

MR. PLESSET: This goes beyond that kind of thing and is a more general requirement.

MR. OKRENT: One is reminded of the fact by this case -- I am raising the question generically.

MR. PLESSET: I understand.

MR. OKRENT: It is an omission.

MR KERR: I think this is an important issue. It seems to me we ought to do something later on and not slow down our current activity.

MR. PLESSET: I agree with you, but it would be nice to settle it at this meeting.

MR KERR: We should, I agree.

MR. REID: We have brought down a set of the testimony, both ours and the Licensee's and the Intervenors' testimony that has been filed thus far in the hearing. We will leave that with the Committee. We have only got time to reproduce one copy before the TMI-1 proceeding.

We will provide a copy of everything that has been filed from here out.

MR. PLESSET: Dr. Okrent has brought up a general matter. I think it is an important one and relates to a subject that has been brought up before: the relationship between this Committee and the Board hearings. I think it was a good point to consider, and we will certainly try to do it at this meeting, what we should do.

MR. MOELLER: I think, in terms of following up on Mr. Kerr's comment -- does that about wrap it up, Mr. Silver?

MR. SILVER: Again, it depends on --

MR. MOELLER: We are running considerably behind time.

MR. SILVER: There are several pages of this listing.

MR. MOELLER: I would just let the Committee read the list. And we do want to give the Licensee his fair share of the time.

MR. OKRENT: I have a few questions that I would like to ask the staff.

MR. MOELLER: Fine.

MR. OKRENT: One of my questions relates to whether TMI-1 should be considered as not the same as any other reactor, but perhaps, either because of its site or because of its site and the combination of other reasons, be looked at in a special way, either the way you are looking at Zion and Indian Point or some other special way.

I would like to hear whether the staff gave this matter specific consideration or not.

MR. REID: We did discuss this briefly at the Subcommittee meeting.

MR. OKRENT: I mean within the staff. Has the staff talked about this as a specific issue? Have they talked about it with the Commissioners as a specific question?

MR. REID: There is currently a Commission paper in preparation on this subject, and as you are aware, this general area is the subject of proposed rulemaking.

MR. OKRENT: What rulemaking would cover this specific question?

MR. REID: Degraded core.

MR. OKRENT: That is a general kind of a rulemaking and what the Commission is doing at Zion, Indian Point, and Limerick is aside from that rulemaking.

MR. REID: That is true. However, the staff deliberations on this one -- it has not been finally resolved on the Indian Point, Zion and Limerick, what the final actions will be for those plants. There are various things --

MR. OKRENT: Excuse me. Your comment indicates you misunderstood my question. My question is have you consciously considered whether you would look at TMI-1 the way you are looking, or in some way at least, in a special way, as you are looking at Zion, Indian Point, and

Limerick?

MR. REID: Yes, it has been consciously determined that they are in the next grouping of plants of similar population density.

MR. OKRENT: "They" who?

MR. REID: TMI is not in as high a population density area as are Indian Point, Zion and Limerick, and they have been put in a second group, I think of eight different sites, for a next priority action. But that would action be determined based on the Commission action.

MR. OKRENT: Is there any kind of a paper that discusses this matter?

MR. REID: It is in preparation. It is going through the concurrence chain right now.

MR. OKRENT: Do you see anything different about TMI among that group of eight? You say it is in the next group of eight. Do you think it is equal to all the other eight, or that it might be different?

MR. REID: It has been determined that it is as equal as you can judge for that group of eight. In other words --

MR. OKRENT: You don't see anything distinctive about this site, as contrasted to others having the same population density?

MR. REID: No, not sitewise. They looked at difficulties of evacuation with respect to the site. They found no unusual evacuation problems for the Three Mile Island site. Population density then would not -- is common to these other eight.

MR. OKRENT: Let me offer an individual opinion. To me it is very different, because it is the one that had a serious accident at the site. To me that is a second factor that I would lump into the grouping. That is an individual opinion.

So at the present time you are not looking to see, with regard to other safety issues, some of which in fact may be of more importance than this long laundry list that I have seen; you see no relevance to looking at TMI-1 on a special basis, not treating it as equal to all other reactors?

MR. REID: Certainly not as a restart issue, and not singling it out because of any other particular problem that we can see at this point.

MR. OKRENT: Let me offer a comment to the Committee. I fundamentally disagree with this, if I can make it clear. I think TMI-1 should be receiving the equivalent of an IREP, for example, should be, if possible, be accelerating a look at other, what you might call generic safety issues.

I think there are a group of these, and I don't know how the Committee feels. But I think in fact this is what I would consider to be fair and proper. That is different than saying, the restart should be delayed. In fact, it may well be that the staff has not given sufficient resources to TMI-1 for this laundry list.

On the other hand, the utility may not have given sufficient resources as to seeing what he can do to improve the safety of the plant on things that are not on that laundry list.

In any event, this to me is an important question in the Committee's review and one which I certainly have some opinions. I don't know what the Committee thinks.

MR. MOELLER: Thank you.

Mr. Chairman, I think we can move ahead now and call on the Licensee. According to the agenda, they were first to give their response to the opening remarks of the staff, and then immediately go into their management and organization.

Mr. Arnold? Incidentally, you are just about on time, because we started with the staff a little early.

MR. ARNOLD: Thank you, Dr. Moeller.

My name is Bob Arnold. I am with General Public Utilities System. We appreciate very much the opportunity to come before the Committee today, particularly following so closely to the Subcommittee's meeting.

I also would like to express, since I was unable to attend the Subcommittee meeting, my personal appreciation, and I know that of the company in general, for the willingness of the Committee to meet on that particular holiday weekend. It has been of tremendous assistance to us in trying to expedite our preparations for the restart of Unit 1. And that effort on the part of the Subcommittee was very much appreciated.

I think in response to the items that were discussed by the staff, I would like to, first of all, comment kind of generally on this issue of open items and what is required for restart, and add my two cents to what has received a fair amount of discussion already.

I think in trying to provide status to the Committee, the approach we were taking was trying to differentiate between items which were just not able to be signed off 100 percent yet by the staff because of the expected status or progress -- they were in process, so to speak, but basically on track -- from those which were still matters in contention or upon which there was still disagreement.

So that in our list of six items, those are six that are what we would say have fairly important disagreements between ourselves and the staff, or different viewpoints, perhaps I should say; that the way in which they will be reconciled is not yet clear.

If we were to truly provide a list of each and every specific element of the requirements for -- or the requirements that we presently have to fulfil to the staff that we were able to identify, those associated with restart and those which may not, I am sure the list would be maybe some 2,000 items. And that kind of represents the other end of the spectrum, so to speak, on open items.

Going to the first slide that Mr. Silver put up, for example, under the management, the health physics line item there, which is actually health physics and emergency planning and emergency preparedness, the letter that we received on November 26th as a result of inspections conducted during the summer had a total of 104 individuals items on it. And I am sure that in the course of addressing many of those, there are additional iterations of specific items, and they are still in a sense open items yet.

I think that the letter which we delivered to you this morning or which we provided you a copy of this morning, and we put into the mail to the Commission on Monday, from Mr. Dieckamp to Chairman Ahearne, has tried to identify a process that we think has taken place over the last year and a half which has not really been anticipated in the summer of '79, when the orders came out.

And I think that process, as we now are a part of it and as we are able to each of us view it, shows substantial differences between what was anticipated in the summer of '79 in the issuance of the NRC's order as to what would be required prior to restart of the Three Mile Island Unit 1 and what today we have before us as potentially required items, at least.

The company feels that it is very important, it is imperative, that we find some basis for regrouping on all of these issues. And as we indicated in our meeting with the Subcommittee, we would seek the Committee's help in attempting to classify those issues which are before all of us that are unique to TMI-1 and those which are really generic issues, and to attempt to focus on the rationale for those that should be required prior to restart and those which really should be handled as part of the standard licensing process or regulatory process.

We have, I think, encountered a great deal of frustration on our part as we attempted to come to grips with issues which have been raised that are not unique to us, which in many cases, while it was identified as an issue in the summer of 1979, the requirements at that time to close the issue were not understood.

Many months have been taken up in identifying the items that -- the specifics of closing those items. And many of the entries on the list presented by Mr. Silver I think represent the impacts of the continuation of that process of refining and attempting to define in many cases just what the requirements are.

Perhaps the easiest example is emergency preparedness, where the guidelines that the emergency plan had to fulfil were not available to us until June of 1980. Clearly, that is not what was envisioned when emergency planning was identified in the order in the summer of 1979.

I think it should also perhaps be clarified, because I am not sure there wasn't some confusion earlier, with regard to the short and long-term items, the so-called Category A and Category B of 0578. The order did not require us to complete the long-term items of 0578, but to show acceptable progress on them. So that that is an example of where the approach being taken by the staff is a different one for us to grapple with, when many of those things have been approached as being required for restart because of the anticipated duration of the hearing process and the initial required dates that were given for the long-term items.

We would still feel that adequate progress on those long-term items should be the governing criteria.

I have one last item that I would like to perhaps address, and then we will get into the next portion of the agenda. The Com ittee report, which we did hope, coming into the Subcommittee, that this perhaps could be the final Committee meeting and it could lead to a letter -- and if that is not the case, we would certainly hope that in this status report we could have as clear an identification as possible of what the additional items are that need to come to further degrees of development before the Committee would be ready to sign off on them.

We would request that you consider permitting that to be done through the Subcommittee meeting if possible. And clearly, if considered appropriate, we would attempt on our part to address those issues as expeditiously as possible and provide the Committee with a schedule for when we think we would be ready to provide for close-out of those items.

In light of the unavailability of myself for last weekend for the Subcommittee meeting and Mr. Clark's participation and role in that, I feel it certainly would be more efficient today if we let him take a similar role in today's presentation for GPU.

I would address just a couple of housekeeping items. In terms of our agenda, we are going to take item B and drop it to follow item D, since Mr. Broughton will be handling items C and D and the control and safety analysis capabiliity part of organization under A. So we will go A, C, D, and then B, with Dr. Long.

We also will probably suggest after the break some rearrangement of the technical issues to perhaps provide a more optimum sequencing of those.

Let me ask at this point for Mr. Clark to take up agenda item 2.A.

MR. MOELLER: Are there any questions for Mr. Arnold?

(No response.)

MR. CLARK: Good morning. I have provided a handout which is the same as we used with the Subcommittee. In the interest of time, in summarizing I am going to use only some of the pages of that handout.

And also, in line with the suggestion of the Subcommittee Chairman, if it is agreeable, I will not, in many cases, read down the slide, but simply put it there and add any elaboration and respond to questions, but not try to read it for you.

I think the Committee is aware that in January of 1980 the chairman of GPU announced the plan to form a GPU Nuclear Corporation. I am going to present to you today the status of where we are with the corporation and I think show you that we have made good progress.

(Slide.)

The first slide shows the major elements we are trying to achieve with the GPU nuclear reorganization. In terms of the pooling of resources, I think you realize that we have TMI-1 and -2, and Oyster Creek will be the three nuclear plants we will be dealing with, and so we are pooling the resources that previously applied to those.

I think also, from a technical standpoint, it is important to recognize that prior to the accident perhaps two-thirds or more of the technical resources of GPU were being applied to Forked River, which was a plant under design and construction. And subsequent to the accident that project was first deferred, and now recently cancelled. And all of the technical resources which had been applied to Forked River were essentially redirected to TMI.

But if you consider today the resources, and in particular the technical resources, applied to TMI, they are perhaps three times the level applied at the time of the accident. So there has been a major increase in the technical resources being applied.

Under personnel policies and procedures that go throughout the company, I think most particularly it applies to the bargaining unit question. We are dealing with IBEW. We are trying to get separate contracts and locals and policies with regard to training, requalification, retesting, of the bargaining unit people.

As a major example of what is meant by the last item --

MR. SHEWMON: On that last item, are we talking about operators only, or does this get into people that fiddle with instruments and do other things?

MR. CLARK: All the bargaining unit people. We are still talking about --

MR. SHEWMON: I don't know what a bargaining unit person is in this case, in yours.

MR. CLARK: Technicians, maintenance people, radiation technicians, as well as the operators.

(Slide.)

We have a defined purpose for the GPU Nuclear Group. Some of these slides will be labeled "Corporation" and some "Group," and they are interchangeable, with one exception which I will address later.

The purpose very clearly recognizes what we believe is unique to the nuclear thing: the overriding importance of the primary significance of the safety. It also recognizes the other key element, which is that we are in business to generate electricity.

But it is very clear from that policy put out by our management to us that, if there is a conflict, then it shows what the relative ranking is. And that has been supplemented by an order put out by Arnold that we intend for our people to set our own standards and not simply comply with those things which are laid upon us, as was one of the major conclusions or charges of the Kemeny and Rogovin reports.

As far as establishment of the Nuclear Corporation, there are a lot of approvals and lots of steps required.

(Slide.)

This chart shows that we are approved by SEC. We have requested other approvals. The corporation exists. Officers and directors are approved. We have had our organizational meeting, but we have no authority to act, except in effect to talk to ourselves.

(Sl de.)

Given that situation and obtaining needed approvals, the steps shown here have been taken. I am going to elaborate on the third point here, "Nuclear Group equals Nuclear Corporation," and I think show you that in a very real sense that is true and that the group has been effective since September 15th.

(Slide.)

I would like to now describe the organization of the Nuclear Corporation and show you briefly how that relates to the Nuclear Group. We have a president, Bob Arnold, who is here. The note on location is a telling one. He is at TMI full-time and his headquarters is there.

He will move to Parsippany some time in the future. I am in Parsippany.

We have three operating plants, each of which has a vice president full-time on site in charge of that plant. His role is the operation, maintenance, and what we call plant engineering, which is the day-to-day engineering support of operations and maintenance. Each of the plant directors has that scope.

Unit 2 has also the decontamination scope, which is unique to that plant.

Support functions. Number one is technical functions, systems engineering, planning, project engineering, and startup and tests. This is a major change, or one of the major changes from the pre-accident organization.

is group has the technical control of the plant. It has the technical control of the plant configuration. It reviews and confers in operating emergency procedures for the plant. And it has a responsibility to be directly involved in the plant performance and problems day-to-day, as opposed to the prior situations where the headquarters technical group was largely on call. When the plant thought they needed help, they asked.

This group is directly charged with the technical responsibility for the plant.

This asterisk, which you will see on all of the support groups, or should, means significant full-time representation at each site. So technical functions has people on each site full-time assigned there monitoring the plant.

The shift technical supervisor reports to technical functions. We thought that what those people are supposed to bring to the operation is an understanding of systems, transient response, interactions. We look to our technical functions group in systems to have that expertise, and therefore the shift technical advisers should get their direction from that group.

MR. SHEWMON: Where is Parsippany?

MR. CLARK: New Jersey, about 30 miles west of New York City. It is the headquarters of General Public Utilities.

MR. SHEWMON: How long has Mr. Finfrock been with you?

MR. CLARK: He started with a subsidiary back before Saxton, a long while.

MR. SHEWMON: Thank you.

MR. CLARK: Nuclear assurance, separated out, has quality assurance, training, emergency planning; it has what we call "nuclear safety assessment," which is a staff function that I am going to address further later, but we think is quite important, and a part of nuclear assurance and independent of the other more nearly lined divisions.

System lab is the one nonnuclear responsibility in GPU nuclear. There is one chemical metallurgy testing laboratory that had to be in either nuclear or nonnuclear and serve both. It has been decided to put it in nuclear, in part, because we view that as part of our quality assurance, which is the laboratory work that they do.

Administration is fairly straightforward. We have our own human resources people so that we do have the capability to handle our own personnel, labor relations, contract negotiations. We have a vice president of maintenance and construction. Basically, it takes off the plant staff the burden of doing the planning and carrying out the major outages. So that instead of the plant staff having to, while they are running the plant for 11 months of the year, also plan and get ready for and then carry out the outage. This group provides that service to them on a full-time basis where that is their major role.

We have a vice president of radiological and environmental controls. All of the radiation technicians report in here. The whole radiation protection function is independent of the plant, except -- and, I think, a very important exception -- our position and the policy we have been implementing for the last year is that "Radiation protection is everybody's job." So the mechanic doing the work is responsible to know the radiation protection rules. He is trained, and he is responsible for doing it in a radiologically proper manner.

The radiation organization provides assistance, guidance, checks, rules, procedures. But all of the operating people are responsible themselves for following it out.

MR. MOELLER: Do you have a person at each site who is in charge of radiological and environmental controls? I noticed Mr. Heward is at Parsippany.

MR. CLARK: Each site has a radiation protection manager for that plant. TMI, there is one environmental manager for the two units, because the environmental is common.

MR. MOELLER: Roughly, what would be the qualifications of the on-site rad protection manager?

MR. ARNOLD: What Phil mentioned may not have been quite clear. Both Unit 1 and Unit 2 at Three Mile Island each have a radiological -- a manager of radiological controls. There is a number of professionals on each of those two staffs, and our radiological control plan provides that that manager for each of the units will himself either meet the reg guide, I think it is 8.8, whichever is the right reference, or we will have a deputy that meets that requirement assigned to that person.

In the case of TMI Unit No. 1, the current manager does not meet the reg guide requirements, and we have been attempting to recruit a deputy who does. We have come very close but have not quite had that marriage yet. However, we do have an individual on the staff of Unit 1 who does meet those requirements, but he is assigned as a supervisor radiological engineer. So there is that kind of professional capability.

MR. MOELLER: Thank you.

MR. ETHERINGTON: In a normal plant, wouldn't most of these vice presidents be superintendents or managers?

And if that is the case, is there some philosophy behind the change of title?

MR. CLARK: I think there is a very important philosophy behind the change of title. It is not a title change only. Those people represent a level of experience in a capability which is above what has heretofore been associated with superintendents. Mr. Finfrock, prior to taking this job, was the vice president for generation, all generation of Jersey Central Power and Light. Mr. Colby comes with that extensive background with GE at Agnes. Mr. Hukill comes to us with an extensive background from the nuclear Navy in both operating and in headquarters and with Burns & Rowe.

So what we have done is to establish a position which is truly a vice-president level in terms of caliber, salary, compensation, the kinds of people we have there for each of those plants.

MR. ETHERINGTON: I would hope that would be your answer. Does it apply right down the line? Don't go through them. But does it?

MR. CLARK: Yes, sir. Vice president of communications in terms of professional competence, order of magnitude of what we have.

Maintenance and construction, also new to the company, this gentleman was a commander of a naval shipyard dealing with nuclear vessels. And then the deputy commander of naval systems command.

We have brought in one, two, three, four, including me, five senior people out of those nine.

MR. WARD: How many technical people, engineers, do you have in the technical functions?

MR. CLARK: Today it has about 250 or 260 total people. That includes secretaries and probably a dozen draftsman. I would say at least 200 technical people in the technical functions group.

Plant engine ing groups has degreed engineers who are important, although not doing design. They are, if I remember properly, of the order of 15 or 20 degreed engineers in each of those plant engineering groups.

We also have engineering people in radiological groups. We have a few engineers in quality assurance and certainly in nuclear safety assessment.

MR. WARD: Can you tell me what that is again?

MR. CLARK: I would like to defer that. It is a part of a safety review process, and I will specifically address it, if that is all right.

MR. CARBON: What is your thinking in moving your headquarters to Parsippany rather than keeping it close to at least one of the operating sites?

MR. CLARK: The headquarters has been in

Parsippany. GPU's system headquarters and the technical function group supporting a lot of the administration and a lot of these other things are in Parsippany. So it isn't that we have moved them. This merely notes where they are.

(Slide.)

I would like to show you what we have in effect. This was the GPU Nuclear Corporation, which existed but cannot function.

We look at the GPU Nuclear as it is today. I have over here the Nuclear Corporation, which has a board of directors, which today operating as a nuclear group under a management oversight committee, which management oversight committee is composed of the same people who will be the board of directors. That is the president of our owners, the Jersey Central, Metropolitan Edison, GPU, et cetera. So there is a one-for-one correspondence in personnel and action and involvement as we would have with the Nuclear Corporation, but it is under a different title.

The Nuclear Corporation will have the office of the president, Mr. Arnold, and me. We have an executive office of the nuclear group, with Mr. Arnold and me. We will have a general office review board, which is a safety group I am going to describe later. We have it in the nuclear group.

And below that, the organization that I just described to you is exactly the same, the same people, the same functional responsibility, et cetera. So that as of September 15, we are in fact operating as GPU Nuclear Group.

But the distinctions between that and the Nuclear Corporation to which we are moving are, on a day-to-day basis, essentially nonexistent. So we have in place and are now consolidating and finishing the staffing and working out the details of the nuclear group.

(Slide.)

We have in the handout for you one page on each of the nine organizational divisions. I would like to show you just a couple of those and point out a couple of things which I think are significant changes. This is the technical functions organization. Look at the summary of responsibility and it doesn't say "When asked." It says, "You are supposed to do it." Technical and regulatory aspects of all aspects of our nuclear activities. It also in all of our groups says, "In accordance with corporate policies as well as laws, regulations, and licenses, to try to highlight throughout the organization that we intend to be setting our own policies where appropriate.

This shows their involvement in the review and concur plant operating alarm in emergency procedures and defined technical requirements for training programs. So you have a very broad initiative role for the group.

(Slide.)

The other one I was going to put up was nuclear assurance, which has three main elements: the quality assurance, training, and emergency planning and laboratory. Training, essentially all training, including management training, emergency plant training, et cetera.

The last thing I wanted to address -- and then I would be glad to answer questions -- is what I have called the "safety review process." The first thing we have on this that often gets left off safety review discussions is that the line organization is supposed to do it and do it right. We are putting great emphasis on that, with our plant staff technical functions people, that "We are counting on you to do it right, and you should not be relying on the committee finding it."

And in an operator's sense, it is very easy to lose that, to find that, in fact, as we get more committees and more requirements for reviews that the people are busy. It is very hard to put something down and let the committee find it. So they have the responsibility to do it right and to get needed reviews by other organizations, radiological control, quality assurance, whatever. Other functional organizations should be involved, and they are responsible to get it. If they don't and it gets to a review committee without it, the committee is supposed to send it back, not do the job.

I think that is a very important point. We have 100 percent independent before-the-fact review of all of the things important to safety, whether it is operating procedures or what. The plant staff prepares it; technical functions reviews them. If it is a radiological procedure, the site radiological group might prepare it; the staff or headquarters radiological group reviews it. It is set up to meet our requirements and also is supportive or meets the ANSI standard or ANS standard for review.

That before-the-fact review includes explicit consideration of whether we need a multidisciplinary review where you don't just have the individuals reviewing it each in his own office, but you want to get a group of people together to kick it around together in a multidisciplinary manner. That has to be decided "Yes" or "No" at this point.

We have for each plant a safety group. It is full-time. It doesn't have other duties in the plant staff or anywhere else. It is on site. So it is directly involved in what is going on, but it reports off site. This is one of the functions of that nuclear safety assessment department. I said I would come back to that. I report to that nuclear safety assessment department.

So they are independent of the plant staff tech functions, anything other than nuclear assurance. And they are on site. They do a before-the-fact review of defined items, tech spec changes, unreviewed safety questions, certain categories of procedures that they or management want them to review before the fact that would be in addition to this.

They do an after-the-fact review of all items important to safety procedures, design changes, et cetera, looking for trends and also looking for whether the safety process is working, whether the people up above are in fact carrying it out, whether things are getting proper review. They have a responsibility not to just review paper, but to go look.

So the fact that they are on site, they can go look at the actual operation of the station, how people are carrying out the engineering functions, what really is going on, so they can assess the safety of how things are working as opposed to merely the safety of what the paper says. Of course, they have full access anywhere in the corporation to information.

MR. CARBON: How large is that group, and what are their qualifications?

MR. CLARK: The group staffing, we think, will be of the order of a manager and perhaps five or six people. They are all professional people, technical professional people. And we are looking for a diversity of background so that they will cover a defined list of disciplines: nuclear safety systems, radiation, and I forget the others. But it is that kind of a thing.

MR. WARD: I take it you don't have those groups all staffed yet?

MR. CLARK: Right. We are in the process of working out a transition from the old safety review process, which we can't let go of until the new one is in place. And to get the new one in place, we need to get a few more details defined and then get NRC approval to substitute this for the plant operations review committee, which I understand is perhaps typical of a number of other plants.

But we do have the manager of the group. We do have, if I remember, two of the people hired and some others identified. But we can't quite put them in there until we decide on the turnover point from the old system.

We are quite concerned that we don't lose something by abolishing the old too quickly.

MR. OKRENT: I am interested in that line that says, "Do it right." What is the definition of "right"? How does a man decide what is right or what is safe or not?

MR. CLARK: I think at that level, the first thing is it is in accordance with whatever company policies, license requirements, laws, and regulations, et cetera, are involved for everybody.

MR. OKRENT: What is the company policy then as distinct from licensing regulations with regard to what is "right"?

MR. CLARK: I think you have to look at specific areas on that.

MR. OKRENT: Let me propose a specific area. There has been an interest in systems interactions, as you know, over the years. Has GPU decided that systems interactions was something that they, on their own initiative, look at to see whether there are any that have been missed in construction and so forth?

MR. CLARK: Yes. I think I can respond to that, and there is a specific presentation on that later. We have set up our systems engineering group. We have people who are qualified and going to get certified, if you will, by NRC. I will make that distinction. We don't have our analysis methods yet approved by NRC, but we are moving to it. We have people in-house who are doing systems analysis calculations who are looking -- analyses -- it is not a calculation -- and we will show you today some of what we have done and some of the things we are developing to provide guidance to the operator, the SDAs, and others, in how the systems respond.

MR. OKRENT: I think you're talking about a different subject. Let me define it for you. For example,

. have had incidents in reactors where failure of a non safety system carrying water flooded the safety systems. If you look, you can find situations in reactors possibly where during an earthquake the motion of non-safety systems will lead to interference with safety systems. These can arise in a variety of ways.

Our experience has been that certainly there are no staff criteria that are detailed in this regard. Our experience has been so far that, at least to my knowledge, rather few, if any, of the plants have, except Diablo Canyon, now, to my knowledge, have gone through in some systematic way to see whether such did exist, and they did it from the seismic point of view. I am trying to understand from this example whether your group has considered this and consciously decided it didn't need to be done, it should be done, or whatever.

I am getting at the point, "Do it right."

MR. CLARK: I would like to say first I don't think the way this chart is set up that that is where it comes. I think perhaps that is the confusion. This is set up for merely when I talk line functions. If you are going to make a design change or procedural change or you are going to implement something, the line function has the responsibility to do it right. When we get down to nuclear safety assurance department and the general office review board or if we go look at the technical functions organization where we have systems analysis people, those people are, in fact, doing some of those things. And we will show you one of them today.

I think the company has done a probabilistic risk assessment, for example, of Oyster Creek. I don't think that we are required by regulation to do that. And we are now working with how to use that and how to implement that. But I would think that would be an example of the kind of thing that you are referring to.

MR. OKRENT: In fact, I think you deserve credit for having done that on Oyster Creek, although I wish it had been published.

MR. CLARK: It's not quite ready, but we are making some use of it.

MR. OKRENT: In fact, I think it has turned out to be advantageous to you.

But I am still exploring how you decide to "Do it right," and I meant, obviously, in terms of the whole function. And I think this enters not only at the headquarters staff level, but in fact in the execution or even trying to decide whether to report something back up. A man needs some kind of a level of, if you will -- or some nonacceptable level -- beyond which he has to at least question. I don't know how you go at it.

MR. EBERSOLE: I would like a more precise example. I had the privilege of examining your Unit No. 1 DC power system, and I observed that it met in fact the regulatory minimums. And you could say "Doing it right" is merely meeting those minimums. Or you could say "Doing it right" is in fact exceeding those minimums -- in your own interest as well as the public's -- making the functions of such a system better than it had to be on a minimum basis.

I presume you have an operation ongoing someplace that looks at matters like that. And in fact, you might have in the interpretation of "Doing it right," doing better than the regulatory minimums.

MR. CLARK: We do have that. And I find it very hard to explain, and I think perhaps it is because we don't have -- the industry and NRC doesn't have a level of safety defined in a quantitative way so that I can say we said we wanted to be twice as good, for example. I don't have a quantitative way to describe that to you.

What we do have, we do have a policy for everybody which says, "The first responsibility you have to us is to decide what is needed and proper for safety. We want you to write that down, and then also write down whether it meets or how it meets the regulatory guidance separately." So we are trying to create the environment where everyday everybody has to think about that question.

We are also proceeding to have an internal reporting system so that events which are not reportable as LERs, which does not, as presently defined, cover all of the classifications we are interested in, are reportable and are followed up from an engineering standpoint.

And we have these functions down here, which I will describe a little more broadly, where people have the charter of going to look for things that we ought to be doing from a safety standpoint that we are doing or not doing properly.

MR. EBERSOLE: Under the present circumstances, I can imagine that you must be snowed with meeting some of the regulatory impositions.

MR. CLARK: We are. We are nonetheless putting in place and doing things which we think should be done which are not part of what is required.

MR. EBERSOLE: Thank you.

MR. WARD: Can I comment on that, Mr. Clark? I think the members are misunderstanding what you were driving at there with your first point. I think it is a very important one. Let me see if this -- this is what I think you mean: I think you are trying, by explicit management policy, to reinforce in all of your line organizations, no matter what their function, that it is their responsibility to do the job right and not depend on audits or oversights from other groups, even though you have those.

MR. CLARK: Yes.

MR. WARD: The responsibility is really on the line organization to do it right without any expectation that they are going to be audited.

MR. CLARK: Absolutely. And if the reviews start finding that it comes to them inadequately, it is supposed to go back and be done over, as opposed to having the review group fix it. I think you said it very, very well.

MR. BENDER: I would like to follow on to Mr. Ward's inquiry for a minute. I, too, think the approach is probably fundamental to a successful operation. But I would like to know more about how this nuclear safety assurance department interacts with those people that are told to "Do it right." Can you tell us something about that?

MR. CLARK: Yes. Let me continue and say what the role of nuclear safety assurance is. They have a headquarters staff, and these would be technical professional, fairly experienced people, but not large in number -- perhaps four to six people -- whose responsibility is to overview the safety performance of the organization and who have no assigned tasks. So you can't find anything in the ANS standards or the reg guides or procedures which say you have to look at every one of these or eight of those or you have to sign off on this.

They have assigned responsibility, but no assigned tasks. So they are free to go look for some of the kinds of things we have been talking about, and decide that we ought to be doing a walkdown of our systems to see under seismic conditions what non-safety systems could interfere with safety systems.

The nuclear safety assurance department has reporting to them the site safety groups, so they have the responsibility to oversee that those site safety groups who are providing this kind of review at each site are performing properly. They have an ombudsman, and we in fact have the guy in place, and we have had two things brought to the ombudsman. And there is a policy that anybody in the company who has a safety concern that they don't feel is being addressed can come up confidentially to the ombudsman. Both of those had some merit. It wasn't overwhelming, but it wasn't clear that they were being dealt with properly by the organization, and we dealt with them.

And they also -- and I think, very importantly, when I get down to the general office review board -- they provide a staff support for general office review board so that our ACRS, if you will, has got some staff that keeps stuff flowing and gets stuff prepared for the review board meetings. That is something that has not always been effective in the past and we think is very important.

MR. BENDER: Let me try again to explore what you are saying. If I look at the first bullet as opposed to the first bullet there in the upper category, it says "Obtain needed reviews." And if I look at the nuclear safety assurance department, I would presume that one of their functions ought to be to review something.

MR. CLARK: This "Obtain needed reviews" refers not to reviews by any of the safety groups, but to review by other line functions. For example, get quality assurance review where appropriate; get radiological review where appropriate. So that the line function, let's say, the plant staff preparing something, is responsible to go get the other divisions in the companyto review it where appropriate before it goes for this review (indicating).

MR. BENDER: Let's go back to the first bullet. There is a nuclear safety assurance department. Does it have any say in whether things are being done right?

MR. CLARK: Yes.

MR. BENDER: How?

MR. CLARK: The site safety group reports to nuclear safety assurance department, and the site safety group is responsible for prior review of certain categories of items or after-the-fact overview of others and for observation and surveillance of the whole operation on site and for seeing that they are done safely.

MR. BENDER: Is that their channel of information; the nuclear safety assurance department's channel of information is through that group? Is that what I understand?

MR. CLARK: That is one major element. The other is what I call the "headquarters staff," and perhaps that introduces some of the confusion. The headquarters staff is not assigned to a site. But they are supposed to be out there a good deal of the time looking.

MR. BENDER: People keep saying that they are talking about quality assurance but I think that is kind of a narrow context, that there should be freedom for the people that have responsibility for performance assurance -- I will use that term so it will be broader -- to look anywhere and talk to anybody. And I am trying to find out how that nuclear safety assurance functions in that capacity.

MR. CLARK: The group on site has the full access, explicitly labeled here. And second, although not labeled on this chart, the headquarters staff has that access. And third, there is access the other way in the ombudsman for anybody to come to them.

MR. BENDER: Thank you.

MR. MOELLER: Is that about to wrap it up, Mr. Clark?

MR. CLARK: I would like to finish very quickly.

Our general office review board reports to the president. It is a board. We have a full-time chairman, who is a very senior person. It has outside members. I think out of an 11-man board, there are five outside members for each board. Now, we have one board for each plant, Oyster Creek, TMI-1, TMI-2, with a good many common members but a few different members because some of the problems are a little bit different and the expertise in boiling water reactors, for example, is different than the expertise for Unit 2.

And a broad charter is to look at the broad functioning of the safety review process, to assess quality assurance program adequacy. It has no other assigned tasks, although it has the broad responsibility of looking at everything, and our experience is they are looking at everything from personnel selection to the details of the widgeting in the shutdown circuit.

And they have access. They report to the president. They have access to the chief executive officer on the board if they should so desire.

That is the end of the planned presentation.

MR. MOELLER: Any questions for Mr. Clark? Any additional questions?

MR. MATHIS: The staff has a draft document out, NUREG-0731, Guidelines for Staffing and Technical Resources for Utilities. Do you feel you are conforming to that guideline as it is now written?

MR. CLARK: Yes. Basically, if I go back to the last chart, we think we meet the requirements for safety review and staffing in this particular area about here (indicating). And essentially, what is below there, not 100 percent, but in greater part what is below there is something that we have and have wanted over and above what is specifically required.

MR. MATHIS: Thank you.

MR. MOELLER: Mr. Chairman, I think this might be a good place to take 10 minutes.

MR. PLESSET: I am sure the members would be grateful.

(Brief recess.)

MR. PLESSET: The meeting will come back to order.

Moving on with the agenda, as Mr. Arnold pointed out, the next two items are: human factors review and the LER operating experience reviews. For that we have Mr. Broughton.

MR. BROUGHTON: I want to speak about a piece of the organization which accomplishes control and safety analysis work, LER review, and also speak about a human factors review project which we have accomplished. There are two particular items which I will address. One is the capability of the organization to provide continued attention to small break analyses. The second piece is to review the operating experience of various power plants.

(Slide)

This is a department within technical functions, the systems engineering department. There are several sections within that department. One particular section of the department is the systems analysis section. And within that group safety analyses, plant transient analyses are performed by one section. Plant analysis is performed by another section, and that includes the LER review program. And the human factors engineering feature of the organization is also part of that section.

The safety analysis work we are performing involves use of computer codes run in-house by in-house engineers and, in particular, codes like the RETRAN code developed by EPRI. That is used by us to study specific transients on our power plant to evaluate design changes, to aid in developing operator procedures or information for operator training programs.

We also use other analysis tools such as risk analysis tools, including fault trees and event trees, safety sequence analysis tools. That has been expanded to about eight engineers over the last few months. It will enable us to do more of this type of work in-house.

The second group I will discuss, the plant analysis group in the LER review, is a group which is reasonably new. There is a program underway which does evaluate operating experience from other plants by reviewing LERs, test of primary review mechanisms. But there are also inputs that particular group uses. There is a B&W program to assess transient response on other B&W plants. That is an input to that review process.

We are involved with some of te work that both INPO and INSAC are setting up to provide industrywide reviews of this information. And the notepad system maintained by INSAC we found to be a very useful piece of information for this kind of review work.

The additional tools we would use, or information sources, would include the nuclear power plant operating experience, vendor letters which come in to us.

Those are the comments which I had on those two particular functions.

MR. MOELLER: Any questions on those items?

(No response.)

MR. MOELLER: Okay, let's move ahead.

MR. BROUGHTON: We have in progress a review of the TMI-1 control room. It was started in February of this year. The review is being conducted by a team made up of members from GPU, the technical staff of GPU, operating personnel from TMI, a consulting firm, NPR, and two experts in the human factors field who provide us with specific expertise for conducting the review.

(Slide.)

The major elements of the review include developing guidelines and objectives for conducting the review. We constructed a full-scale mock-up of the TMI control room., which included all of the control panels which were of import to the operators in executing the operating and emergency procedures.

The main mechanism for evaluating the control room was a controlled walk-through process in which experienced operators walked through evolutions that would be performed in the control rooom, and the suitability of instrument and control layouts arrangements were evaluated using this walk-through technique.

Following the walk-through, each of the individual control panels was also reviewed to look for some of the more specific details of instrument layouts to insure that spacing and labeling and arrangements and so forth were also proper.

There is a separate review of the alarm system, the main enunciator panels within the control room to evaluate ways of enhancing their usefulness. And the review also included a review of the environmental conditions within the control room.

(Slide.)

We found that the existing control room reflected quite a few strengths which were the result of careful design process which was initially used the walk-through mock-up process. Most of the controls and displays were well-grouped. There was not an excessive number of controls and displays on the panel. There was a good division of responsibility between control room operators and operators who are normally stationed outside the plant. We looked, in particular, at how well the control room components performed, and we found that the hardware which had been selected originally was quite reliable.

There was a general coordination between the alarm and the control sections of the control room, such that if an enunciator did illuminate, the controls the operator would need to use based on that enunciator were located in good proximity to it.

Generally, we found that the bulk of the problems in the control room were ones that resulted not from inadequate design initially but from addition of modifications to the plant throughout its lifetime.

MR. WARD: The last item there, Mr. Broughton, the general lack of actuated alarms, that is from the prior experience with operating TMI-1. Can you be quantitative about that?

MR. BROUGHTON: Yes. The design of the alarm system was such that at full power all of the enunciator panels should have been dark, unilluminated. And by previous operating history, in fact, we found that there were perhaps only half a dozen or so of these which might have been illuminated during operation of the plant.

So the general concept of having a dark alarm panel and then when an abnormal condition occurred to have that illuminated was one that had been executed.

MR. WARD: Half-dozen was typical during normal operations?

MR. BROUGHTON: Yes.

MR. EBERSOLE: In plants of your vintage and even much later, visual information coming to the control room was categorized as of non-safety grade in quality of information and, in some cases, nonredundant and did not have redundant power supplies, et cetera. The cable groupings were even all lumped together.

What, if anything, have you done to compensate for this general low grade of visual information that prevailed prior to TMI-2?

MR. BROUGHTON: One thing we are looking at in the control room review is the ability of the operator to get information from diverse sources so he can validate various key parameters.

MR. EBERSOLE: Even though the individual sources may not be all that reliable?

MR. BROUGHTON: It turns out that, as a result of some of the changes we are making to the plant, we will be providing additional instrumentation. As that is added, we are assuring it is reliable as possible and does come from a diverse source and is separately routed. So the chances of losing the instrumentation he would need for monitoring and control of the plant are being reduced.

MR. EBERSOLE: That means you have a new set of instruments which you have so upgraded on the boards that are different from the old set which were not of that caliber. How are you showing any differential in a differential sense which are the good ones versus those which are simply incidental instrumentation for the operational process?

MR. BROUGHTON: I don't think we determined that the ones we had in the control room are not adequate. What we are doing is providing additional instruments which could be used in the case of failure of the first set.

MR. EBERSOLE: Backing these up.

MR. BROUGHTON: Yes. And also displaying them so that not only the control panel operator can see them, but so that the supervisor can see them.

MR. EBERSOLE: Are they intermixed with the present instrumentation or set aside in their own right?

MR. BROUGHTON: Eventually, they will be set aside in their own panel. In some cases, we are adding new instruments in the existin panel, and that is being done by rearranging the instrument array so it is an integrated display rather than one that has had things added to it and obviously stuck on.

MR. EBERSOLE: Thank you.

(Slide.)

MR. MOELLER: I presume the next slide tells us what was wrong with the control room? You have told us what was right.

MR. BROUGHTON: This indicates are that we are attempting to improve in the control room. The first is labeling and outlining. I think this is a problem typical of control rooms of this vintage. We have a program underway right now to construct new labels which are much more visible, which move the label of the component from the actuator button, whereas it is typically placed to a separate label on the control panel to make it more legibl

Those of you who are familiar with the EPRI work done in this area would recognize many of the things we are doing is similar to those, grouping instruments and controls together by use of demarcation and orderings.

A second area where we are making improvements to the panel is in the arrangement of the controls and ind'cations for the emergency feedwater system. This is a typical case of where the existing layout was adequate. But due to changes being made in the system, in order to keep an adequate display in the control arrangement, it is necessary to make modifications to t'e control panel.

The third item, readability of the safeguards status panel. This is an item which we are working on to make it easier for the operator to tell at a glance the status of what his actuation systems are. And this again is a case of where modification is being made to the safeguards systems. They are requiring us to go back and make sure that the information, as we will display it after the modification, is useful and unambiguous to the operator.

The alarm prioritization and acknowledgement. In addition to the longer-term study we are doing on alarms, in the short term we are doing things to highlight certain alarms which may be of more importance to the operator and require his immediate attention.

The existing alarm panel has things which could be considered both alarm and status indication. One thing we are trying to do is separate those out so that it is clearly evident which are the alarms and which are the status.

MR. OKRENT: In the accident at TMI-2 there was a time, if I recall, when more information was coming through the computer than they could handle. What is the status of the computer at TMI-1?

MR. BROUGHTON: The computer at TMI-1 has had some modifications made to it to deal with the potential backlog of printed material coming out of the computer, which was the real problem with TMI-2. The computer itself internally was able to keep up and didn't lose information, but it wasn't able to display that information in hard-copy form to the operator.

We have increased the speed of output devices to preserve the hard copy. But on both of the systems there are other ways to extract information from the computer independently of the hard-copy output, so the operator does have immediate access to any information that he desires from the computer. That is both through CRT and other displays that can be driven by the computer.

In addition, there is a program underway to upgrade the entire computer system at TMI-1 to replace it with a more modern computer with greater capability.

MR. BENDER: I assume you are reworking procedures as well in this program. Has there been any effort to take the procedures and see whether the symptoms that are required to apply the procedures are properly correlated on the control panels in any way?

MR. BROUGHTON: Yes, sir, there is. That is one thing the walk-through was helpful for identifying. And I will speak later today about a program that we had to take symptoms and direct operators to take actions.

MR. BENDER: Thank you.

MR. CARBON: I am not sure what your walk-through implies. Let me ask, in this activity do you assume different kinds of accidents of different severities and then follow through analytically what would happen, which instruments would be activated, whether some would be masked out, too much noise, too many things for the operator to comprehend? Do you follow through simulated sequences of accidents?

MR. BROUGHTON: We do look at accident sequences, and some of the accident sequences we have looked at -- for example, multiple casualties, perhaps a fire in addition to some other upset in the plant -- we didn't ahead of time generate sequences analytically and impose those on the operators. Instead, it was a walk-through of symptoms which would exist if these various conditions were present in the plant.

Through the walk-through, we were able to determine what the operators would be consulting to try to gain information about the plant, where they would have to go to get that information, where they would have to go to act. That was the primary purpose of these walk-throughs.

MR. CARBON: Thank you.

(Slide.)

MR. BROUGHTON: The last item is the process we are going through to make changes to the control room. Since we noted that many of the control room problems were due to improperly making changes in the past, we thought that it was important that in correcting deficiencies we found in the control room, that they were well evaluated before they were implemented.

The general process I have described here, where there may be one or more conceptual designs of how to fix the human factors problem that we find in the control room, we would construct diagrams which would indicate how we would rearrange the controls and use those on the mock-up.

The revised parts of the panel would then be walked through with operators again going over many of the same procedures which identified that there were problems in the first place. So we would now be evaluating the control room as it would be after the design change.

We found that this is an iterative process. We have not been able to produce the design change first without the walk-through. So this goes on until we are satisfied that what we have produced is in fact an improvement.

. MOELLER: Any more questions for Mr. Broughton?

(No response.)

MR. MOELLER: There being none, we will move on to the next item on the agenda, which is the coverage of the training program that GPU has instituted for the various people working at the plant. And Dr. Long will be covering that.

Dr. Long, since you are a former professor, I am sure you can modify your lecture presentation to any length we desire. So five minutes would just bring tears.

(Laughter.)

MR. LONG: I would like to highlight the handouts that I gave to the committee.

(Slide.)

Basically, GPU Nuclear has made a very strong commitment to the training and retraining of personnel throughout the corporation. They have done that by establishing a position of director of training and education for the corporation, which is my present assignment. That position reports to the vice president of nuclear assurance.

Under the director there are three training departments, one at TMI, one at Oyster Creek, and one at the corporate level. Those are headed up by people with training backgrounds. In particular, at TMI the manager of training is a former professor at the University of New Mexico. I have to admit that I recruited him away from there, having brought him on the faculty when I was chairman of the department.

We have increased the size of our training department from about seven before the accident to approximately 50 people at the present time. The operator training session consists of 13 people distributed between licensed operator training and nonlicensed operator training. These would be the auxiliary operators, mechanics who are in the chain, in the pipeline, if you will, for preparation to become licensed operators.

The training facilities at Three Mile Island have been improved to the extent that we brought in additional temporary trailers that are giving us the room for the large number of classes which we are now teaching in many different areas as well as office space for the constructors.

The company has made a commitment to provide a training facility near site early in 1981. We have two alternatives. One is the purchase of a college building, and we are in the process of negotiating whether or not that will happen. The second would be the construction of a new building very near the site.

The effort in simulator training has gone forward, and we presently use the B&W simulator at Lynchburg for our simulator training. We are closely monitoring that simulator training by sending our staff people from both training and technical functions to the B&W site when we have people in training. We have done that with a recent group of replacement operators for all of the eight weeks. We have had a few days' observation of that activity. We have been feeding back to B&W changes that we think need to be made in the program as well as keeping a license foreman from the plant at the site at the B&W simulator all during the training to closely tie the experience at the simulator to that of the plant.

The corporation has also made a commitment to the purchase of a replica simulator for TMI. We are presently talking to vendors for such a simulator, and we expect to proceed with preparation for acquisition of that simulator in 1981.

MR. WARD: There are two reactors, two different control rooms. How are you going to handle that with the simulator? Which are you simulating?

MR. ARNOLD: I think the only thing we can say at this time is that the eventual recovery of Unit 2 is still an open issue. It is not one we will even probably be able to address until '83 and '84. We really haven't considered that.

MR. MATHIS: This outline, I gather, pertains only to operator retraining or training. What about maintenance personnel, do you have a training program there?

MR. LONG: Yes, sir, we do. The reason it pertains only to operator training is that that was the subject asked to be addressed by the subcommittee.

We have an ongoing maintenance training program both for initial maintenance personnel as well as retraining. The maintenance people are on a six-shift program, and one time in six weeks they are in training for one week. During that time they get training like quality assurance, radiation safety, as well as the various maintenance activities that are involved.

MR. MATHIS: Do they get part of the advantage of this lecture series so that they understand the systems?

MR. LONG: Yes. That is correct. Yes, they do get systems training as well.

MR. EBERSOLE: I want to ask two questions that may extend your five minutes a little bit. There are two worlds of training. It is what you tell the operators to do and what you tell them not to do. The latter one has been largely ignored in the business, so they have a great deal of freedom to do the wrong thing, like what was done at TMI-2. Are you enhancing greatly that aspect of operator training that says, "Do not do the following things"?

MR. LONG: Yes, sir, we are trying very hard to do that. Our operators have been through what we call the "operator accelerated retraining program." One aspect of that program was a one-week course in decision analysis. The basic thrust of the decision analysis course was to instill in the operators the attitude of stepping back, considering what was happening, considering alternatives before they took action, and from that evaluating what was the right decision or the right action. That is one of the ways of doing it.

MR. EBERSOLE: So you are enlarging on that field of instructions which has been largely nonexistent.

The second is: If you take your emergency instruction books, usually printed in red or some such thing as to show them as being very important and look at them carefully, you notice from time to time as you go through them there will be a call-out to the operator to verify that something happens when he loses the first stage of some function.

What I have found missing in the training manuals is, having looked at this portion of the instruction manual and verified, there was no further instruction if in the verification process he found a given service was inactive. In short, he was left off at that point, and that was based on the thesis that the single-failure criterion would always work and the operator would always have the prerogative to say to you, "I don't need to go any further than that, because it will always be there." In fact, many took that position that you have no right to claim that when you came to that point in the instruction manual, when you verified, you would not find in fact that everything was as it should be. What are you doing about that? That represents a potential several stages beyond just verify that. It is impractical to go all the way out, but you have to go to some level.

MR. LONG: I think the anticipated transient operating guidelines that Mr. Broughton will address later, those really focus on that, giving the operator some guidance as to what the symptoms are, what things he ought to be looking at, and if he doesn't see what he should, where does he go and what kinds of questions should he ask next.

MR. EBERSOLE: You mean beyond the normal degree of failure?

MR. LONG: Yes, sir.

MR. EBERSOLE: Thank you.

MR. MOELLER: Go ahead.

MR. LONG: I want to point out that we had a one-week instructor training course that all of our permanent staff are participating in. In fact, some of our contractor staff have also been in that course. We focus on a strong emphasis on understanding what the behavioral learning objectives should be for particular types of training.

This is, quite frankly, new to many of our instructors, to identify clearly what it is that the operator or the maintenance person or the rad technician person should be doing, should be able to do at the completion of training. And thereby we hope to focus and use our available training time efficiently by giving that entire focus as part of our training.

The on-the-job training area, I would also like to comment on that, in that that has been an area that has been weak in the past, and we are presently working with the operations personnel to find ways of effectively monitoring that on-the-job training. It has varied greatly depending upon the enthusiasm of the particular shift supervisor and shift formen for training. And we are developing some control methods that we think are going to greatly improve the overall quality of on-the-job training.

I would like to say one last thing: that in terms of how we have gone beyond the regulations. The regulatory requirements for retraining are for 60 hours. With our operators in a one-week-in-six training cycle, they receive about 240 hours per year in that retraining program.

MR. MOELLER: Thank you.

Mr. Shewmon.

MR. SHEWMON: You divided the world into operators, maintenance people, and radiation specialists -- my words, not yours. There are a lot of different types of systems to maintain. When one is appointed as an maintenance technician by you people, does he now maintain everything? Or how do you break down, say, electrical instrumentation, mechanical, or whatever?

MR. ARNOLD: Our classifications include electrical maintenance, instrumentation and control maintenance, a mechanical, a machinist, and then a general utility classification. So we have those five different classifications of maintenance personnel. The training programs are tailored to the different classifications.

MR. SHEWMON: So when someone is called out at 4:00 o'clock in the morning, and the guy goes down and says, "This guy has the least amount of overtime, so he is the one we have to call in to look at the instrumentation and control package," he will have been certified on all instrumentation and control packages and, therefore, you feel will be qualified to take care of whatever he had to be called in for?

MR. ARNOLD: The issue you bring up is a very real one for us. What our experience in the past has been is it becomes more a matter of economy than anything else, because we call out the low person and then we call out the one that also in fact is qualified to do it. And Mr. Clark mentioned in his presentation the adaptation or the adoption, putting into place of personnel policies that apply to nuclear activities.

The specific problem you are identifying is one that we will be issuing or we will be addressing in the negotiations that we will be doing with our bargaining unit people in getting the kind of flexibility and specificness to the assignment of people to tasks that we need.

But I think, pending that completion, it is more a matter of the economic impact of it and not the safety, because we end up calling out a person who can be trained additionally and the person who can do the work.

MR. MOELLER: Any other questions for Dr. Long?

(No response.)

MR. MOELLER: Thank you very much.

We will move on into the technical issues. We have seven different subjects that we are going to try to cover in the next hour and a half, and the first of these is hydrogen.

MR. ARNOLD: I would like to suggest, for flow of the presentation, that we pick up item G up first, and then item C, both of which will be handled by Mr. Broughton, and then we will pick up the remainder in the sequence they are presented.

MR. MOELLER: We are doing G and C?

MR. ARNOLD: Yes.

MR. MOELLER: These are the ATOG pressure/temperature plots and the reactor vessel water level indicator.

MR. ARNOLD: While Gary is going up there -- in further response to the question on the procedures as to "Suppose the action isn't there that is asked to be checked for," for our procedures on inadequate core cooling specifically, the procedures have been expanded to say, "If it is not there, then do this," so that there is not that sort of assumption of the right answer.

MR. BROUGHTON: The abnormal transient operating guideline program is an attempt to satisfy the NUREG-0578 requirements to look in more detail at different transients, providing realistic assessments to be used for a training and procedural basis. We are participating in a program jointly sponsored by other B&W owners which develops both guidelines which can be converted into procedures for a plant, and it also develops a training package which explains how to use the guideline, how plants should respond to these various transients, and how the plant may respond if there are other abnormal conditions that exist during the transients.

There has been one set of these guidelines developed for the Arkansas plant, and most of the comments that I make today will be based on those TMI-1 specific guidelines are being developed but do not yet exist.

There was a human factors input into these guidelines in helping us determine things like what level of detail is appropriate in helping us evaluate the guidelines on a simulator to make sure that they were really useful in addressing problems which the operator might be expected to face.

A guideline that results from this work would be executed each time the reactor tripped. From that standpoint, it is a one-for-one replacement of the reactor trip procedure. It has instructions in it based on key symptoms within the reactor plant, things like reactor power, temperatures, pressures, flows. Based on whether those symptoms are normal or abnormal, specific actions will be directed for the operator. It is not necessary for the operator to understand at the early point in this guideline exactly what event has occurred so that he can deal with it properly. That is in constrast to the existing procedures which are most frequently used, which are event-oriented procedures such that the operator must decide ahead of time what event he has before he can pick up the procedure and find the guidance to deal with it.

The symptoms in this procedure are arranged, however, to allow him to be diagnosing what the event is at the same time he is treating the symptoms. There is a prioritization in the response, in that if several different events have occurred, he will be treating the ones with the greatest potential for adverse consequences first and the ones of lesser importance later on.

MR. WARD: How is that priority established? In the training?

MR. BROUGHTON: It is established, first of all, technically by the analyses that went into making up the procedures. There was an extensive analysis based behind the procedures, and then it is established in his training, which is the training package not used as part of the guidelines. And third, it is an effort to be established in the guidelines themselves.

MR. EBERSOLE: Is he helped in that process by CRT printouts that really follow the recipe?

MR. BROUGHTON: He can be helped. And I will have an example that shows how he might be able to use these guidelines. The procedure is capable of detecting combinations of malfunctions. It is not limited to dealing with one specific event at a time. If two or three events should occur simultaneously, the capability is within the procedure to deal with those.

Once the specific event has been diagnosed, then there may be a different set of instructions which the operator follows to deal with it. For example, if the event were a tube rupture, then there is an appendix to this procedure which gives him specific instructions for dealing with the tube rupture event.

There is a very important aid which is used to help the operator follow the procedure and ask various questions which are posed by it. It is a very simple temperature plot used to evaluate three particular conditions, one of them being a loss of subcooling, a condition which could occur because of a loss of coolant accident, an overcooling event or a loss of heat sink event.

I have some examples of how this pressure/temperature plot works that I think will help show the use of that and also explain a little more about the procedure.

MR. MOELLER: Perhaps for these we ought to turn all of the lights off, because they are rather dark.

(Slide.)

MR. BROUGHTON: This explains the basic temperature plot used. There is a plot of primary system pressure versus hot leg temperature. The saturation curve is that determined by the steam table. This range marked "expected" is the condition that the plant should wind up in following the trip if there are no malfunctions.

So if I design this, that the plant should stabilize in this condition, the plant may be in some other regime on the plot at the time of the trip, but the trend of this plot of pressure versus temperature should be in the direction toward the expected range.

MR. SHEWMON: Is this something the operator sees on a CRT, or is this what you use to teach them, or what?

MR. BROUGHTON: This is used for teaching. It is the concept. I will show examples of what he would actually see on the CRT..

(Slide.)

The second piece of the diagnosis is very similar. Here we look at steam generator pressure and compare that to cold leg temperature of the coolant out of the steam generator. Again, there is an expected range and a characteristic trend for normal operation. This is also the saturation curve. Basically, what this plot tells you is how efficient the steam generator is in transfering energy out of the primary coolant.

(Slide.)

Now, combining the primary plot at the top and the secondary plot at the bottom, we can look at the trends expected for certain abnormal conditions. This is the type of trend you would expect to see if you saw a loss of coolant accident in which pressure continues to decrease, and it may decrease down to the saturation curve or even below.

(Slie.)

This trend is typical of a loss of heat sink event in which there is abnormal heat removal from the primary, and the result is that the temperatures n the system will heat up and the trends will be to the ri ht. The downward trend here is typical of losing heat removal in one steam generator while temperature is still being controlled by the other. You would note there would be a pressure decrease in the generator which was inefficient. Any trends off in this direction are indicative of the loss of heat sink.

(Slide.)

The third would be overcooling, in which temperature is reduced down below the expected range on both the primary and the secondary.

(Slide.)

Now, the next few slides were taken from some work that GPU has been doing to use this technique for training operators and also to evaluate how it may be used in the control room to present this information in real time during a transient.

What I have plotted here is the same pressure/temperature plot we have been looking at with the two expected ranges for primary and secondary. These additional lines on the plot help to further define these areas. The green region being the overcooling, anything to the right or below this magenta line would be the loss of heat sink, and violation of this red dashed line would indicate a loss of subcooling. So the typical trends for abnormal conditions would also be reinforced by the location of the data on the plot.

This list over here indicates the major steps of the abnormal transient operating guideline procedure. There are a series of questions asked by the procedure; and to answer some of these questions, these latter few, for example, this plot becomes particularly valuable.

What I will show you is actual data from the TMI-2 accident plotted using this accident, and indicate how it would be addressed by this abnormal transient procedure.

(Slide.)

MR. BENDER: I think we are not too clear. There is a red line and a blue line and a magenta line. What are they intended to plot? Are they plots of --

MR. BROUGHTON: The blue line that cuts diagonally is the saturation curve. The red line above it is some minimum margin above the saturation curve. If I go below the minimum margin, then the operating procedure will require that the event be considered as a loss of subcooling or a LOCA event and action taken that is appropriate for that event. So this region keys me to use that feature, that section of the procedure.

The magenta line indicates a boundary of normal heat transfer and heat removal to the left of that line, abnormal if I am to the right of that line or below that line. So if I wind up in this particular region here, that keys me to use a separate part of the procedure to deal with that particular abnormal condition. The green line here indicates I have overcooled the primary, excessively reduced the temperature. There is a section of the procedure which tells me what to do if those conditions arise.

There are two other reference lines on here. The 2500 line is simply the safety, primary safety system set points. It is another limit which should not be reached during normal operation. The 600 line is an automatic steam isolation line which would activate a system which would isolate feedwater to the steam generators.

The procedure can also deal with events that occur in those regions. I would be concerned primarily with the subcooling line and the loss of heat sink area.

MR. MATHIS: The operator will know what all those lines mean from his training?

MR. BROUGHTON: He knows what they mean from the training, and he knows what the trends mean from the training. We have had actual experience with training of TMI operators. We have introduced this method to them. It has been a method which they have been able to learn quickly. They found it very useful. And in fact, they can use this to diagnose events in real time.

MR. SHEWMON: How often will an operator in routine operation be using that plot?

MR. BROUGHTON: This particular pressure/temperature plot would be displayed following a trip of the reactor, so that might be in normal operations seldom. However, through the training program where he is trained on what to do following events like that, he would probably be exposed to this quite frequently.

MR. LAWROSKI: In the Three Mile Island accident, can you find on that curve where one would have been for what duration?

MR. BROUGHTON: The next series of slides will show that. This slide indicates the data for the TMI-2 accident one minute after the reactor was tripped, so the primary trace has gone up to the SCRAM set point and begun to drop down -- not atypical yet. The steam generator trace has increased in pressure and temperature.

MR. LAWROSKI: Do we have a flashlight that could be used instead of the pointer?

MR. BROUGHTON: The primary trace is in the upper part of the picture. First increase is to the SCRAM set point and then begins to decrease. The trace in the lower part of the picture is the steam generator trace, and that begins to increase in pressure and temperature, and at the end of one minute it is here -- it has moved to the right.

Now, from this point on, for a normal transient, what we would expect to see would be the steam generator trace moved to this lower blue box, and the primary trace would move to this upper blue box.

MR. EBERSOLE: It would help to have arrows on your curves. That represents timespan.

MR. BROUGHTON: Yes. We are looking at things like arrows or tick marks that mark intervals, or some other method of portraying the time response.

MR. LAWROSKI: How large of a display is he seeing?

MR. BROUGHTON: This was photographed from a 12-inch CRT. It could be placed on any size CRT available.

MR. BENDER: I think it tells you just from looking at the curve, it tells you what actions to be concerned with; that is, overcooling or overpressure or some such as that. Does it tell the operator what the accident really is?

MR. BROUGHTON: It tells him what it is if he winds up being in one of these abnormal regions. For example, if he ends up being in this region marked by the magenta line where heat removal is inadequate, that would correspond to a total loss of feedwater event, no emergency feedwater, no removal for high-pressure injection.

Now, there are many different combinations of events that could lead to a total loss of heat removal. Rather than calling it by the name of all the components that malfunctioned to get him there, it is termed generically by: this is a loss of heat removal event.

The first one he would see, he has inadequate feedwater flow one minute after the trip, and that would be based on no main feedwater flow and no emergency feedwater flow. There is a step in the procedure that should call his attention to that fact.

(Slide.)

Moving on to the next time frame, this is two minutes after the trip. Instead of the primary system turning and running over toward the blue box, it continues to decrease in pressure and it reaches the point of engineered safeguards actuation, which is this flag here (Indicating).

While that doesn't require any action from the operator other than to verify that the safeguards system has functioned, he is now starting to gget symptoms of additional abnormal performance

(Slide.)

At three minutes, the secondary trace, the lower trace, crosses over this magenta line, which indicates that there is inadequate heat removal from the steam generators. That has resulted from the inadequate feedwater, but it is now picked up by the information obtained from this plot.

There is a separate section of the procedure which would tell the operator what should be done based on the fact that he has inadequate feedwater.

MR. OKRENT: The lower line is a plot of pressure on the secondary against temperature where?

MR. BROUGHTON: Yes. The lower curve is steam generator pressure versus cold leg pressure, the primary coolant coming out of the generators. So it indicates there is inadequate transfer of energy from the primary system into the steam generator.

MR. BENDER: All he is looking at is the curve, I take it? He doesn't have that printout, does he?

MR. BROUGHTON: We would envision that this kind of a diagnostic tool would not be the primary plot used by the man who stands at the control panel. The basic reason is, we are only looking at four variables here. And in order to properly control the plant during normal operation or during upsets, you need to monitor more than four variables.

We would look at this information as information being provided to another operator in the control room, perhaps a supervisor, such that he has the perspective of whether or not the plant transient is normal, and if it is not where his particular problems are.

It may also be possible to implement an automated checklist like this via the computer to assist him in knowing which parts of the procedure apply. The logic required to evaluate these conditions is quite basic. It is very well within the capability of the computer system. So he could have both. He could have a plot and a checklist.

MR. OKRENT: The information going to this is not all safety-grade, is it?

MR. BROUGHTON: The information which goes to this plot would, of course, depend on the plants. At TMI some of the information that we would feed to the plot currently is safety grade. There are other pieces of information which would not be safety grade.

One of the questions we are addressing before implementing a method like this is what do we need to make sure that the data and display is adequately reliable to prevent the operators from taking incorrect action.

MR. WARD: How elaborate is the programming? You have three flags over there, three yellow items. Does that indicate that the latest point is outside the box or does it indicate something about the trend?

MR. BROUGHTON: We have not made up the algorithms to enable us to use this display. The answer is that it could be as simple as looking at the latest point, although we will see a point later in this transient where that would be an undesirable way to evaluate some of these conditions. In other words, trends and routes of change should be included in some of those algorithms.

(Slide.)

MR. BROUGHTON: This point at four minutes I display because it shows that pressure continues to decrease, and we have not violated the subcooling margin curve. There are four appendices to this procedure as it exists and there will be a fifth.

The appendices are tube leak, subcooling, heat removal. These appendices would be prioritized such that if you had a tube leak and some other condition, he would deal with the tube leak first. If he has a subcooling problem and a heat removal problem, he deals with the subcooling problem first.

This is the case of a multiple casualty, where there has been some forethought into which of those abnormal conditions should be dealt with first.

(Slide.)

This point at eight minutes shows the most extreme condition of the loss of heat removal in the steam generator, that is, the steam generator trace is furthest away from the saturation curve. It also shows that the primary system has come down to the saturation condition in the system. And as the temperature increases because of no heat removal, the primary system pressure also increases.

This was a fact that was confusing to operators by looking at those things individually, and when they are correlated like this it becomes clear as to why the pressure increased.

(Slide.)

This trace shows that as feedwater is admitted to the generators, as it was at eight minutes, that the system pressure began to recover in the steam generator. From here on out, the pressure trend in the steam generator would converge on this expected range.

(Slide.)

This shows that the steam generator is restored to normal performance, even though the primary remains in this inadequate subcooling region. These were conditions at about 20 minutes after the trip at TMI-2.

MR. MOELLER: Are there further questions on this?

MR. OKRENT: Is the report written which gives the details of the rationale for the establishment of the particular display, and then the way in which the operator is taught, or whoever it is that is taught, how to react to it?

MR. BROUGHTON: The B&W guidelines for Arkansas, all that material is available. There is also a report, a paper which GPU has prepared, which is a much more consolidated version of that, which we make available to you.

MR. OKRENT: I think it would be of interest to Subcommittee members to have a chance to look at that. I suggest we get copies of what is available.

MR. WARD: I would like to make a comment. This looks like a noble effort, a little elaborate perhaps. I worry perhaps more about the quality assurance of the software involved than the hardware, although that is a concern, too.

Have you thought much about that?

MR. BROUGHTON: Yes. First of all, the implementation of the procedure does not require that you use an automated plot like I have shown you. The procedure can be implemented without the use of that plot. It is simply required that the operator be able to answer those three questions posed by -- that are answered by the plot: Do I have enough subcooling, do I have too much or too little heat removal?

There are other ways to obtain those answers. The automated plot is certainly the easiest. As a backup to that, we found that the operators can manually plot that data, and all the data they would need to make those determinations is displayed in the control room. And on a plotting form pre-established with those limits on it, operators are able to plot that and draw those same determinations.

In fact, that is the method we used to teach this concept when we teach it to the operators.

We think we can implement procedures completely independently of having to have the CRT display.

MR. BENDER: You partially answered my question, but I will try to get it amplified a little bit. In the training program, how would you make use of this information? I think you pointed out that the operator doesn't necessarily have to rely on it. I guess I have to think in terms of what is he going to be trained to react to? That is the fundamental question.

I would like to get some insight from you now as to -- given that you have a new set of procedures that have evolved over the last several months, and now you have new kinds of displays that are available, how the operator is going to establish his first and second line of symptomatic diagnosis, whatever you want to call the thing, to know what to do?

MR. BROUGHTON: It turns out that, although this is a one-for-one replacement with the reactor trip procedure, because it covers many other events, it replaces many other procedures. So first of all, he can now approach the problem of transient response using a different procedural format.

Secondly, we have gone through training with the operators in periods of about two weeks' worth of work with the operators, in which we covered transients that they are used to covering, events like loss of feedwater and LOCA's and so forth, showing them how diagnosis by this method compares with diagnosis by other methods. So there has already been this new approach introduced.

And the operators themselves are now starting to categorize events which we give to them in training in terms of these three basic categories, which is a much more logical way to approach them. And it turns out that their actions are really based on the category of event now, rather than knowing specifically that a particular steam valve may be stuck open.

So that transition has already started, and when we get the guidelines that we are ready to implement at TMI that transition will be completed.

I shouild also mention, if I may, that in doing this training we rely very heavily on actual data from operating plants. We use simulations to some extent, but to the maximum extent possible we have gathered data from operating plants which shows normal and abnormal performance. And it has shown that this method is effective in diagnosing those particular malfunctions.

MR. BENDER: I don't challenge that. I was more trying to understand how the operator is going to do things. I would presume after he gets the event categorized, then he just has a sequence of events that he goes through.

MR. BROUGHTON: That's correct. If he diagnosed an inadequate heat removal event, there is a section of that procedure which says, given that you have an inadequate heat removal event, these are the steps that you take.

MR. BENDER: There are steps and there is the analytical process, and steps that would presume to be here operating actions that are done. But are there analytical questions that he has to address?

He has lost the heat sink. How does he go about determining what is interfering with the heat sink?

MR. BROUGHTON: Those are the types of things that will be put into the procedure, that says, these are the steps you need to take to get the heat sink back. Those would be specific to his plant. He should be looking to see if he has a feedwater system available and there is flow through the feedwater system.

MR. BENDER: I won't pursue it further.

MR. ETHERINGTON: The subcooling is in essence a temperature-measuring device, which is combined to give you some curves --

MR. MOELLER: We can't hear you.

MR. ETHERINGTON: I just said, the meter is one instrument and a steam table. Now, if you had to invoke such a thing as the feed-bleed process, we know that the process involves a suppression of primary fluid down to a certain low level, which may well be below the level that you have the subcooling meter temperature measurement.

Do you know where that level is? I am saying you might lose your signal.

MR. BROUGHTON: You might lose your signal on our subcooling meter.

MR. ETHERINGTON: And your signal goes to zero. Water is suppressed below that point.

MR. BROUGHTON: And the operator is instructed to use the core thermocouples in determining in lieu of the subcooling meter.

MR. ETHERINGTON: You have accounted for the potential blindness of the subcooling meter?

MR. BROUGHTON: Yes, sir.

MR. MOELLER: Any other questions on this topic?

MR. LAWROSKI: What kind of experience underlies the reliance that you can put on this? From some other reactor plant, whatever?

MR. BROUGHTON: All of the technical information used in deriving the procedures is technical information available from both plant operating experience and simulation. I think that is fairly sound and specific to this industry.

One of the things that the human factors consultant did for us was to help us evaluate this type of an approach, that is, a symptomatic approach to problem-solving. That is an approach which has been used in other fields, particularly in the military. There is a good history from these other fields that this is an effective way of dealing with problems.

MR. CLARK: To date, our reliance on this concept has been solely to help us develop improved procedures. We are now moving into using it to help train the operator to understand what happens.

We are not about to put a CRT in the control room for the operator to use during a transient instead of his normal instrumentation. After a while, we may well put a CRT for the shift technical adviser or the shift supervisor to look at while the operator uses the primary instrumentation. So we are going to feel our way into reliance on this thing.

MR. MOELLER: Why don't we move ahead with the pressure vessel water level indicator. Mr. Broughton, if you can do this briefly, it will help. I think we understand that this is a matter that is under debate.

MR. BROUGHTON: Yes. I think the slide and the handout summarizes the current status of this. We have not found the need to use the water level indicator in existing guidelines, and we are not clear on how we would use it if it were available in the guidelines.

We are concerned about being able to provide something to the operator which would be unambiguous and useful rather than confusing. However, we are participating in programs to review what can be done in terms of providing such a measurement device, and we are committed to look into these and work with, in particular, the other owners in the B&W group to evaluate promising alternatives. And we may get involved in additional R&D efforts ourselves.

MR. MOELLER: Questions or comments?

MR KERR: I am told by some who have looked at the St. Lucie incident, which involved some loss of coolant, that the operators there would have been assisted considerably had they had a water level meter.

Have you looked at that incident and convinced yourself, at least insofar as it might apply to your plant, that a level meter would be of no assistance in a similar incident?

MR. BROUGHTON: Yes, we looked at the St. Lucie event and, while I wouldn't go so far as to say water level indicator might not have been of help, it would depend on how you could install that. If you could get it up at the very top of the vessel, for example, it might be a help.

However, there are other ways to determine that you have voiding in the upper head of the reactor vessel which we believe are more feasible and less ambiguous, and that would be to use a temperature sensor to evaluate saturation conditions there, like we are evaluating saturation conditions in the loop.

MR KERR: Then you may be saying that a temperature indicator would be a water level indicator.

MR. BROUGHTON: It wouldn't indicate water level. All we would know is that we had some voiding in the head. We wouldn't know whether we had a very small amount or whether we had voiding almost down to the nozzles. It would be an indication of something of a less than full condition, but it wouldn't tell us how much less.

MR. LAWROSKI: What kind of magnitude of temperatures would you be observing if you were getting that voiding?

MR. BROUGHTON: As I understand the St. Lucie event, there was a fair amount of subcooling in the loops, perhaps on the order of 50 degrees or more, throughout the entire cooldown.

MR. LAWROSKI: I am talking about the use of temperature indicators.

MR. BROUGHTON: The loops were kept subcooled by 50 degrees or more, and the head had to be at saturation. So it would have had no subcooling in order to have given us the voiding. We are looking at a difference of at least 50 degrees between the two, which is well within the capability of the instruments to detect.

MR. EBERSOLE: Isn't the saturation meter, the temperature-measuring part of the saturation meter, isn't it in fact a level indicator which goes blind at a discrete level? You don't know -- once it passes that, if it goes to saturation, then that's all it knows. Beyond that, it has to be submerged?

MR. BROUGHTON: Yes.

MR. EBERSOLE: So it is a level gauge in indirect context.

MR. BROUGHTON: It has the limitation that it may tell you that you are not full in the system, but it doesn't tell you how far away you are.

MR. EBERSOLE: It has no sense that way, right.

MR. BROUGHTON: It is more of a yes-no type indicator than an analog.

MR. EBERSOLE: A level meter would be an analog.

MR. BROUGHTON: A level meter could be an analog.

MR. CLARK: I think one other thing on the St. Lucie incident is that our review shows that with the existing instrumentation and procedures the operator had everything he needed to decide what to do. That really underlies our position on the reactor vessel w[illegible] level.

And if you look at the first two items on the slide, it says, you don't use it in the guidelines of telling the operator what to do. And even if you had it, you couldn't tell him anything else to do. A review of the St. Lucie incident in our view confirmed that.

MR. OKRENT: I must say, I find it less than convincing to be told that a review of an event a day or a month or some months after it occurs shows one that there was enough information for the operator to know what to do. That is really not the issue, in a sense. The issue is --

MR KERR: Let me clarify his comment. I thought you were saying that the operators at the time knew what to do, not that they would have known what to do had you been operating.

Did I misunderstand your comment?

MR. CLARK: Somewhat. Let me clarify first.

I don't expect to convince myself or you on the basis of one event, one day. The only reason I alluded to the St. Lucie incident is that it is recent. A question was asked. And we had already made a review with B&W and our own people of TMI-2 and other incidents of which we are aware of general analyses of the plant, and asked ourselves for everything that we could postulate, is there enough instrumentation available to the operator to tell him what to do.

And we had concluded, based on all of that, that the answer was yes. St. Lucie did not change that prior conclusion.

MR. OKRENT: I will stay with my point. It is a hell of a lot easier for an analyst after the incident, when he sees it all in front of him, in the same way it is for a Monday morning quarterback to see whether he should have gone for a touchdown or a field goal, than it is for the operator during the event, when there is a complexity of things going on, and he may just be thinking along another line.

I think it is in that context that one asks himself, even if you think you have a system like this, which I think is not completely straightforward, might knowing the water level by some other way be of use or confirm something or be there when another signal is unavailable or whatever.

We have a history of instrumentation being there, but the operator not in fact having taken an action.

MR. CLARK: We don't disagree, but we feel we need to balance that potential advantage with the disadvantage of potential complexity and additional possibilities of confusion. That is a balance. Our judgment has come out on one side of that.

MR. EBERSOLE: I find it interesting to find us discussing the saturation meter in the absence of a level meter, against the narrow context of a theory that we have a pressurizer level system, one that we can in fact put water into and get some pressure in it and so control and maintain a saturation, a margin above saturation.

Suppose we have a condition where in fact we have lost the ability to pressurize, and now we need to know where the water is, so that we can cut off any one of X pumps, or else watch them quit, and still declare we're safe. I don't find then that the saturation meter is worth a nickel, and I need to know how much core cover I have. How am I going to know that?

I can't fill up to the pressurizer.

MR. BROUGHTON: Our guidelines would require that in the absence of a subcooled system that maximum flow through all the available pumps be maintained.

MR. EBERSOLE: So I lose X pumps. What do I do then?

MR. BROUGHTON: If you have already tried to isolate the leaks you have and you have lost available pumps, you have no more active equipment which you can start. You have all of your active equipment running, you try to repair pumps and you monitor the exit core thermocouple temperatures.

MR. EBERSOLE: You would declare that when I reach X number of pump failures, that is the point of calling out the emergency plan or something?

MR. BROUGHTON: I believe our emergency plan would have been activated well before that time.

MR. MOELLER: Any other comments on this subject?

MR. NOVAK: If the Committee wishes, we have about a five-minute presentation -- it could certainly be limited to that -- which might put into focus some of the staff concerns. It is one of the points where I would say -- it is one of the half dozen points where we do disagree with.

MR. MOELLER: We haven't heard from the staff for some time, so why don't we listen.

MR. NOVAK: Larry Phillips will make the presentation.

MR. MOELLER: I was going to comment a little bit, too. There is dispute as to the commercial availability or the status of the potential commercial availability of such instrumentation.

MR. PHILLIPS: Before you get frightened by the handout, I only intend to use the first page. The rest is just some information on some various level-monitoring systems which have been proposed and a table showing the general development status and so forth for your information.

MR. MOELLER: All right.

(Slide.)

MR. PHILLIPS: I just want to briefly address the whole concept of the staff review. The objective is to detect and respond to non-mechanistic symptoms of inadequate core cooling, without regard to how we got there or what is causing it.

It is indicated by core overheating, the core overheating, that could be due to a two-phase froth level below the top of the core or by local voiding due to flow blockage, a situation of the type at TMI.

The requirement is that we want to provide instrumentation to detect the approach to ICC by monitoring coolant saturation conditions and increasing void fraction for decreasing liquid level. Generally, we would speak in terms of increasing void fraction while the pumps are running, and we see it in terms of decreasing liquid level when we cu[illegible] them off.

We want to also detect the existence of ICC by monitoring the two-phase froth level below the top of the cool and increasing fuel temperature or coolant superheat. We also want to monitor recovery from this condition, if it should occur. That would be generally your flow blockage condition that we are talking about.

The information needs --

MR KERR: You say monitoring recovery would mean core blockage? I don't understand.

MR. PHILLIPS: Monitoring recovery from a condition in case it should occur. I am saying, if we think in terms of core exit thermocouples being an aid, for instance, it would be looking at a local flow blockage condition or a gross flow blockage condition, such as we had in TMI, where we saw the thermocouple temperatures come down. We would also see level rise.

Now, the information needs are twofold. GPU addresses only the first one, as a basis of operator action to prevent or recover from ICC -- I will come back to that.

Secondly, there is a reason for having the level information. This is to assist the operator and supporting emergency operations staff to assess the recovery progress from unidentified situations. Basically, we feel that a level measurement system definitely enhances the operational safety if you get into this type of condition.

It definitely gives you, not only the staff at the site but everywhere -- it is valuable information as to where you are and whether you are trending up in level or you are trending down, the situation is getting better or it is getting worse.

MR KERR: Can you give me an example of a decision that you would make based on knowing where the water level is?

MR. PHILLIPS: Yes. Possibly if you can't get the level up, whether to evacuate or not, if in spite of everything you do, you can't get it up. That is a rather gr ss one, I think. But if I thought for a few minutes I could come up with some better ones.

MR KERR: This is just an indication of whether there is water on the core, not an indication of the water level. I thought you said it was important to know what the water level is during the process.

MR. PHILLIPS: What the trend is, sure.

Yes, I can give you an example, that is really coming back to the second one, I think -- I mean the first one, the basis for operator actions. If you look at the B&W GPU guidelines, the guidelines are given only for the existing instrumentation, that is, using the core exit thermocouples. We have reviewed guidelines using similar instrumentation on other plants and have determined that those provide adequate safety for those plants to operate.

Now we get to the point of enhancement of the guidelines. GPU and B&W, of course, have not -- or anyone else, for that matter -- have not provided guidelines for recovery from ICC with level instrumentation available, because it is not there. Therefore, we question, number one, whether they themselves have taken --

MR KERR: I didn't make my question clear. I'm not trying to be critical. Since you have thought this through, you must have thought of some situation in which knowing the level trend would make you do something different than what you would do if you didn't know it. I am just asking for one example of something you do different.

MR. PHILLIPS: What I am saying is we h e not reviewed those types of guidelines. So the example I am going to give may or may not be a good thing to do.

MR KERR: I'm not asking if GPU has thought of it. I am asking what you would have thought of that you would do differently if you had this.

MR. PHILLIPS: The level right now, GPU calls for depressurizing using the steam generator, and also opening the PORV after the water level has fallen into the core, as depicted by overheating of the -- by superheat on the thermocouples.

I question whether, if the water level is falling, definitely trending down after you have -- number one, your first indication would be the saturation meter. Now, after you have gone saturated, if your water level is still falling, trending down, I question whether it wouldn't be wise to depressurize your secondary system earlier in order to increase your HPI flow, and in order to bring in low pressure sources of additional injections, such as accumulators.

So I don't think -- I think that you want to avoid, if at all possible, opening the PORV when your water level is already into the core. So I think there is a possibility, even though there are small breaks which will go to core uncovery and without -- by design, getting into an ICC type of condition, those events are so rare that possibly, before the possibility of ICC, you may want to consider depressurizing earlier.

MR. MOELLER: Does that answer your question, Mr. Kerr?

MR KERR: I don't see why, if you are going to depressurize before the water gets down that low, that the level indication would make you do anything differently. It seems to me that you are saying that with the existing instrumentation you would make a different decision than GPU proposes to make.

I am looking for --

MR. PHILLIPS: No, I didn't say that. With the existing instrumentation, you don't have an indication until you have fallen into the core. You have the saturation meter.

MR KERR: All right.

MR. MOELLER: Does that about wrap it up?

MR. PHILLIPS: One couple of other small points. I believe that the level indication definitely enhances your use of the vent system, if you ever go to use that system.

That is the top head vent. It definitely would tie into that.

I am not sure that the point was clear that, even if we agree with GPU that there are no immediate operator actions, that is, in his emergency procedures due to the inclusion of a water level system, that we still feel that that system should be provided for the second function here of information needs. Now, that is to provide the additional information on the status of the system.

MR. BENDER: Given that we or somebody agrees that you need level indication, there is a matter of urgency. We're going to license this plant, and I think the question we need to address is, does the licensing imply a level indicator before you start operating? I think that is a matter of practicality.

Is there a level indicator you could get if you needed it? Do you have an answer to that?

MR. PHILLIPS: To answer the first part of your question, our position has been that this plant is like other OL's. There is a date of requirement for level instrumentation. That requirement is January 1st, 1982.

Yes, we believe there are level indicators that are available which are at least sufficiently developed that there is high confidence that they will do the job.

MR KERR: I thought when I asked Mr. Ross this question at the Subcommittee meeting -- and the question I asked was whether there existed one that could be ordered, that would be approved by NRC -- that his answer was no. Perhaps I misunderstood him.

MR. PHILLIPS: I don't think I said anything different. In order to approve it, we need a great deal of additional test information.

MR KERR: The answer is, if a Licensee wanted to order one today, he could not order an NRC-approved one.

MR. PHILLIPS: That's right.

MR. BENDER: Given you could satisfy the other requirements and get ready before 1982, there would be nothing in the way of running this plant as far as level indication is concerned?

MR. PHILLIPS: That's right.

MR. BENDER: That's the interpretation I put on it.

MR. PHILLIPS: That's right.

I would want to make one more comment. The point on the thermocouple in the vessel head, that is a level indicator. It is at discrete axial locations. There have been experiments in LOFT which show that it makes a very effective level indicator.

MR. OKRENT: Getting back to Professor Kerr's question, there was a time, I have to assume, when people thought that exit thermocouple temperatures wouldn't be important to safety, or they would have done things differently than they did. I don't really think it would be too hard to develop some scenario where you would like to know whether the level was holding steady after you dropped somewhat below the top of the core, whether it was going down very rapidly or so forth.

I would suggest, if one set himself to find some scenario of this type --

MR KERR: I agree with you, and I assumed that the staff had gone through such scenarios and I was looking for one.

MR. NOVAK: I have been trying as hard as you to come up with something realistic. It is unlikely that we can follow a specific accident and pin down, okay, here is where a water level indicator would be of use. The thing that happens is you look at operating experience.

And I will take the case where you are doing some sort of maintenance on a steam generator and you have opened up the system and you are on decay heat cooling. And all of a sudden, all of your decay heat pumps become air-bound. Now you are sitting there with an open vessel and no way of putting in water.

It took you a couple of hours to try to clear the vapor lock on the pumps. And it would be good then to know how quickly your water level is dropping just due to boil-off. Clearly, it is a scenario that you might bootstrap your way around, because something like that has already happened and clearly people thought they had the situation under hand.

But a level instrument might have been of use if something else had happened, if you didn't clear those pumps in a couple of hours. So it is hard.

MR KERR: I'm not disagreeing. I thought, if you had given it more thought, that you could give me several incidents.

MR. PHILLIPS: Basically what I am trying to say is that the saturation meter does not provide an unambiguous indication of impending inadequate core cooling. Therefore, they have to wait until they get into the core to have advance indication. That is, the core is already uncovered, the fuel is heating up, the steam superheat shows it. The level indicator trending down, in spite of the HPI being on, provides them with advanced warning of inadequate core cooling.

MR. MOELLER: We will close out on this topic with Mr. [illegible]csole. It is a generic problem, and of course it is applicable to TMI-1, but I am not sure we are going to solve it here.

MR. EBERSOLE: The last statement implies that the saturation meter temperature device is located right above the core. In fact, there is quite a dead band of water between where it is put and the top of the core, within which you might say you are in a dead band, an ignorance band, wherein you could take extraordinary action.

MR. PHILLIPS: Absolutely.

MR. EBERSOLE: That may be a rather comfortable amount of water, for which you could invoke massive evacuation. I don't think we would do it prior to that. If we were doing pretty good, we could do a variety of things: depressurize the primary loop and so enhance the flow of systems, do things that we might otherwise not do prior to that time.

And I don't think we have really worked out the potential of the meter at all. We have tended to try to find ways to discredit the meter, rather than find ways to use it.

MR. PHILLIPS: The saturation meter, the thing is that when we have a gross overcooling event, that just a transient will go to saturation. So we don't know that we are as far from an indication that we are going toward inadequate core cooling. We may not be losing cooling at all.

Level indication would show the loss of cooling on top of that.

MR. EBERSOLE: Right.

MR. MOELLER: Thank you, Mr. Phillips.

Looking at the agenda, Mr. Arnold, I see you have 40 minutes' worth of material remaining, and we have 20 minutes on the clock. Which are we going to take up next? Are you ready to go with the hydrogen?

MR. ARNOLD: We suggest that items A and B have the higher priority. And Mr. Croneberger will cover item A and will be followed by Mr. Levandoski of B&W.

MR. CRONEBERGER: I would like to discuss the general subject of hydrogen inside of containment. I will be summarizing very briefly some of the aspects, primarily of measurements inside of containment, and more especially cover the area which we were unprepared for on the Subcommittee meeting on what studies were performed to address the possibility of stratification of hydrogen inside of containment.

(Slide.)

First I would like to discuss the reactor coolant high point vents. We are installing vents on each of the hot legs, the top of the candy cane, one vent on the reactor vessel. And we are modifying the pressurizer vent line to permit remote operation.

As far as each of the hot leg vents as well as the reactor vessel vent we have the capability of venting one-quarter of the system volume in one hour as a design basis.

MR. MOELLER: Can you install the RPV vents without taking the head off the pressure vessel?

MR. CRONEBERGER: You can install it without removing the head.

MR. EBERSOLE: You are expressing this in the context of noncondensibles, right, not water?

MR. CRONEBERGER: Right. As far as the flow diagram, I'm trying to describe one vent back from the head to the atmosphere. And when I talk about the atmosphere, this would be the large air space above the refueling deck in the building. Likewise, a vent path off each of the candy canes to that same air space, and off the pressurizer, venting to the reactor coolant drain tank.

Again, as far as the possibility of using the vent system, the major flow, should the system ever have to be used, would be to the major air space above the operating deck.

MR. SHEWMON: Do all of those little squiggles and the line on top of the one coming out of the pressure vessel say that you can do it remotely from the control room?

MR. CRONEBERGER: Yes, sir.

MR. SHEWMON: What about on the candy cane?

MR. CRONEBERGER: They can all be operated remotely.

MR. EBERSOLE: Are these safety grade vents?

MR. CRONEBERGER: They are safety grade. But for each vent path, you do have double valving to maintain isolation. You don't have what might be characterized as a Christmas tree for the flow paths.

MR. EBERSOLE: But as a set?

MR. CRONEBERGER: That's correct.

MR. EBERSOLE: Any pair of these vents is in fact a safety grade configuration; is that right?

MR. CRONEBERGER: That's right.

MR. EBERSOLE: Have you considered them as alleviating a problem of having inadequate PORV relief?

MR. CRONEBERGER: That has been studied, although I don't think that study is complete yet, is that correct?

It is being studied right now.

(Slide.)

The other area discussed briefly is post-accident sampling. We are installing modifications to provide the ability to take a grab sample of the containment atmosphere. This is using existing containment penetration, where we are drawing the sample out of one of the air return ducts in the ventilation system to a point external to the containment drawing the sample and making provisions for analysis in the lab at the plant.

(Slide.)

I will show you schematically where that location is. We have within the plant a number of ducts, including these downcomers, which are the return to the building cooling units. We have on this side of the plant a downcomer where we are drawing the air for the grab sample.

In addition, divorced from the ventilation ductwork, we are installing two points for permitting continuous measurement of hydrogen in the containment atmosphere post-accident.

Thirdly, we are installing hydrogen recombiners, a hydrogen recombiner. And what is shown schematically here is the piping which connects to the installed hydrogen recombiner, which again is drawing air from one of these return ducts.

From the hydrogen recombiner standpoint, the concept is that we would have one permanently installed recombiner, which is sized to take the design basis accident generation of hydrogen, and have the ability to install in series -- I'm sorry, in parallel -- an additional recombiner, with that recombiner currently being located at the Unit 2 site on the Island.

I would like to spend a little bit more time talking in terms of some of these studies that we have performed on the whole subject of hydrogen dispersion.

(Slide.)

The first study -- all of these studies that we performed on hydrogen dispersion tend to be relatively gross in scope, to understand what kinds of problems as to potential stratification might exist within the containment volume. The first series of studies, which I will summarize in the next three slides, are based upon some work which was done for us by an outside consultant.

What I would like to do is discuss, on the Lehigh studies, in the reverse order as presented here types of scenarios that we felt should be evaluated. One of the evaluations was a concern that on some of the essentially completely enclosed compartments in the basement level, there might be hydrogen generated from radiolysis of the water which would be accumulating in there, and in fact the mechanism for dispersion of that hydrogen outside of that cubicle would be sufficiently slow that we could get a combustible concentration of hydrogen there.

Indeed, in that particular case some analyses were performed which indicated that from strictly a molecular diffusion standpoint that no substantial hydrogen concentrations would exist in those enclosed compartments. When I say "enclosed," there are doorways out, but other than that they are complete boxes.

MR. SHEWMON: You mean absolutely no convection.

MR. CRONEBERGER: Right.

The thought was that they might be sufficiently removed from the normal ventilation mixing of the air in there that it was strictly conservatively looking at molecular diffusion.

Another area was the controlled venting of the hydrogen to the reactor coolant tank. In this particular case, as I described on the one venting flow path, it was to continue to make use of the pressurizer vent flow path down to the drain tank. And in that case, as a result of the study, it was concluded that, with that controlled venting, which is a relatively slow venting of the primary system, one can control the buildup of pressure in the drain tank until the rupture disc would blow and permit exhausting the hydrogen in spaces outside of the enclosed drain tank compartment.

The other area, working up, was control venting of the hydrogen to what at the time of the study was going to be the containment fan cooler system exhaust. At the time of the study, we were considering taking the vents from the reactor vessel and the top of the hot legs and taking them down to the basement and simply exhausting the hydrogen where in fact the air cooler exhaust is also.

The study involved a calculation of what, looking at a turbulent jet exhaust from half-inch tube, to determine for the velocities that would be predicted in trying to vent the primary system, what the dimensions would be at which point the hydrogen concentration within the jet would be down to 4 percent, with 4 percent being used as the lower flammability limit.

That calculation predicted that the concentration of hydrogen to the 4 percent limit, where we were exhausting hydrogen from the system, would be something like 18 feet. Now, indeed the designs investigation at that point suggested that there was no real advantage of discharging in the exhaust ventilation system. So we subsequently modified the design to simply vent directly into the large air space above the refueling deck.

The fourth area that was investigated in this area was to simply look at the rupture of one of the hot legs and determine what happens when you release the hydrogen concurrent with the release of the fluid.

(Slide.)

Again, just repeating the model that was used before, the model that I will describe the results here now, it is simply a turbulent jet, with our attempt to identify this Z dimension, which I will show in tabulation, with the Z dimension being that dimension at which the hydrogen concentration no longer exceeds 4 percent.

In this particular case, the analytical model --

and this analytical model is based upon the hydrogen first being generated at time 25 seconds and exiting this three-foot diameter pipe for a two minute duration. So the entire amount of hydrogen that would be generated would be exhausted at a uniform mass flow rate for that two-minute period of time.

The important conclusion from this particular result is that upon first releasing this hydrogen -- and the hydrogen in this case is being released at a substantially lower velocity because of the larger diameter nozzle -- that during this period when you are releasing strictly pure hydrogen this jet would have a dimension, the 4 percent hydrogen concentration, of approximately 70 feet. And this shows the similar dimensions for how far you would have the relatively enriched hydrogen.

(Slide.)

Now, another scoping study we did do -- and this was being done entirely -- was to say nevertheless, although from a general standpoint there should be general mixing of the hydrogen which would be released into the building, both as a result of ventilation system mixing and as a result of a turbulent jet effect, we wanted to take another scoping study to see what the prospects were for general molecular diffusion, taking no credit for other mixings.

In this particular case, we have a two million cubic foot containment, and we assumed 40,000 cubic feet of hydrogen, pure hydrogen, would be released and simply, contrary to previous studies, accumulated at the top of a cylinder like this (Indicating).

We assumed conservatively that we were at ambient pressure and we had only 70-degree temperature inside of containment. And what we were trying to find out is, for time zero, with this being the profile, how long would it take to establish both basic equilibrium inside of containment and how long would it take until the concentration here got down to the point where you were substantially below flammability limits.

(Slide.)

As a result of this study, indeed, with this very conservative model it takes quite a long while before you get steady state conditions inside the building. In a period of one day you are down around 6 percent at the top, which had been the 100 percent hydrogen mixture, with this being a profile, where the bottom of the building still hasn't seen any of the hydrogen due to the diffusion.

And at 20 days you are down here at 4 percent. This calculation was relatively gross, a gross scoping calculation.

One of the other variables that was looked at was, if instead of 70-degree temperature one was looking at

280-degree temperature within the building, this would cause what is shown as the one-day transient to be occurring in approximately six hours, basically a factor of one-fourth of the previous calculation. Again, these were very gross, conservative types of scoping calculations.

It does suggest that in fact what had been considered concerns for initial stratification and no basic movement or diffusion of the hydrogen as probably not being realistic.

MR. ETHERINGTON: At equilibrium is there any difference, any noticeable difference between top and bottom?

MR. CRONEBERGER: It is a small percentage difference, due to the density. That line --

MR. ETHERINGTON: That is not equilibrium. It would be essentially straight.

MR. CRONEBERGER: that's right.

MR. MOELLER: But if it takes 120 days at 70 degrees to reach even a sense of equilibrium, that is a long time in comparison to what we are dealing with.

MR. CRONEBERGER: The important thing is not having achieved equilibrium, but how long has it taken to get below what might be a detonation limit up here at the top. It does show that if in fact you don't get the general mixing either due to jet effects or the building ventilation, you will have higher concentrations in the --

certainly the scope of calculations suggests that shouldn't occur.

But even should you, within a matter of hours you start getting relat ly rapid molecular diffusion.

MR. BENDER: How short does the time interval have to be before you decide to ignore the problem? I think that is really what the question is. Is six hours short enough? Is an hour short enough? That is kind of what we want to know.

MR. EBERSOLE: What is the value of time?

MR. CRONEBERGER: Let me dismiss the case where you are dealing with the hydrogen being released with a relatively major LOCA, at which I would think that both the jet effects that I talked about before plus the pressure that would result in building spray actuation, that would tend to have major mixing.

So we are talking about a case where we are talking in terms of not having any major pressure excursion in the containment, but instead trying to vent the reactor coolant loops themselves. The design basis, as I said, would be to try to vent within one-quarter of the volume of the loop within about one hour.

You have the ability to control the rate of release, and I think what one would be concerned about would be something in the order of three to four hours.program

MR. PLESSET: I think it is a highly idealized calculation. If you are going to make the calculation, you should ask a different question: How long would it take before you had a detonable mixture near the top of the dome? Because the hydrogen comes down. You will get to a detonable mixture at some pont.

MR. CRONEBERGER: The calculations as far as the turbulent jet would suggest that you would never have a detonable mixture.

MR PLESSET: You are starting with another calculation.

MR. CRONEBERGER: Just a bounding calculation.

MR. BENDER: You have a release rate and you have a mixing rate, and somehow or other you have got to put those two together. I don't see that that has really been done. Maybe I didn't understand what you told us.

MR. CRONEBERGER: Let me go back to what I tried to describe on the turbulent jet associated with venting through one of the vents of the primary system. That analysis suggested that approximately 18 feet from the nozzle -- this was a very idealized case -- that you would have gotten mixing to the point where you were below not a detonable mixture, but a flammable mixture; and which means, because of the location of that, by the time you got up to the dome you would have a mixture substantially below the flammable limit.

MR. BENDER: That is a certain kind of jet you are starting with.

MR. CRONEBERGER: That is correct.

MR. BENDER: It is the right jet?

MR. CRONEBERGER: That would be a jet associated with having the system at pressure and completely opening one of those vent paths.

MR. PLESSET: I would still think it is more to the point to calculate where you would have a detonable mixture.

MR. BENDER: I am uncomfortable with the answer, because if hydrogen burned in TMI-2 then your answer wouldn't have predicted it. That's what worries me. I would like to be able to predict that event and then be able to rationalize why I should or shouldn't worry about it.

MR. CRONEBERGER: Indeed, it was because of the investigation of TMI-2 that some of our designs on these vents looked the way they did. Certainly, our evaluation of the data would indicate that the detonation occurred in compartments of the lower portion of containment, where in fact we were above the detonable limit on containment on hydrogen concentrations. And we simply at that time, because we were discharging at a very low point in a relatively enclosed area, hadn't gotten the dispersion of hydrogen.

What we are trying to do with the vents is, instead of doing that, is to vent up into the large air space at the top of containment.

MR. BENDER: I guess it is coming through better. I apologize for being a little dense.

The physical changes which you made in how the stuff is coming out are said to eliminate the possibility of detonation occurring.

MR. CRONEBERGER: We are trying to stay away from enclosed compartments as far as releasing hydrogen sources from the system.

MR. BENDER: Thank you. I wasn't clear.

MR. SHEWMON: How is the operator to know that he should vent his hydrogen out of the top of the candy cane or wherever instead of what he did at TMI-2, I think is the next question in that line?

MR. CRONEBERGER: We have some guidelines provided by B&W on how to operate this vent system. These guidelines are under review, and I believe at this time we haven't completed our review. Is that correct?

MR. ARNOLD: Yes.

MR. SHEWMON: You are saying that -- your answer to Mr. Bender was, if he vents the way we hope he vents it, then we don't have problem like we had at TMI-2.

MR. CRONEBERGER: The guidelines, as I said, we haven't reviewed yet. Presumably, if one had major venting, it would have to be done not through the pressurizer to the drain tank, but would have to be through one of the other vent paths.

MR. SHEWMON: Since you don't have hydrogen detectors on the core, then he has to deduce its existence from something else, which hopefully is in the procedures.

MR. CRONEBERGER: Yes, sir.

MR. CARBON: Would you please speak a little louder. I'm having difficulty hearing you.

MR. EBERSOLE: I would ask -- I thought the venting program was oriented to getting, if you could, a water solid condition in the coolant loop and in no way, except for undesirable aspects, had anything to do with controlling the hydrogen problem.

You are trying to use the venting complex, in addition, in a way to control the hydrogen explosion problem. Isn't it to no avail that you tried to do this, since the operator may have had a vent in the system in the very worst possible place and he has a vent that he can't do anything about?

MR. PLESSET: I think that's right. But I think he feels -- I am putting words in his mouth -- that since he has to have a venting arrangement, he might as well take an additional advantage.

MR. EBERSOLE: But it will only go so far.

MR. PLESSET: That's right. The hydrogen might be coming out somewhere else.

MR. BENDER: Just being able to turn loose the hydrogen through the vent valve in a better place is certainly an improvement, and we ought to accept that as such. I think I would support the idea. I just didn't understand it well.

MR. PLESSET: I object to the calculation that was made. If it's all up there at the top, I would like to say, forget about that calculation with the diffusion.

MR. CRONEBERGER: I am showing you what were intended to be broad scoping calculations on the problem.

MR. PLESSET: No criticism intended. I guess you were asked to do it.

MR. MOELLER: Mr. Chairman, we are now at the time that had been scheduled for the lunch break. We have four of the technical issues that we have not covered. Of the four, perhaps two I would suggest we consider covering, and that is B and F.

However, I would like to know the Committee's desires.

MR. PLESSET: And leave the others out?

MR. MOELLER: Yes. We would leave D and E out.

But again, I would want to know whether the Committee would agree with that approach. Hopefully we could do those. They say ten minutes each, but maybe we could do them in 15 minutes and then go to lunch.

Personally, I would prefer to wrap it up now before lunch.

MR. PLESSET: I think we should. I don't hear any great urge to do them all this time.

MR. MOELLER: Let's allow five minutes for B and five for F. Mr. Arnold, would that work?

MR. ARNOLD: We will do our best.

Mr. Levandoski is going to make this presentation for us. He is with Babcock & Wilcox Company.

MR. MOELLER: We wanted to be sure to have this one in, so Mr. Shewmon wouldn't be disappointed.

MR. LEVANDOSKI: Good morning. Mr. Arnold pointed out, I am from Babcock, Wilcox. I have been asked to come up here to address the item of reactor vessel thermal fraction mechanics at GPU's request.

What I will try to do is perhaps summarize the presentation I gave to the Subcommittee last week, and then go back and fill in any missing material if the questions require it.

The issue we are talking about has currently been designated by the staff as item 2.K.2.13 of draft

NUREG-0737. The staff's request is that a detailed analysis of the reactor thermomechanical conditions be performed on the reactor vessel, assuming a small break has occurred, with an extende loss of all feedwater. We also include the loss of all reactor coolant flow in our analysis assumptions. The staff has asked for a report to be submitted to them by January 1st, 1981.

Very quickly, the scenario we are looking at is small break occurring; all feedwater has been lost, all reactor coolant flow has stopped. That then forces you into the situation of providing long-term core cooling by taking water from the borated water storage tank, injecting it into the reactor coolant system cold legs via the HPI system.

The fundamental question to be answered in this analysis is that, for a long-term situation where relatively cold water is being injected into the system, do you potentially run the risk of initiating some kind of brittle fraction concern on the reactor vessel due to the cold downcomer fluid?

The final objective of the calculation, as I point it out here by key issue number one, is to assess the potential for thermal shock of the reactor vessel, resulting from this long-term safety injection flow. You have to perform a fracture mechanics analysis on the vessel and the weld material.

Without going into any of the details, which I gave to the Subcommittee Saturday, this is a very, very complicated situation to try to provide some hard quantification for which would undergo or be sufficient to undergo a rigorous defense. The problem is not so much the mechanics analysis, but more the thermal hydraulics analysis.

MR. OKRENT: Which of these two is your specialty, or is it both?

MR. LEVANDOSKI: Thermal hydraulics more than mechanics. For example, what you have to do is determine the transient temperature gradient in the reactor vessel walls. To do that, you have to know the coolant temperature next to the wall.

To know that coolant temperature, that requires a pretty good knowledge of the mixing and flow rates taking place between the vent valve flow and the flow rate coming into the downcomer from the inlet nozzle.

The temperature in the cold leg itself is also a function of the fluid residing in the cold leg, plus the temperature and the flow rate of the HPI fluid being injected. Obviously, the mixing occurring in these regions is the area where we have the principal uncertainty. It is highly flow-dependent, temperature-dependent, to a certain degree pressure-dependent, and probably more than anything else, geometry-dependent.

And we are taking about a very complex geometric situation between the injection point for the HPI water and finally the location out here, against the reactor vessel weld.

MR KERR: The suspense is getting to me. Are you going to tell me that this was impossible, or it was very difficult and B&W is clever?

(Laughter.)

MR. LEVANDOSKI: I'm not going to tell you it is impossible. I will tell you we probably don't know how to do it right now to the point where we think we could walk into the staff and say, this is the answer.

MR. PLESSET: Then don't try it here.

(Laughter.)

MR. LEVANDOSKI: I'm not going to.

(Slide.)

As a result of that uncertainty, what we have done is put together a very, very generic, conservative -- the word "gross" has been used several times this morning. I think it applies here more than any other place I have heard it.

We have put together, as I said, a very generic bounding analysis set of assumptions to cover all of the B&W operating plants. This is not to say that we think the problem should end here with this type of bounding calculation. But it is a model we have put together as an initial step with the staff, so that ongoing actions can continue and discussions with the staff can commence on what is actually the best way to try to quantify the situation.

This conservative evaluation primarily consists of five gross assumptions. For example, rather than trying to address the mixing explicitly, we have simply made the assumption, no mixing occurs between the vent valve fluids, the HPI fluids, and the fluids residing in the cold leg inventory.

So in fact, what this essentially means is that water coming from the borated water storage tank is assumed to eventually directly lie up against the reactor vessel wall. We have used the minimum allowable fluid temperature in the borated water storage tank allowed by the technical specifications. In the case of TMI-1, this would be 40 degrees, even though in fact TMI-1 BWST temperature is being heated to 68 degrees.

We have assumed an infinite heat transfer coefficient between the wall, the fluid next to the wall, and the wall material itself. What that accomplishes for you is it makes the wall temperature of the vessel instantaneously cooled down to the 40 degree temperature that we have assumed for the BWST fluid.

MR. SHEWMON: Sir, let me ask a couple of questions. You are talking about the downcomer only, this calculation. And this is well above its ductile brittle transition temperature. You know that much about it. And you are lking about a one-cycle strain-limited fatigue test; is that right?

Now, even if you had instantaneous cooling for 30 degrees, so what? Is it really going to make any difference?

MR. LEVANDOSKI: We are talking about decreasing the temperature about from 550 down to 40 degrees.

MR. SHEWMON: Then it is not above the ductile-brittle transition. And this is a Faraday pipe in your plant, is that right?

MR. LEVANDOSKI: The hot leg?

MR. SHEWMON: Whatever you are doing your 100 degree subcooling on.

MR. LEVANDOSKI: I'm not at that point yet. Let me put this in perspective.

MR. SHEWMON: Let me try to find out what the pipe is and what the temperature excursion is.

MR. LEVANDOSKI: The temperature excursion. Let me address that first. The vessel wall material subjected is 550 down to 40 degrees.

MR. SHEWMON: So you will get out of the downcomer and into the -- okay, let's go on.

MR KERR: I think you are trying to rush him, Professor Shewmon.

MR. SHEWMON: Yes.

MR. LEVANDOSKI: Let me just quickly say that we have also assumed the worst weld material properties to exist directly in the flow stream of the 40-degree coolant, and that we have allowed this situation to exist despite operator guidelines which would cause him to take actions to help alleviate this situation.

What we have found, the results show that with the operator throttling HPI flow to maintain 100 degrees subcooling, that for the conservative bounding analysis which has been carried out to an irradiation value of an additional .5 effective full power years beyond where we are now for the worst plant, the results are still acceptable.

As I pointed out to the Subcommittee -- and I will repeat it here -- this is not to say that in one-half an effective full-power year we necessarily have a problem. This is just the time frame to which the analyses have been taken out.

MR. SHEWMON: The half effective full-power year doesn't mean that he keeps running cold water over this for that long. It must mean that it gets that much more irradiation in it.

MR. LEVANDOSKI: That is exactly right. The actual term of the transient we are talking is about ten hours.

MR. OKRENT: Implicit is some flaw size?

MR. LEVANDOSKI: Yes. We used the Section 11 ASME, and the flaw size was .5 inches, initial flaw size.

MR. OKRENT: We ought to consider it in a sense probabilistic. Some things are taken conservatively and some things according to regulation.

MR. EBERSOLE: I have two questions. When you said instantaneous cooldown of metal to HPI fluid temperatures, you are just talking about the interface for the metal, a few thousandths?

MR. LEVANDOSKI: Yes, the surface temperature.

MR. EBERSOLE: So you have a gradient in which the inside is contracting and the outside is still hot. And the second one is, in B&W's opinion is this the worst sort of thermal transient that you can have in the context of repressurization and achieving maximum rates of cooldown and take into account massive secondary side failures as being one mechanism? And if you want to be conservative, you can augment that by run-on of main feedwater?

Is this the worst end of the cooldown problem and the resulting repressurization, or is it just a place somewhere in between that the staff pointed to?

MR. LEVANDOSKI: The analysis or the size of breaks that we have addressed so far range from .007 square feet to .023 square feet.

MR. EBERSOLE: I said zero breaks; secondary side depressurization.

MR. LEVANDOSKI: The thinking there is that secondary side, you have a certain amount of natural circulation flow occurring in the primary loop.

MR. EBERSOLE: But you have a severe cooldown, however.

MR. LEVANDOSKI: True. But we don't see --

MR. EBERSOLE: Have you looked at the thermal transients associated with the full-scale steam line break, the continuity of run-on --

MR. LEVANDOSKI: The answer is no.

MR. EBERSOLE: Do you not now know whether that is at the worst end of this thermal shock spectrum, or do you know where that is? What transient event can produce the worst shock event?

MR. LEVANDOSKI: I have to say we haven't evaluated all of the possible events to come up with that final conclusion.

MR. EBERSOLE: Just do that one, then, the secondary side main steam line failure and prolonged cooling. The primary loop will come down in temperature.

The reactivity problem will bucket for a while, but in the final array you will have cooling to the secondary circuit at atmospheric pressure. And if you have the pumps running on, you will have a prodigious rate of cooling.

u can, of course, argue that you will turn the pumps off and go ahead and do that.

MR. LEVANDOSKI: Okay.

MR. MOELLER: Does that about wrap it up? That pretty much wraps up what I have.

MR. ETHERINGTON: I don't understand the 30-degree downcomer mixing, the 30 percent, rather. What is the condition of the water in the downcomer?

MR. LEVANDOSKI: I really haven't addressed this.

A second analysis was performed, for comparative purposes more than anything else. Assuming that we did have 30 percent mixing --

MR. ETHERINGTON: At what temperature is the water it is mixing with?

MR. LEVANDOSKI: We are talking about 40-degree water coming in the cold leg and the vent valve fluid, which is in the temperature range of about 500 degrees, 500 to 600.

MR. ETHERINGTON: Hasn't that all been replaced by the HPI; the continual inflow of cold water there, haven't you? How do you have hot water remaining in the downcomer?

MR. LEVANDOSKI: You find that the vent valves remain open throughout this transient.

(Slide.)

MR. PLESSET: He has hot water from the core spilling down from the downcomer into the open vent valve. So he does have the two different --

MR. LEVANDOSKI: The vent valve fluid has traversed the core and is coming out.

MR. PLESSET: That is a special feature of this design, that he can get that.

Dade, I would urge that we move along.

MR. MOELLER: I think so. Does this wrap this up?

MR. LEVANDOSKI: Yes.

MR. MOELLER: Why don't we handle item F simply by questions. I think the Subcommittee had questions of the staff, probably primarily in the sense that we read the quotation or what we understood was a quote that the pressurizer heater was not essential to save reactor performance.

They used several different words.

MR KERR: You have to be careful about the language.

MR. MOELLER: Right. Can you offer comments and clarify the questions that we have?

MR. PLESSET: I thought the questions related to the fact that putting the pressurizer heaters on this emergency supply degraded other systems?

MR. MOELLER: Yes. It has to be phased in just a certain way and so forth.

MR. PLESSET: Thanks.

MR. CONRAN: As I understood the question, it involved discrepancies between two pieces of testimony, Walter Jensen's testimony on Contention UCS-3 about pressurizer heaters and my testimony, which is a more general treatment of definitions: what is important to safety, what is safety-grade, which of the pieces of formerly non-safety pieces of equipment that came into play at TMI-2 should now be considered safety grade, and that sort of thing.

In that context, Mr. Jensen's testimony said pressurizer heaters are not important to safety and they do not have to be safety-grade. And just to get right to the point, that is inconsistent with the definition of important to safety that is in my testimony, that has been accepted by the organization. And we are all instructed now to use that definition.

I think the problem was, Mr. Jensen's testimony was finalized before mine was, and it reflects inconsistent usage of the term "important to safety" by different people on the staff. The fix is to change the testimony to read something like, by definition it is important to safety, but the decision with respect to safety grade still is that it does not have to be safety grade. The pressurizer heaters are not required to mitigate accident consequences that were in question, and therefore they do not have to be safety grade.

MR. EBERSOLE: That implies that devices that prevent accident sequences don't have to be safety grade, and that's not so.

MR. CONRAN: It doesn't imply at all that such components would not have to be safety grade. With respect to the pressurizer heaters, they are important to safety because they fall within a definition given within the preamble to the general design criteria.

But more to the point, I think, in the discussion that was going on with the Subcommittee meeting, they are not required -- they are not required to perform critical accident mitigation functions. There are other safety systems or components that can be relied upon. So even though they are important to safety by definition, they are not critically important to that critical safety, that very specific safety function. And therefore they do not have to be safety grade.

MR. JENSEN: I would like to make one clarification. What I was trying to show in my testimony was that if the pressurizer heaters failed, there would be no -- the public health and safety would not be affected. There are other systems, the makeup systems, the letdown systems, that could be operated by the operator, and the high pressure injection system could be put into play by the operator to maintain an adequate pressure in the primary system.

MR. MOELLER: Are there questions on that?

(No response.)

MR. MOELLER: I think, Mr. Chairman, we might, I presume, let the staff have a minute for any wrapup they want, and then the Licensee a minute for any final comments from them. That way, we will finish at 1:30.

MR. NOVAK: Just a point. We will go back and read the transcript with regard to the need to provide a document which identifies what is the status of the open items.

I think the problem here is that if you had a head count there are very many of them that improved. The significant ones, I think we can highlight them and provide enough of an understanding of them so that the document itself that you read would give you enough understanding of where the staff feels that the Licensee is still missing information for us to complete our review regarding the restart.

Also, in terms of writing a letter regarding the status as you see it today, I would certainly encourage the Committee, if they feel that there are portions of our requirements that should be enlarged upon -- and again, I will just use the point of the deciding consideration that was discussed by Dr. Okrent earlier -- if the Committee desires these kinds of studies, I think it is incumbent on them, then, to identify it in the letter.

At this point in time we do not have any plans to do anything in specific with regard to Three Mile Island 1 and its site. In a sense, this is no different than the Commission itself suggesting that the order should be reviewed with regard to its sufficiency, that the staff, for example, beyond the orders themselves, has decided that Three Mile Island 1, as a prerequisite to startup, should meet the essentials of a near-term operating license.

Many of the things with regard to control room review are a reflection of that position. We would certainly look at the letter and, in concert with the direction that the letter gave us, go ahead on that basis.

MR. MOELLER: Thank you.

MR. SHEWMON: I am not sure when -- and it certainly doesn't come from him, so let [illegible] bring one last question up with the staff. One of the things that the staff has in their five-year plan has to do with possible hydrogen damage to the pressure vessel head from reasonable temperature and high hydrogen pressure.

I wondered if or where I might get an authoritative description of what the pressure-temperature history was for that head, how much level there was, and what was being interpreted as a bubble wasn't particularly clear to me and may have changed. I would be interested in seeing that.

And if you could give us a reference on where I might find that, I would appreciate it.

MR KERR: You are talking about TMI-2 and not TMI-1?

MR. SHEWMON: Right.

MR. MOELLER: Mr. Arnold, for a final minute.

MR. ARNOLD: I will make it only 60 seconds. The company very much apprciates a chance to be before the Committee. We appreciate your patience through what has been a significant overrun on the schedule.

I would ask consideration or re-emphasis, reiteration I think of only one point that we have made previously, and that is that I think any assistance that the Committee can give in helping to clarify or to provide their viewpoint on what are those things that are in fact required to be in place prior to restart, I am sure all parties would find that helpful.

MR. MOELLER: Thank you.

MR. PLESSET: Thank you, Dade, and thank you, Tom and Mr. Arnold.

And maybe when you come back on this subject again, you will be ahead of schedule rather than behind.

We will recess for lunch, until 2:30.

(Whereupon, at 12:29 p.m., the Committee recessed, to reconvene at 2:30 p.m. the same day.)

NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

____

in the matter of: 248TH GENERAL MEETING OF THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

Date of Proceeding: December 4, 1980

Docket Number: ____________________

Place of Proceeding: Washington, D. C

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

Barbara L. Whitlock

Official Reporter (Typed)

Barbara L. Whitlock

Official Reporter (Signature)

T-2

RESTART SER OPEN ITEMS

NUREG-0680 OPEN ITEMS		STATUS
79-05B-1	Natural Circulation - Analysis of anticipatory fill	Awaiting Licensee submittal (Restart)
79-05B-5	Anticipatory Trips - Check out Procedure	Start up checkout
79-05B-7	Tech Spec Changes	Draft awaiting review (Restart)
79-05C-5	Inadequate core cooling procedures	Review in Progress (Restart)
3 -	Emergency Planning - Test Exercise	(Restart)
4 -	Separation of TMI-1 & 2 gaseous radwaste - ESF filter detail design	Submittal scheduled June 1981 (Restart)
5 -	Waste Management solid radwaste system - plans for low activity storage	Response inadequate (Restart)
6 -	Management	
	-- Training program for unlicensed personnel	Licensee to respond (restart)
	-- Long-term operator training	Licensee to respond (restart)
	-- Facility procedures	Licensee to respond (Restart)
	-- Health Physics	Licensee to respond to 11/26/80 letter (restart)
	-- Operational QA - Q list	Awaiting licensee response (restart)
7 -	Financial - Revised financial plan	Awaiting licensee response

RESTART SER OPEN ITEMS

NUREG-0680 OPEN ITEMS		STATUS
8 - 2.1.1	EMERGENCY POWER SUPPLY FOR PRESSURIZER LEVEL & BLOCK VALVES - PROCEDURES	AWAITING REVISED PROCEDUR
8 - 2.1.3.A	VALVE POSITION INDICATION - ADDITIONAL JUSTIFICATION FOR SV'S - PROCEDURES	AWAITING LICENSEE RESPONS (RESTART)
8 - 2.1.3.B	INADEQUATE CORE COOLING - EXISTING INSTRUMENTATION ANALYSIS, COMMITMENT, SCHEDULE DESCRIPTION	RESPONSE OF DECEMBER 79 CONSIDERED ADEQUATE BY LICENSEE, NUREG-0737 REQUIRES ADDITIONAL RESPONSE BY 12/15/80 (RESTART)
8 - 2.1.4	CONTAINMENT ISOLATION - DETAIL DESIGN INFORMATION	SUBMITTAL SCHEDULED JANUARY 1981 (RESTART)
8 - 2.1.6.A	SYSTEM INTEGRITY - PROCEDURES	AWAITING PROCEDURES (RESTART)
8 - 2.1.6.B	PLANT SHIELDING - DESIGN REPORT	REVIEW IN PROGRESS - PROBABLY NOT COMPLETE (RESTART)
8 - 2.1.7.A	AFW AUTO INITIATION - DETAIL DESIGN OF LEVEL INDICATION AND LONG-TERM MODS - TECH SPECS	CONCEPTUAL DESIGN REVIEW IN PROGRESS. DETAIL SUB-MITTAL JANUARY 81 (RESTART
8 - 2.1.8.A	POST-ACCIDENT SAMPLING - SYSTEM DESIGN, PROCEDURES	JUSTIFICATION FOR EXISTING SYSTEM NOT COMPLETE. (RESTART) IMPLEMENTATION O NEW DESIGN DELAYED UNTIL 1/82.
8 - 2.1.8.B	RADIATION MONITOR RANGE - LONG-TERM DESIGN DETAILS - PROCEDURES	AWAIT SUBMITTALS. LONG-TER EQUIPMENT AND PROCEDURES PRIOR TO RESTART. IF DELAY SHORT-TERM PROCEDURES WILL BE USED.
8 - 2.1.8.C	IODINE INSTRUMENTATION - PROCEDURES & TRAINING	AWAITING LICENSEE RESPONSE
8 - 2.1.9.B	TRANSIENT & ACCIDENT ANALYSIS FOR INADEQUAT[illegible] CORE COOLING - REVIEW ANALY[illegible]IS - PROCEDURES	REVIEW IN PROGRESS (RESTAR
8 - 2.2.2.B	ONSITE TECH SUPPORT CENTER - PROCEDURES	REVIEW IN PROGRESS (RESTAR
8 - ADD 4-RCS	VENTING - DETAIL DESIGN & ANALYSIS	SUBMITTAL SCHEDULED JULY 1981 (RESTART)
LONG-TERM 2	SMALL BREAK ANALYSIS - PROVIDE ADDITIONAL INFORMATION	REVIEW IN PROGRESS

TMI-1 RESTART HEARINGS
EMERGENCY PREPAREDNESS CONTENTIONS
(ONSITE)

GENERAL CATEGORY	NUMBER OF CONTENTIONS	CONCERNS RAISED
ASSIGNMENTS OF RESPONSIBILITY (ORGANIZATIONAL CONTROL)	7	• NEED FOR IMPROVED AGREEMENTS TO PERFORM EMERGENCY SERVICES
ONSITE EMERGENCY ORGANIZATION	3	• INSUFFICIENT PERSONNEL TO CONDUCT DOSE ASSESSMENT AND MONITORING • MULTIPLE RESPONSIBILITIES ASSIGNED CERTAIN INDIVIDUALS IN EMERGENCY ORGANIZATION
EMERGENCY CLASSIFICATION SYSTEM	2	• VALIDITY OF EMERGENCY CONDITION INDICATORS • IMPROPER CLASSIFICATION OF SPECIFIC ACCIDENTS TO EMERGENCY CATEGORIES
NOTIFICATION METHODS AND PROCEDURES, AND COMMUNICATIONS	7	• NOTIFICATION OF AGENCIES AND COUNTIES • EDUCATION OF PUBLIC ON EMERGENCY RESPONSE • AVAILABILITY OF INFORMATION TO OFFSITE GROUPS • SUFFICIENCY OF COMMUNICATION LINKS
ACCIDENT ASSESSMENT	7	• ADEQUACY OF RADIOLOGICAL INSTRUMENTATION AND PROCEDURES • OFFSITE MONITORING CAPABILITY • EXPERTISE OF EMERGENCY MANAGERS
PROTECTIVE RESPONSE	8	• ADVERSE CONDITION PROTECTIVE RECOMMENDATIONS • RESPONSE AND ASSESSMENT TIMES • SELECTION OF EMERGENCY PLANNING ZONES
MAINTENANCE OF EMERGENCY PLANNING	2	• ADEQUACY OF DRILL SCENARIOS • PLAN MODIFICATIONS DUE TO CHANGING CONDITIONS OF OBSERVED PROBLEMS

TMI-1 RESTART HEARINGS
EMERGENCY PREPAREDNESS CONTENTIONS
(OFFSITE)

GENERAL CATEGORY	NUMBER OF CONTENTIONS	CONCERNS RAISED
ASSIGNMENTS OF RESPONSIBILITY	12	• LACK OF COORDINATION BETWEEN VARIOUS FIRE/ POLICE SERVICES • EMERGENCY WORKER COMMITMENTS AND AVAILABILITY
EMERGENCY RESPONSE SUPPORT AND RESOURCES	13	• POLICE/MILITARY COMMAND AND CONTROL • ADEQUACY OF EMERGENCY RESOURCES AT LOCAL LEVEL (PERSONNEL AND EQUIPMENT) • LACK OF EMERGENCY CONTINGENCY FUNDS
NOTIFICATION METHODS AND PROCEDURES	13	• EDUCATION OF PUBLIC ON EMERGENCY RESPONSE • PROMPT NOTIFICATION IN PLUME EPZ
EMERGENCY COMMUNICATIONS	7	• INADEQUATE EMERGENCY COMMUNICATION LINES AND OPERATORS • STATUS OF LOCAL EOC INSTALLATIONS
PUBLIC INFORMATION	4	• DISSEMINATION OF PUBLIC INFORMATION ON PROTECTIVE ACTIONS TO BE TAKEN DURING EMERGENCY
EMERGENCY FACILITIES AND EQUIPMENT	8	• PROVIDING EQUIPMENT AND MAINTAINING IT • STATUS OF LOCAL EOC FACILITIES • FACILITIES FOR PROTRACTED ACCIDENTS AND EVACUATIONS

TMI-1 RESTART HEARINGS

EMERGENCY PREPAREDNESS CONTENTIONS
(OFFSITE)

GENERAL CATEGORY	NUMBER OF CONTENTIONS	CONCERNS RAISED
PROTECTIVE RESPONSE	35	• ADEQUACY OF EVACUATION PLANS • EVACUATION DURING ADVERSE CONDITIONS • PROTECTIVE ACTIONS FOR ELDERLY, INSTITUTIONS AND SPECIAL CASES • PROTECTION OF LIVESTOCK • SELECTION OF EMERGENCY PLANNING ZONES • TIME PERIODS FOR PROTECTIVE ACTIONS
RADIOLOGICAL EXPOSURE CONTROL AND PUBLIC HEALTH SUPPORT	8	• DISTRIBUTION OF THYROID BLOCKING AGENTS (KI) • DECONTAMINATION FACILITIES AND PROCEDURES • CARE FOR RADIATION VICTIMS • AVAILABILITY OF CARE FOR EVACUATED HOSPITAL PATIENTS
MAINTENANCE OF EMERGENCY PREPAREDNESS	7	• ADEQUACY OF DRILLS TO TEST EMERGENCY ORGANIZATIONS • ADEQUACY OF TRAINING OF EMERGENCY WORKERS

T-3

CONTENTIONS & BOARD QUESTIONS

DESIGN AND ANALYSIS

NATURAL & FORCED CIRCULATION

UCS-1 NATURAL CIRCULATION IS INADEQUATE TO COOL THE CORE
UCS-2 FORCED COOLING METHODS DO NOT MEET REGULATIONS
BOARD QUESTION 6D, 6E, 6F - QUESTIONS ON FEED AND BLEED

ADDITIONAL LOCA ANALYSIS

UCS-8 PERFORM ANALYSES FOR SPECTRUM OF SMALL BREAKS
ECNP-1E

BOARD QUESTION UCS-8 ADDRESS RECOMMENDATIONS OF NUREG-0565 AND 0623. JUSTIFY RELIANCE ON OPERATOR ACTION

EFW RELIABILITY

BOARD QUESTIONS 6.A-C, G-K QUESTIONS ON RELIABILITY OF EFW

SAFETY SYSTEMS BYPASS AND OVERRIDE

UCS-10 SAFETY SYSTEM FUNCTIONS SHOULD NOT BE MANUALLY OVERRIDDEN OR
SHOLLY 3 BYPASSED

SAFETY CLASSIFICATION

UCS-12 SAFETY-RELATED EQUIPMENT TO BE ENVIRONMENTALY QUALIFIED BY RESTART.

UCS-14 ALL COMPONENTS WHICH CAN CAUSE, AGGRAVATE, OR MITIGATE ACCIDENTS SHALL BE SAFETY GRADE.

UCS-3 PZR HEATERS SHOULD BE SAFETY GRADE

BOARD QUESTION UCS-12 ENVIRONMENTAL QUALIFICATION, INCLUDING RADIATION

VALVES AND VALVE TESTING

UCS-5 PORV AND BLOCK VALVES SHOULD BE SAFETY GRADE
UCS-6 PERFORM QUALIFICATION TESTS ON SAFETY AND RELIEF VALVES
BOARD QUESTION ON UCS-6- WILL VALVES PERFORM IN ACCIDENT ENVIRONMENT

CONNECTION OF PRESSURIZER HEATER TO DIESEL

UCS-4 PZR HEATERS WILL DEGRADE EMERGENCY POWER

INTEGRATED CONTROL SYSTEM

SHOLLY 6A - FMEA OF ICS SHOULD BE SHORT-TERM

Containment Isolation

Sholly 1 - Safety grade radiation signals for purge and sump.

Filters

Lewis - Upgrade aux building filters
ANGRY V(D) - Provide effluent filtration for large volumes of gas and liquid by restart

Computer

Sholly 13 - Computer upgrade prior to restart
ECNP-1a - Computer is inadequate - slow and ambiguous

Safety System Status Panel

UCS-9 - A R.G. 1.47 system status panel should be provided
ECNP-1c - Control system should record all necessary parameters

Instrument Ranges

Sholly 5 - High range effluent monitoring prior to restart
ECNP-1d - All monitoring instruments cover full range of co ditions

Detection of Inadequate Core Cooling

UCS-7 - Require RV water level measurement
ANGRY-V(B)- Require water level indication by restart
Sholly-6b - Require ICC detection instrumentation by restart

Control Room Design - Human Factors

Sholly-15 - Complete CRDR by restart
ANGRY-V(C) - Analyze and modify control room by restart

Class 9

UCS-13 - TMI-1 does not protect against class 9 accidents
Sholly-17 - Analyze health effects of class 9 sequences before restart
ECNP-4b - Evaluate consequences of TMI-2 accident with EOL core
4c - Evaluate consequences of TMI-2 accident with loss of access to spent fuel.

Additional Board Questions

1. Staff position on NUREG-0694 requirements.
2. How has Staff identified all requirements and accident sequences.
3. Will IREP be applied to TMI-1.
4. Placement of dose rate meters.
5. Staff position on NUREG-0660.
7. Application of NUREG-0667 (Crystal River).
9. Groundwater contamination.

Separation of Unit 1 and 2

CEA-5 - Impact of Unit 2 decontaminated water on water storage space and operation for Unit 1.

CEA-6 - "Leakage" from Unit 2 Impact on water storage capacity.

CEA-7 - Adequacy of radiation monitoring to discriminate between Unit 1 and 2 effluents

Board Question 8 - Parallels CEA-7

Management

Aamodt 2 - Certification by Independent Engineering firm for technicians and management personnel.

Angry 4 - Insufficient management capability as demonstrated by actions before and during accident.

TMIA 5 - Lack of technical qualification. Emphasis on maintenace activities

Board question 10 - Explain 6/27/80 accident, discuss maintenance history.

Sholly 14 - Insufficient management capability. Adm. structure, staffing, HP, safety review, maintenance.

CEA-13 - Training of Operators - (mindset)

T-2,5

GPU NUCLEAR GROUP

ORGANIZATION

GPU NUCLEAR GROUP

PURPOSE

MANAGE AND DIRECT THE NUCLEAR ACTIVITIES OF THE GPU SYSTEM TO PROVIDE THE REQUIRED HIGH LEVEL OF PROTECTION FOR THE HEALTH AND SAFETY OF THE PUBLIC AND THE EMPLOYEES.

CONSISTENT WITH THE ABOVE, GENERATE ELECTRICITY FROM THE GPU NUCLEAR STATIONS IN A RELIABLE AND EFFICIENT MANNER IN CONFORMANCE WITH ALL APPLICABLE LAWS, REGULATIONS, LICENSES, AND OTHER REQUIREMENTS AND THE DIRECTIONS AND INTERESTS OF THE OWNERS.

GPU NUCLEAR CORP

STATUS 11/80

- o FORMATION OF GPU NUCLEAR CORP APPROVED BY SEC
- o DIRECTORS AND OFFICERS ESTABLISHED
- o NOT AUTHORIZED TO ACT
- o APPROVAL OF NJ BPU AND PA PUC REQUESTED FOR OPERATING AGREEMENTS
- o REQUEST FOR NRC APPROVAL OF GPU NUCLEAR AS OPERATOR TO BE SUBMITTED

GPU NUCLEAR CORP

STATUS 11/80 - PENDING NEEDED APPROVALS

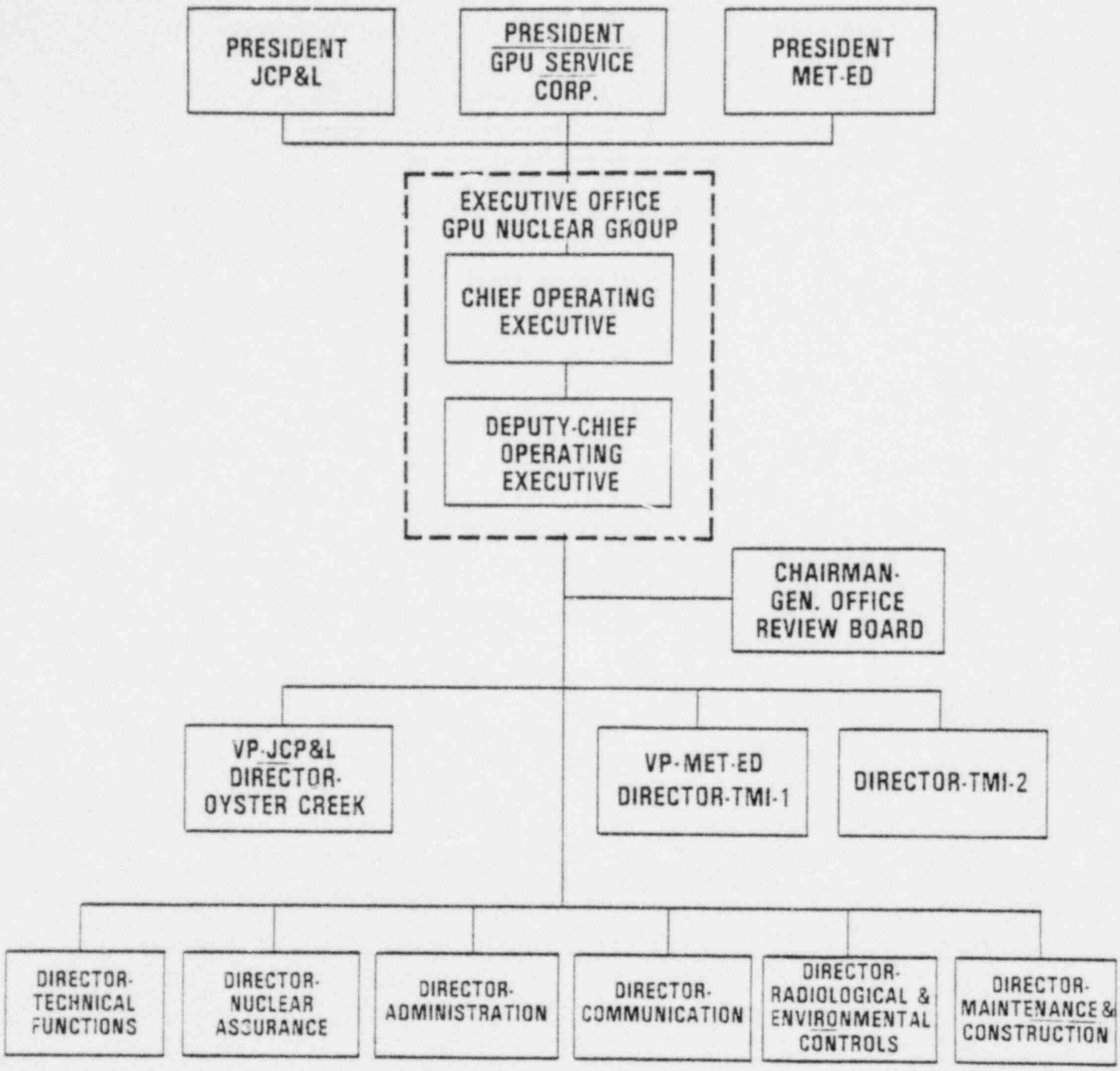
- o STRUCTURE ESTABLISHED AND KEY JOBS FILLED
- o TECH SPECS APPROVED FOR GPU NUCLEAR GROUP
- o NUCLEAR GROUP EQUALS NUCLEAR CORP EXCEPT FOR REPORTING
- o NUCLEAR GROUP EFFECTIVE 9/15
- o NEEDED STAFFING AND ORGANIZATION DEVELOPMENT UNDERWAY

GPU NUCLEAR

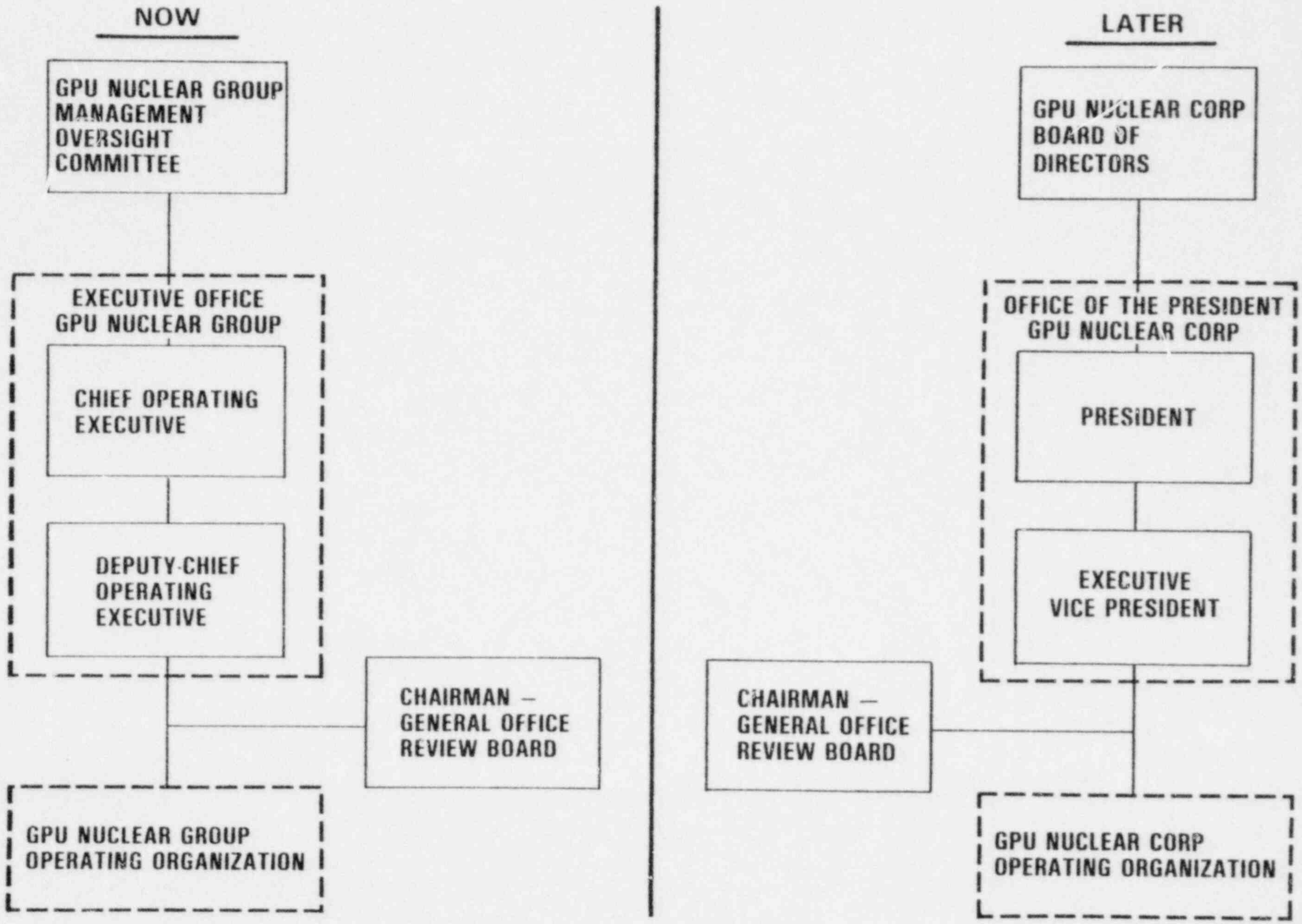
MAJOR ELEMENTS

- FULL TIME ORGANIZATION DEDICATED SOLELY TO NUCLEAR GENERATION
- INCREASED ON-SITE TECHNICAL AND MANAGEMENT RESOURCES
- STRONG CENTRAL TECHNICAL CONTROL
- FULL TIME ON-SITE MANAGEMENT FOR PLANT OPERATION AND MAINTENANCE - - WITH SUPPORT IN ADMINISTRATION, ENGINEERING, RADIATION PROTECTION, AND OTHER AREAS BEING PROVIDED SEPARATELY
- INDEPENDENT NUCLEAR ASSURANCE DIVISION - ENCOMPASSING TRAINING, QUALITY ASSURANCE AND A NUCLEAR SAFETY ASSESSMENT DEPARTMENT
- POOLING OF RESOURCES FOR SUPPORT OF SEVERAL GENERATING STATIONS
- PERSONNEL POLICIES AND PROCEDURES APPROPRIATE FOR NUCLEAR GENERATION

Organization Chart
GPU Nuclear Group



GPU NUCLEAR
MANAGEMENT OVERVIEW



GPU NUCLEAR CORPORATION

- **President** — R. C. ARNOLD (TMI then Parsippany)
  - **Executive Vice President** — P. R. CLARK (Parsippany)
    - **Chairman GORB** — J. R. THORPE** (Parsippany)
    - **Vice President, Oyster Creek** — I. R. FINFROCK (Oyster Creek)
      - . Operation
      - . Maintenance
      - . Plant Eng'r'g.
      - FORKED RIVER
    - **Vice President, TMI-1** — H. D. HUKILL (TMI)
      - . Operation
      - . Maintenance
      - . Plant Eng'r'g.
    - **Vice President, TMI-2** — G. K. HOVEY (TMI)
      - . Operation
      - . Maintenance
      - . Plant Eng'r'g.
      - . Decontamination
    - **Vice President, Technical Functions** — R. F. WILSON (Parsippany)*
      - . Systems
      - . Eng. & Plng.
      - . Proj. Eng'r'g.
      - . Startup & Test
    - **Vice President, Nuclear Assurance** — J. G. HERBEIN (Parsippany)*
      - . Qual. Assur.
      - . Training
      - . Nuc Saf Assess
      - . Emerg Planning
      - . System Lab.
    - **Vice President, Administration** — F. GLICKMAN (TMI then Parsippany)*
      - . Fiscal Mgmt Inform. Sys.
      - . Human Resources
      - . Security & Facilities & Indus. Safety
      - . Legal Services
    - **Vice President, Communications** — W. L. GIFFORD (TMI then Parsip.)
      - . External Communication
      - . Internal Communication
    - **Vice President, Radiological & Environment Controls** — R. W. HEWARD, JR. (Parsippany)
      - . Hqtrs Radcon
      - . Hqtrs Environment
      - . Site Radcon
      - . Site Environment
    - **Vice President, Maintenance & Construction** — F. F. MANGANARO (Parsippany) *
      - . Hqtrs Staff
      - . TMI & O.C. Site Organizations
      - . Production
      - . Planning Schedules
      - . Methods & Procedures

- - - - -

*Significant full time representation at each site.

**Responsible to and takes general direction from Office of the President. Has direct access to CEO and Board of Directors.

11/80

OYSTER CREEK DIVISION

SUMMARY OF RESPONSIBILITIES

- o OPERATE AND MAINTAIN THE OYSTER CREEK PLANT IN A SAFE, RELIABLE, AND EFFICIENT MANNER IN ACCORDANCE WITH CORPORATE POLICIES AND ALL APPLICABLE LAWS, REGULATIONS, LICENSES, AND TECHNICAL REQUIREMENTS.

MAJOR FUNCTIONS

- o ESTABLISH AND MAINTAIN PLANT LEVEL POLICIES, PROCEDURES, STANDARDS, AND PRACTICES RELATED TO THE OPERATION AND MAINTENANCE OF THE PLANT.
- o PROVIDE AND MAINTAIN A PLANT STAFF QUALIFIED TO OPERATE AND MAINTAIN THE PLANT IN ACCORDANCE WITH CORPORATE POLICIES AND ALL APPLICABLE LAWS, REGULATIONS, LICENSES, AND TECHNICAL REQUIREMENTS.
- o OPERATE THE PLANT IN A SAFE, RELIABLE, AND EFFICIENT MANNER IN ACCORDANCE WITH CORPORATE PROCEDURES, THE ELECTRICAL NEEDS OF THE GPU SYSTEM ALL APPLICABLE LAWS, REGULATIONS, LICENSES, AND TECHNICAL REQUIREMENTS.
- o ESTABLISH AND IMPLEMENT PREVENTATIVE AND CORRECTIVE MAINTENANCE PROGRAMS TO MAINTAIN THE STATION IN A SAFE, RELIABLE, AND EFFICIENT MANNER IN ACCORDANCE WITH CORPORATE POLICIES AND ALL APPLICABLE LAWS, REGULATIONS, LICENSES, AND TECHNICAL REQUIREMENTS.
- o ENSURE THAT PLANT OPERATIONS AND MAINTENANCE ACTIVITIES ARE CARRIED OUT IN ACCORDANCE WITH CORPORATE RADIATION CONTROL, QUALITY ASSURANCE, SECURITY, AND EMERGENCY PREPAREDNESS PROGRAMS.

THREE MILE ISLAND UNIT 1 DIVISION

SUMMARY OF RESPONSIBILITIES

- OPERATE AND MAINTAIN THE TMI-1 PLANT IN A SAFE, RELIABLE, AND EFFICIENT MANNER IN ACCORDANCE WITH CORPORATE POLICIES AND ALL APPLICABLE LAWS, REGULATIONS, LICENSES, AND TECHNICAL REQUIREMENTS.

MAJOR FUNCTIONS

- ESTABLISH AND MAINTAIN PLANT LEVEL POLICIES, PROCEDURES, STANDARDS, AND PRACTICES RELATED TO THE OPERATION AND MAINTENANCE OF THE PLANT.
- PROVIDE AND MAINTAIN A PLANT STAFF QUALIFIED TO OPERATE AND MAINTAIN THE PLANT IN ACCORDANCE WITH CORPORATE POLICIES AND ALL APPLICABLE LAWS, REGULATIONS, LICENSES, AND TECHNICAL REQUIREMENTS.
- OPERATE THE PLANT IN A SAFE, RELIABLE, AND EFFICIENT MANNER IN ACCORDANCE WITH CORPORATE PROCEDURES, THE ELECTRICAL NEEDS OF THE GPU SYSTEM, ALL APPLICABLE LAWS, REGULATIONS, LICENSES, AND TECHNICAL REQUIREMENTS.
- ESTABLISH AND IMPLEMENT PREVENTATIVE AND CORRECTIVE MAINTENANCE PROGRAMS TO MAINTAIN TMI-1 IN A SAFE, RELIABLE, AND EFFICIENT MANNER IN ACCORDANCE WITH CORPORATE POLICIES AND ALL APPLICABLE LAWS, REGULATIONS, LICENSES, AND TECHNICAL REQUIREMENTS.
- ENSURE THAT PLANT OPERATIONS AND MAINTENANCE ACTIVITIES ARE CARRIED OUT IN ACCORDANCE WITH CORPORATE RADIATION CONTROL, QUALITY ASSURANCE, SECURITY, AND EMERGENCY PREPAREDNESS PROGRAMS.

THREE MILE ISLAND UNIT 2 DIVISION

SUMMARY OF RESPONSIBILITIES

- OPERATE, MAINTAIN, AND CONDUCT DECONTAMINATION AND RECOVERY OPERATIONS OF TMI-2 IN A SAFE AND EFFICIENT MANNER IN CONFORMANCE WITH CORPORATE POLICIES AND ALL APPLICABLE LAWS, REGULATIONS, LICENSES, TECHNICAL REQUIREMENTS, AND OTHER REQUIREMENTS. THIS INCLUDES CONSTRUCTION OF REQUIRED FACILITIES.

MAJOR FUNCTIONS

- ESTABLISH AND MAINTAIN PLANT LEVEL POLICIES, PROCEDURES, AND PRACTICES RELATED TO THE DECONTAMINATION, RECOVERY, OPERATION, AND MAINTENANCE OF THE PLANT.
- PROVIDE AND MAINTAIN A PLANT STAFF QUALIFIED TO DECONTAMINATE, RECOVER, OPERATE, AND MAINTAIN THE PLANT.
- OPERATE AND MAINTAIN ALL SYSTEMS AND EQUIPMENT REQUIRED FOR DECONTAMINATION, RECOVERY, AND LAYUP OF SYSTEMS IN A SAFE, RELIABLE, AND EFFICIENT MANNER.
- DECONTAMINATE AND CLEAN UP THE WATER AND DECONTAMINATION FLUIDS IN A SAFE AND EFFICIENT MANNER.
- DIRECT AND CONTROL THE PLANT RECOVERY PROGRAM.
- DIRECT AND CONTROL THE CONSTRUCTION OF FACILITIES REQUIRED FOR THE DECONTAMINATION AND RECOVERY PROGRAMS.
- ESTABLISH AND IMPLEMENT PREVENTATIVE AND CORRECTIVE MAINTENANCE PROGRAMS TO ASSURE THAT THE PLANT IS MAINTAINED IN A SAFE AND RELIABLE STATUS.
- ASSURE THAT ALL PLANT ACTIVITIES ARE CARRIED OUT IN ACCORDANCE WITH CORPORATE RADIATION CONTROL, QUALITY ASSURANCE, SECURITY AND EMERGENCY PREPAREDNESS PROGRAMS.

TECHNICAL FUNCTIONS DIVISION

SUMMARY OF RESPONSIBILITIES

- ASSURE TECHNICAL AND REGULATORY ADEQUACY OF ALL ASPECTS OF NUCLEAR ACTIVITIES TO PROVIDE SAFE, RELIABLE, AND EFFICIENT OPERATIONS IN ACCORDANCE WITH CORPORATE POLICIES AND ALL APPLICABLE LAWS, REGULATIONS, LICENSES, ETC.

MAJOR FUNCTIONS

- PERFORM, MANAGE, AND DIRECT ALL OUT-OF-PLANT ENGINEERING, DESIGN, SAFETY ANALYSIS AND PLAN AND DIRECT STARTUP AND TEST ACTIVITIES.
- MAINTAIN ALL PLANT TECHNICAL BASIS AND CONFIGURATION CONTROL DOCUMENTS INCLUDING FUEL MANAGEMENT.
- CONTROL AND PERFORM INTERFACE ACTIVITIES WITH REGULATORY GROUPS.
- PERFORM PLANT TECHNICAL MONITORING/ASSESSMENT/PRODUCTIVITY ANALYSIS, INCLUDING MAJOR EQUIPMENT FAILURE ANALYSIS.
- PREPARE/REVIEW/CONCUR WITH ALL ENGINEERING AND LICENSING PROCEDURES AND LICENSING DOCUMENT CORRESPONDENCE AND PREPARE SARs, TECHNICAL SPECIFICATIONS AND ENVIRONMENTAL SPECIFICATIONS.
- SPECIFY, MANAGE, AND DIRECT ALL NUCLEAR FUEL MATERIAL, CONVERSION, ENRICHMENT, AND FABRICATION CONTRACTORS.
- REVIEW AND ASSESS THE SAFETY SIGNIFICANCE OF NRC NOTICES, BULLETINS, REPORTS, AND PLANT OPERATING EXPERIENCE INFORMATION.
- PROVIDE AND DIRECT OPERATING PLANT SHIFT TECHNICAL ADVISORS.
- REVIEW AND CONCUR IN ALL PLANT OPERATING, ALARM, AND EMERGENCY PROCEDURES FOR TECHNICAL ADEQUACY.
- DEFINE TECHNICAL REQUIREMENTS FOR TRAINING PROGRAMS.

NUCLEAR ASSURANCE

SUMMARY OF RESPONSIBILITIES

- MONITOR ALL NUCLEAR ACTIVITIES TO ASSURE THAT THEY PROVIDE THE REQUIRED HIGH DEGREE OF SAFETY AND RELIABILITY AND ARE CARRIED OUT IN ACCORDANCE WITH CORPORATE POLICIES AND ALL APPLICABLE LAWS, REGULATIONS, LICENSES, AND TECHNICAL REQUIREMENTS.
- PROVIDE TRAINING OF CORPORATION PERSONNEL AS NEEDED TO CARRY OUT THEIR DUTIES AND TO MEET CORPORATE POLICIES AND ALL APPLICABLE LAWS, REGULATIONS, LICENSES, AND TECHNICAL REQUIREMENTS.
- PROVIDE SUPPORT TO THE OPERATING STATIONS IN THE AREAS OF EMERGENCY PLANNING AND ANALYTICAL LABORATORY SERVICES.

MAJOR FUNCTIONS

- MONITOR, EVALUATE, AND ASSURE THAT ALL ACTIVITIES HAVING THE POTENTIAL FOR COMPROMISING NUCLEAR SAFETY ARE ADEQUATELY ADDRESSED.
- PROVIDE AND MAINTAIN THE QUALIFIED PERSONNEL TO DEVELOP AND ADMINISTER THE OPERATIONAL QUALITY ASSURANCE PROGRAM AND ASSURE THAT IT IS IMPLEMENTED IN ALL ACTIVITIES IMPORTANT TO SAFETY.
- DEVELOP AND IMPLEMENT ALL NECESSARY GENERAL EMPLOYEE OPERATOR, TECHNICIAN, AND MANAGEMENT TRAINING PROGRAMS.
- DEVELOP THE SITE EMERGENCY PLANS AND ASSURE THAT EMERGENCY PLAN PREPAREDNESS IS MAINTAINED.
- PROVIDE THE GENERATING STATIONS WITH CHEMISTRY AND METALLURGICAL ANALYTICAL SERVICES AND RECOMMENDED CHEMISTRY REQUIREMENTS AND SPECIFICATIONS.

RADIOLOGICAL AND ENVIRONMENTAL CONTROLS DIVISION

SUMMARY OF RESPONSIBILITIES

- ESTABLISH AND IMPLEMENT UNIFORM RADIOLOGICAL AND ENVIRONMENTAL POLICIES, PRACTICES, AND PROCEDURES REQUIRED TO ASSURE SAFE, RELIABLE, AND EFFICIENT OPERATION IN ACCORDANCE WITH CORPORATE POLICIES AND ALL APPLICABLE LAWS, REGULATIONS, AND LICENSES.

MAJOR FUNCTIONS

- ESTABLISH AND MAINTAIN CORPORATE LEVEL POLICIES, PROCEDURES, STANDARDS, AND PRACTICES RELATING TO RADIOLOGICAL AND ENVIRONMENTAL ACTIVITIES.
- PROVIDE THE PERSONNEL, PROCEDURES, AND ADMINISTRATIVE CONTROLS TO IMPLEMENT THE PLANT RADIATION AND ENVIRONMENTAL PROTECTION PROGRAMS.
- PROVIDE ADMINISTRATIVE AND TECHNICAL GUIDANCE APPLICABLE TO RADIATION PROTECTION, RADIOACTIVE MATERIALS, RESPIRATORY PROTECTION, AND RADIOLOGICAL ENGINEERING INCLUDING ALARA PROGRAMS AND DOSIMETRY CONTROL.
- PROVIDE ADMINISTRATIVE AND TECHNICAL GUIDANCE APPLICABLE TO ENVIRONMENTAL PROTECTION, ENVIRONMENTAL MONITORING, AND NPDES.

MAINTENANCE AND CONSTRUCTION DIVISION

SUMMARY OF RESPONSIBILITIES

- o ESTABLISH AND MONITOR UNIFORM POLICIES, PRACTICES, AND PROCEDURES FOR ALL MAINTENANCE, REPAIR, AND CONSTRUCTION ACTIVITIES IN ACCORDANCE WITH CORPORATE POLICIES AND ALL APPLICABLE LAWS, REGULATIONS, LICENSES, AND TECHNICAL REQUIREMENTS.
- o CARRY OUT ASSIGNED PLANT MODIFICATIONS, REPAIRS, AND CONSTRUCTION ACTIVITIES AND CONDUCT MAJOR AND SPECIALIZED MAINTENANCE WORK IN ACCORDANCE WITH CORPORATE POLICIES AND ALL APPLICABLE LAWS, REGULATIONS, LICENSES, AND TECHNICAL REQUIREMENTS.

MAJOR FUNCTIONS

- o MONITOR, EVALUATE, AND ASSURE THAT MAINTENANCE ACTIVITIES AT THE GENERATING STATIONS ARE BEING PERFORMED IN ACCORDANCE WITH CORPORATE POLICIES, PROCEDURES, AND GOOD MAINTENANCE PRACTICES.
- o ESTABLISH AND MAINTAIN THE NECESSARY CORPORATE LEVEL MAINTENANCE AND CONSTRUCTION PROCEDURES, STANDARDS, AND PRACTICES FOR THE PERFORMANCE OF MAINTENANCE AND CONSTRUCTION ACTIVITIES.
- o PLAN, SCHEDULE, AND DIRECT PLANT MODIFICATIONS, PLANT CONSTRUCTION PROJECTS, AND MAJOR AND SPECIALIZED MAINTENANCE JOBS.
- o PLAN, SCHEDULE, AND DIRECT MAJOR AND SPECIAL MAINTENANCE AND CONSTRUCTION ACTIVITIES INVOLVED IN PLANNED AND FORCED OUTAGES.
- o DEVELOP AND IMPLEMENT A FORMAL METHODS IMPROVEMENT/ PRODUCTIVITY PROGRAM.
- o DEVELOP PREPLANNED METHODS, PLANNING, AND SUPPORT FOR FORCED OUTAGES.

COMMUNICATIONS

SUMMARY OF RESPONSIBILITIES

- ESTABLISH AND IMPLEMENT POLICIES AND PROGRAMS FOR COMMUNICATIONS WITH THE NEWS MEDIA, LOCAL GOVERNMENT, CITIZENS GROUPS, AND INDIVIDUALS DURING BOTH NORMAL AND EMERGENCY CONDITIONS IN ACCORDANCE WITH CORPORATE POLICIES AND APPLICABLE REGULATIONS, ETC.
- ESTABLISH AND IMPLEMENT POLICIES AND PROCEDURES WHICH ASSURE INFORMATION OF GENERAL INTEREST TO EMPLOYEES IS DISSEMINATED FULLY, EFFECTIVELY, AND IN A TIMELY MANNER.

MAJOR FUNCTIONS

- MONITOR, EVALUATE, AND ASSURE THAT APPROPRIATE COMMUNICATIONS WITH OUTSIDE ORGANIZATIONS OR INDIVIDUALS WHICH ARE NOT THE SPECIFIC RESPONSIBILITY OF OTHER FUNCTIONAL DIVISIONS ARE ESTABLISHED AND MAINTAINED.
- ESTABLISH AND MAINTAIN CORPORATE LEVEL POLICIES, PROCEDURES, STANDARDS, AND PRACTICES RELATING TO INTERNAL AND EXTERNAL COMMUNICATION OF OTHER FUNCTIONAL DIVISIONS WITH NEWS MEDIA, LOCAL GOVERNMENTS, CITIZENS GROUPS, ETC.
- ESTABLISH AND MAINTAIN CONTACTS WITHIN LOCAL GOVERNMENT AND CITIZEN GROUPS TO ASSURE EFFECTIVE COMMUNICATIONS BETWEEN THOSE ORGANIZATIONS AND THE CORPORATION.
- COORDINATE COMMUNICATIONS ACTIVITIES WITH GENERAL PUBLIC UTILITIES, THE GPU SERVICE CORPORATION, AND THE OPERATING COMPANIES.
- SUPPORT THE DEVELOPMENT OF A POSITIVE ATTITUDE ON THE PART OF LOCAL OFFICIALS AND THE LOCAL PUBLIC TOWARD THE PRESENCE, ROLE IN THE COMMUNITY, AND SAFETY OF GPU NUCLEAR CORPORATION OPERATING PLANTS.

ADMINISTRATION DIVISION

SUMMARY OF RESPONSIBILITIES

- PROVIDE IN AN EFFICIENT AND RELIABLE MANNER AND IN ACCORDANCE WITH CORPORATE POLICIES AND ALL APPLICABLE LAWS, REGULATIONS, LICENSES, AND OTHER REQUIREMENTS, ALL REQUIRED BUSINESS MANAGEMENT AND ADMINISTRATIVE SUPPORT SERVICES FOR PRUDENTLY CONDUCTING THE ACTIVITIES OF THE GPU NUCLEAR GROUP.

MAJOR FUNCTIONS

- ASSEMBLE, REVIEW, AND ISSUE BUDGETS ON A CORPORATE-WIDE BASIS AND REGULARLY MONITOR AND REPORT PROJECTS, PROGRESS, AND EXPENDITURES AGAINST CAPITAL AND O&M BUDGETS AND ASSOCIATED WORK PLANS.
- PROVIDE MATERIALS MANAGEMENT SERVICES INCLUDING CONTRACTING AND PROCUREMENT, CONTRACT ADMINISTRATION, WAREHOUSING, AND INVENTORY CONTROL ON A CORPORATE-WIDE BASIS.
- DEVELOP AND ADMINISTER SECURITY, FACILITIES, SERVICES, AND INDUSTRIAL SAFETY PROGRAMS DIRECTED TO CREATING A SAFE, CONVENIENT, AND PROTECTED ENVIRONMENT FOR COMPANY EMPLOYEES AND PROPERTY IN ACCORDANCE WITH CORPORATE POLICIES AND ALL APPLICABLE LAWS, REGULATIONS, LICENSES, AND OTHER REQUIREMENTS.
- PROVIDE HUMAN RESOURCES PERSONNEL SERVICES IN THE AREAS OF RECRUITING, INDOCTRINATION, AND ORIENTATION OF NEW EMPLOYEES, WAGE AND SALARY ADMINISTRATION, CAREER COUNSELLING AND PLANNING, EMPLOYEE BENEFITS ADMINISTRATION, EMPLOYEE RELATIONS SERVICES FOR PROFESSIONAL EMPLOYEES AND BARGAINING UNITS, EEO, AND OTHER EMPLOYEE RELATIONS AND RETENTION PROGRAMS.
- NEGOTIATE AND ADMINISTER UNION CONTRACTS AND GRIEVANCE AND ARBITRATION PROCESSES.

ADMINISTRATION DIVISION
(continued)

- PREPARE, REVIEW, COORDINATE, AND ISSUE CORPORATE ADMINISTRATIVE POLICIES AND PROCEDURES.
- PROVIDE INFORMATION MANAGEMENT AND DOCUMENTATION CONTROL SERVICES.
- PROVIDE LEGAL SERVICES IN SUPPORT OF THE GROUP OPERATIONS INCLUDING PRESUBMISSION REVIEWS OF MAJOR PURCHASE TRANSACTIONS AND VENDOR NEGOTIATIONS, SUPPORT LITIGATION AND ARBITRATION OR ADMINISTRATIVE PROCEEDINGS AND REVIEW, AS APPLICABLE, PROPOSED CORPORATE ADMINISTRATIVE POLICIES AND PROCEDURES.

ELEMENTS OF SAFETY REVIEW PROCESS

- EMPHASIS ON RESPONSIBILITY OF LINE FUNCTION
  - DO IT RIGHT
  - OBTAIN NEEDED REVIEWS
- 100% INDEPENDENT BEFORE THE FACT
  - INVOLVEMENT OF SUPPORT GROUPS
  - EXPLICIT CONSIDERATION OF MULTIDISCIPLINARY
- SAFETY GROUP FOR EACH PLANT
  - FULL TIME ON SAFETY
  - ON-SITE - REPORT OFF-SITE
  - PRIOR REVIEW OF DEFINED ITEMS
  - AFTER THE FACT OVERVIEW
  - DIRECT OBSERVATION/SURVEILLANCE
  - FULL ACCESS
- NUCLEAR SAFETY ASSURANCE DEPARTMENT
  - HEADQUARTERS STAFF
    - OVERVIEW
    - NO ASSIGNED TASKS
  - OVERSEE SITE SAFETY GROUP
  - OMBUDSMAN
  - STAFF TO GORB
- GENERAL OFFICE REVIEW BOARD (GORB)
  - FULL TIME CHAIRMAN
  - OUTSIDE MEMBERS
  - BROAD CHARTER
    - FUNCTIONING OF SAFETY REVIEW PROCESS
    - QUALITY ASSURANCE PROGRAM ADEQUACY
    - NO OTHER ASSIGNED TASKS
    - ACCESS TO CEO & BOARD

T-6

TMI-1 CONTROL ROOM DESIGN REVIEW TEAM

- Members of the GPU Engineering Staff
- TMI Unit 1 Operating Personnel
- Engineers from MPR Associates, Inc.
- Two well known experts in the human engineering field, Dr. J. M. Christensen and Dr. T. B. Sheridan

TMI-1 CONTROL ROOM DESIGN REVIEW

- Development of guidelines and objectives
- Construction of a full scale control room mock up
- Walk-through/talk-through of key operating procedures.
- Individual review of displays and controls.
- Review of alarm systems
- Survey of environmental conditions.

STRENGTHS OF TMI-1 CONTROL ROOM

- GROUPING OF CONTROLS AND DISPLAYS
- UNCLUTTERED CONSOLE AND PANEL
- DIVISION OF OPERATIONAL RESPONSIBILITY BETWEEN CONTROL ROOM AND LOCAL STATIONS
- RELIABILITY OF CONTROL AND DISPLAY HARDWARE
- RELATIVE LOCATION OF CONTROLS AND ASSOCIATED DISPLAYS
- RELATIVE LOCATION OF ALARM ANNUNCIATORS TO RELATED CONTROLS AND DISPLAYS
- GENERAL LACK OF ACTUATED ALARMS DURING NORMAL OPERATION.

AREAS WHERE IMPROVEMENT IS BEING PURSUED

- LABELING AND OUTLINING
- ARRANGEMENT OF EMERGENCY FEEDWATER CONTROLS AND INDICATORS.
- READABILITY OF THE ESAS PANEL
- ALARM PRIORITIZATION AND ACKNOWLEDGEMENT.
- CONTROL ROOM ENVIRONMENT UPGRADE.

METHOD OF MAKING CHANGES

- Develop conceptual design
- Construct full scale drawing for use on mockup
- Conduct walk-throughs with licensed operators
- Construct other models as needed
- Make final decision on changes

T-6

SMALL BREAK ANALYSIS AND FEEDBACK OF OPERATING EXPERIENCE

LONG TERM ORDER ITEM NO. 2:

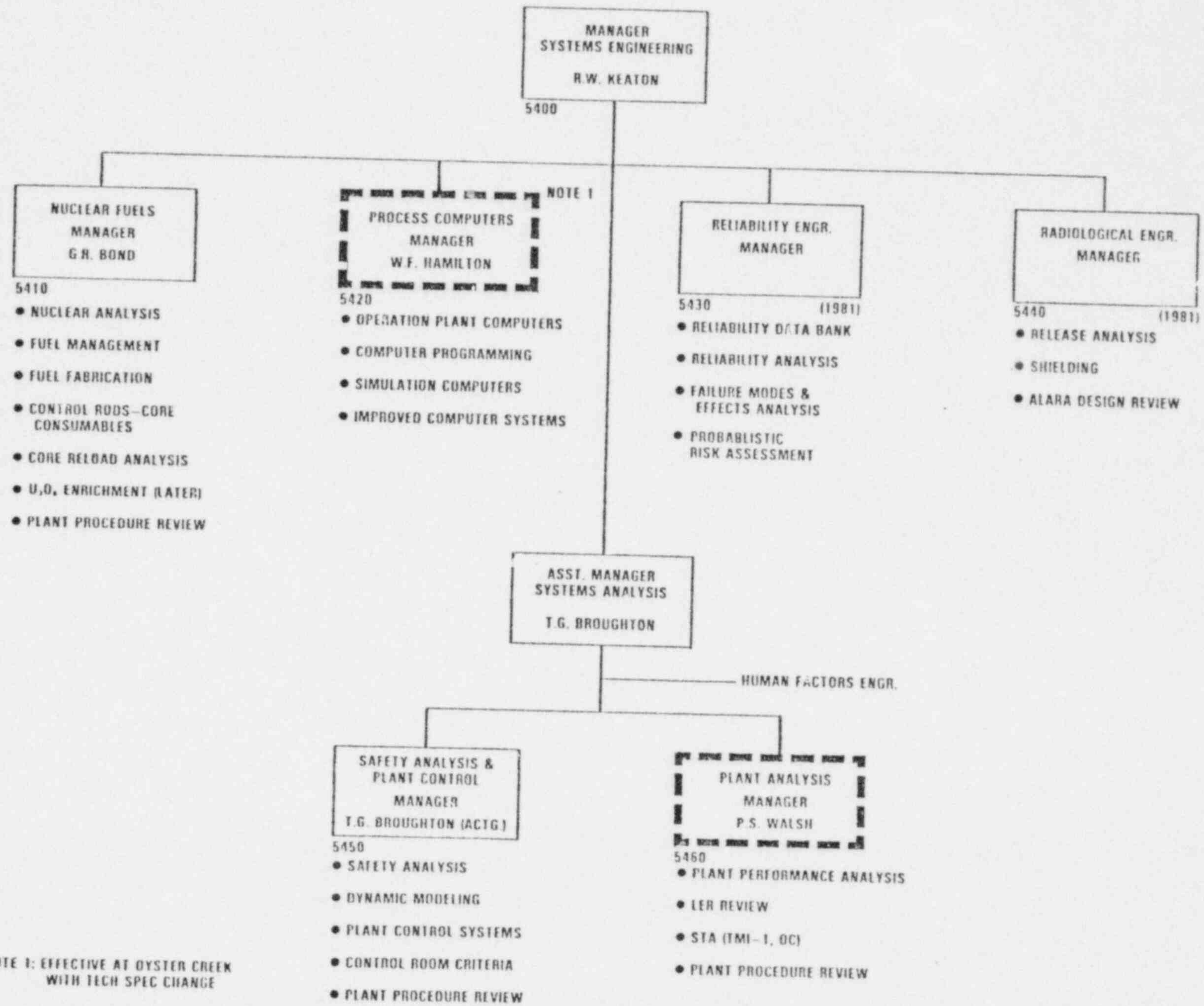
"... GIVE CONTINUED ATTENTION TO TRANSIENT ANALYSIS AND PROCEDURE FOR MANAGEMENT OF SMALL BREAKS BY A FORMAL PROGRAM SET UP TO ASSURE TIMELY ACTION OF THESE MATTERS".

PROCEDURES FOR FEEDBACK OF OPERATING EXPERIENCE

PERFORMED BY PLANT ANALYSIS SECTION OF SYSTEMS ENGINEERING DEPARTMENT

GPU NUCLEAR
TECHNICAL FUNCTIONS DIVISIONS
SYSTEM ENGINEERING DEPARTMENT

INDICATES ON-SITE LOCATIONS FOR MAJORITY OF PERSONNEL



NOTE 1: EFFECTIVE AT OYSTER CREEK WITH TECH SPEC CHANGE

OPERATOR RETRAINING PROGRAM

PHILOSOPHY - EXTENSIVE RETRAINING PROGRAM VITAL IN CONTINUOUSLY UPGRADING OPERATOR PERFORMANCE TO PROMOTE SAFE, RELIABLE PLANT OPERATIONS.

MANAGEMENT COMMITMENT

- Nuclear Assurance
- Operator Training Section
- Management and Supervisory Capabilities
- Training Facilities
- Simulator
- Instructor Qualifications and Training

GOAL - PROVIDE RETRAINING PROGRAM FOR OPERATORS EXEMPLIFYING PHILOSOPHY OF PROMOTING SAFE, RELIABLE PLANT OPERATIONS, INCLUDING PROPER RESPONSE TO TRANSIENTS. PROGRAM MEETS OR EXCEEDS REQUIREMENTS IMPOSED VARIOUS NUREGS, REG GUIDES, CFR, AND ANSI STANDARDS AND RECOMMENDED BY INPO.

PERSONNEL IN RETRAINING PROGRAM

- 16 SRO Licensed
- 13 RO Licensed
- 2 RO's in training for SRO
- 10 individuals in training for RO
- 8 STA's

ELEMENTS OF RETRAINING PROGRAM

- Requalification Lecture Series (one in six shift rotation ~ 240 hours/yr)
  - Heat Transfer and Fluid Flow
  - Mitigating Core Damage
  - Plant Transients
  - ICS Manual Operations
- On-the-Job Training
- Annual Examination

T-7

ATOG

ABNORMAL TRANSIENT OPERATING GUIDELINE PROGRAM

INTENDED TO SATISFY NUREG 0578 RECOMMENDATION 2.1.9c

"PROVIDE THE ANALYSES, EMERGENCY PROCEDURES, AND TRAINING TO SUBSTANTIALLY IMPROVE OPERATOR PERFORMANCE DURING TRANSIENTS AND ACCIDENTS, INCLUDING EVENTS THAT ARE CAUSED OR WORSENED BY INAPPROPRIATE OPERATOR ACTIONS"

B&W PROGRAM FUNDED BY SIX OWNERS

PLANT SPECIFIC GUIDELINES

TWO PARTS: PROCEDURE GUIDELINES
TRAINING MATERIAL

HUMAN FACTORS CONSULTANT WITH MILITARY PROCEDURES EXPERIENCE

GUIDELINES

Executed after Each Reactor Trip

Instructions Based on Key Symptoms

Symptoms Arranged to Diagnose Events

Response Prioritized

Considers Loss of Instrumentation and Control Power

Detects Combinations of Malfunctions

Appendices for Specific Events

Pressure-Temperature Plot can be used as Aid to Identify:

- Loss of Subcooling
- Overcooling
- Loss of Heat Sink

IMPLEMENTATION

TMI-1 Draft Event Trees	October '80
TMI-1 Draft Guidelines	April '81
TMI-1 Final Guidelines	July '81
Revised Procedures and Operator Training	September '81

T-9

II.F.2 INADEQUATE CORE COOLING (ICC) CONSIDERATIONS

Detect and respond to nonmechanistic symptoms

Core overheating

- Two-phase froth level below top of core
- Local voiding (e.g., flow blockage)

Provide instrumentation to

- Detect approach to ICC by monitoring coolant saturation conditions and increasing coolant void fraction or decreasing liquid level
- Detect existence of ICC by monitoring two-phase froth level below top of core and increasing fuel temperature or coolant superheat
- Monitor recovery

Information needs

- Basis for operator actions to prevent or recover from ICC
- Assist the operator and supporting emergency operations staff to assess the recovery progress from unidentified situations

REACTOR WATER LEVEL SYSTEMS UNDER EVALUATION

LEVEL ABOVE CORE	LEVEL WITHIN CORE
ΔP measurement	ΔP measurement
Heated thermocouples	Core exit thermocouples In-core TCs in instrument thimble SPNDs in instrument thimble
Neutron detectors above and below reactor vessel	Neutron detectors above and below reactor vessel

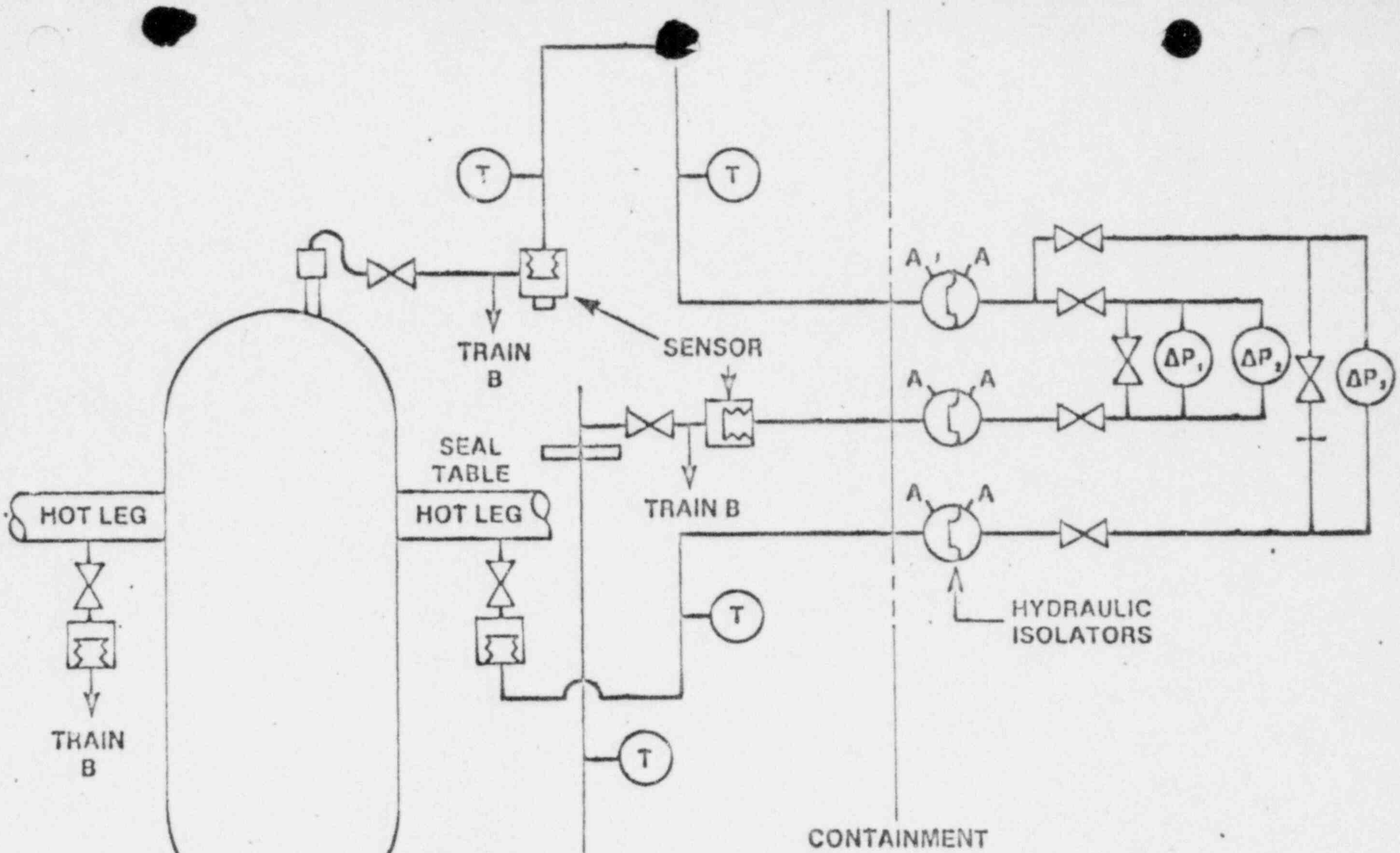
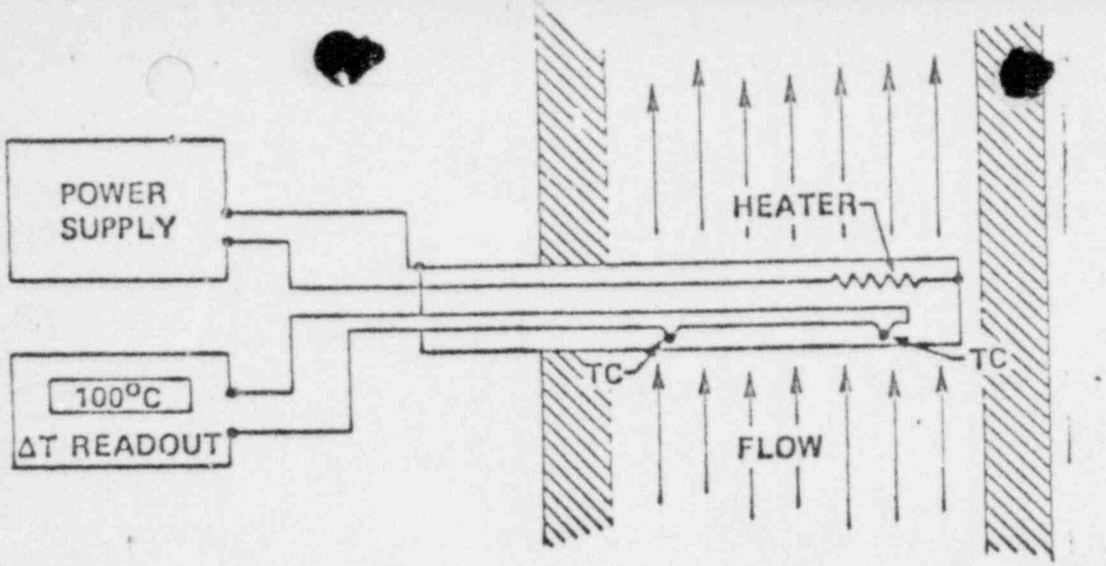


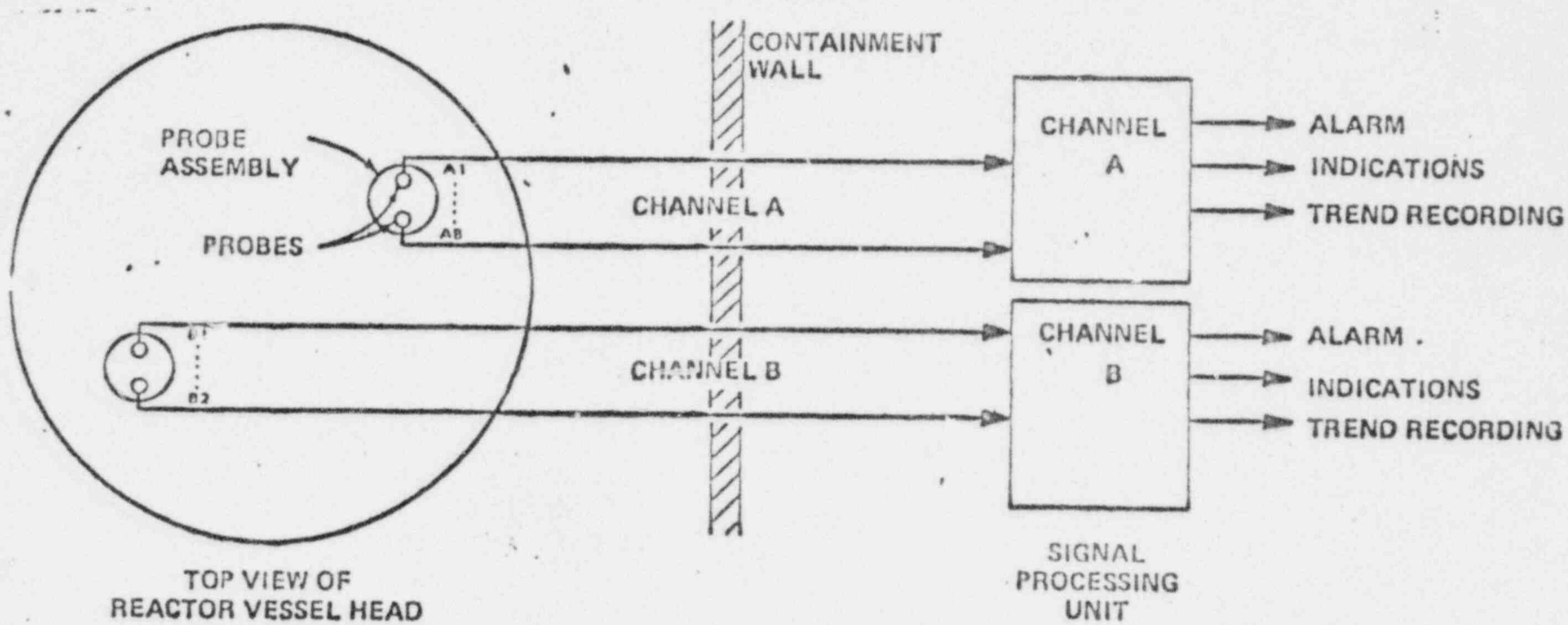
FIGURE 1

WESTINGHOUSE
REACTOR VESSEL WATER LEVEL
MEASUREMENT SYSTEM

FIGURE 2

CE HEATED JUNCTION THERMOCOUPLE





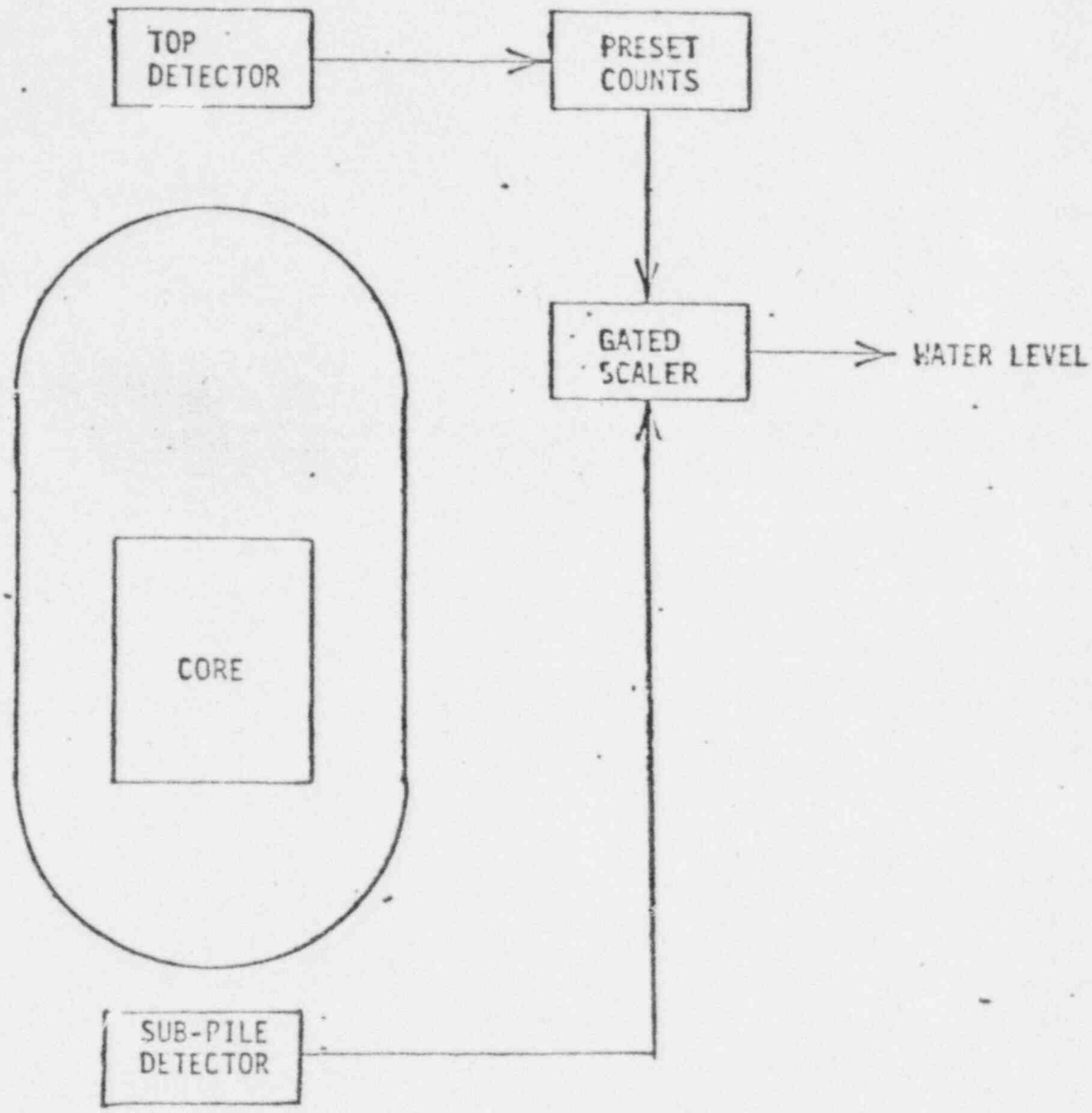


FIGURE 3
NNC NEUTRON DETECTOR
SIMPLIFIED DIAGRAM OF
SYSTEM TO MEASURE
WATER LEVEL IN SHUTDOWN REACTOR
(AMPLIFIERS AND POWER
SUPPLIES NOT SHOWN)

(a)

(b)

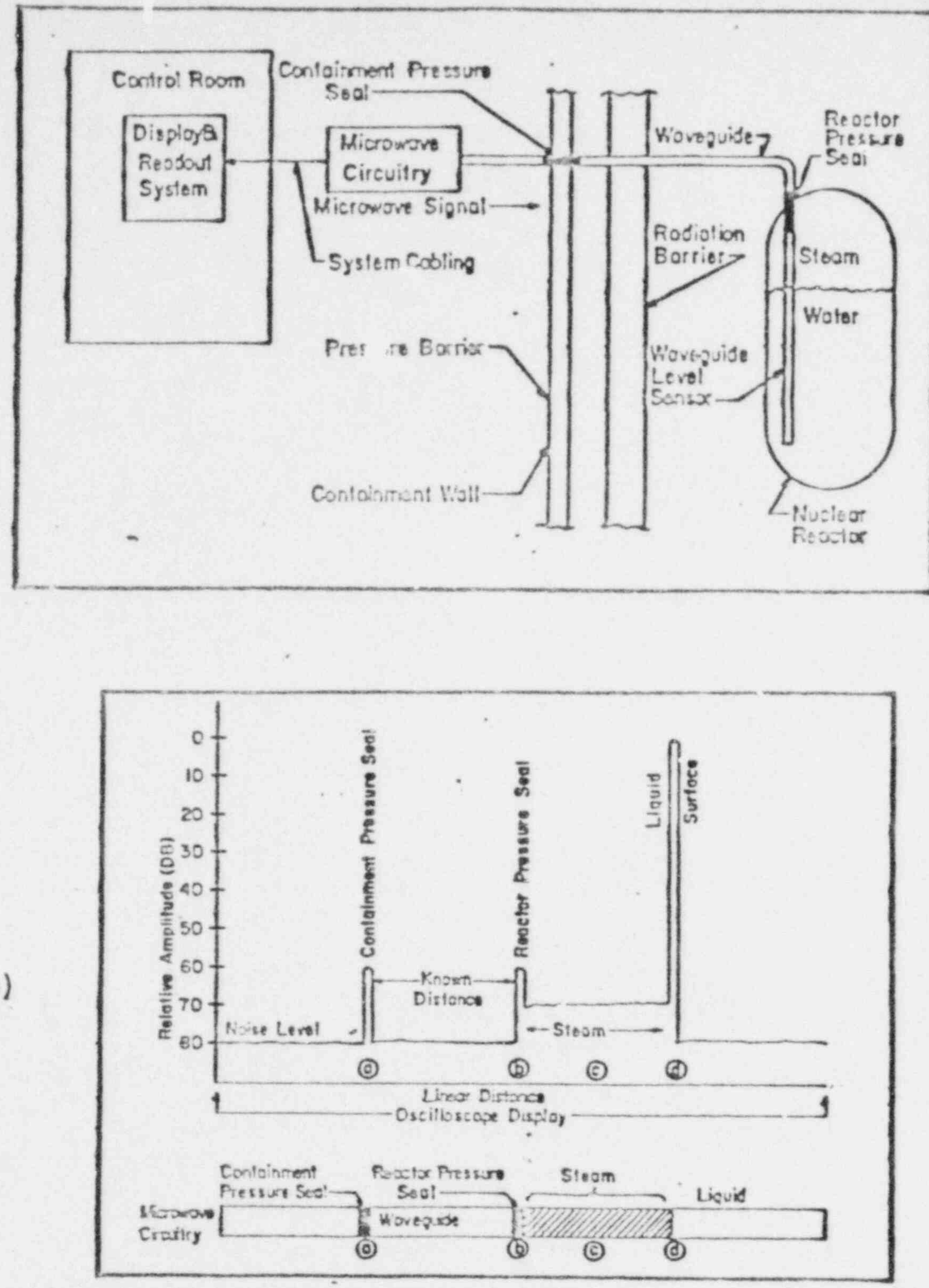


FIGURE 4

DAVCO MICROWAVE LIQUID LEVEL GAUGE FOR USE IN A HIGH RADIATION ENVIRONMENT

POOR ORIGINAL

TABLE 1

REACTOR VESSEL WATER LEVEL DETECTOR

System	Supplier	Status	Problems	Test Dates	Special Features
Heated Junction T/C (Differential Temp. Type)	ORNL	Some testing performed on prototype units	Droplet effects; Need droplet shield	Semiscale late 1980 Possible LOFT to be scheduled	Indicates wet or dry surface reflecting the heat removal capability of the coolant quality existing at discrete axial levels
Heated T/C (Absolute Temp. Type)	INEL	New prototype; Need further evaluation	No commercial development	ORNL late 1980	
Heated Junction T/C (RVLMS)	CE	Conceptual design similar to ORNL's HJTC	Suitable for level detection above core only	Under development & test at CE Semiscale or LOFT early 1981	
Ultrasonic	ORNL	Built & tested under research & development	Funding and development problems	ORNL early 1981	Near continuous level indication
Neutron Detector	NNC (EPRI sponsored)	Proof of principle needed Some prototype testing performed	Reliability of signal interpretation	LOFT late 1980	No leads in vessel
Differential Pressure (RVLIS)	W	Built commercial	Need further evaluation under simulated accident condition	Semiscale late 1980 Possible LOFT to be scheduled	Continuous level indication - can possibly be installed within one year
Microwave Liquid Level Gauge	DAVCO	New Conceptual Design	Need further development & system design	Semiscale or LOFT late 1981	Continuous level indication

T-10

THERMAL MECHANICAL REPORT - EFFECT OF HPI ON VESSEL INTEGRITY FOR SMALL BREAK LOCA WITH NO AFW

REQUEST (DRAFT NUREG - 0737, II.K.2.13)

PERFORM DETAILED ANALYSIS OF THERMAL/MECHANICAL CONDITIONS IN THE RV DURING RECOVERY FROM SMALL BREAK WITH EXTENDED LOSS OF ALL FEEDWATER. SUBMIT REPORT JANUARY 1, 1981.

KEY ISSUES

ASSESS POTENTIAL FOR THERMAL SHOCK OF RV RESULTING FROM COLD SAFETY INJECTION FLOW

ASSESS FLUID STREAM MIXING IN THE DOWNCOMER

OPERATOR ACTIONS TO THROTTLE HPI FLOW RATES

STATUS

B&W SUBMITTED REPORT TO GPU NOVEMBER 21, 1980

UNDERGOING INTERNAL REVIEW

WILL BE SUBMITTED TO STAFF BY JANUARY 1, 1981

INVESTIGATIONS COMPLETED

- O GENERIC BOUNDING ANALYSIS PERFORMED TO ENVELOPE ALL B&W OPERATING PLANTS
- O CONSERVATIVE EVALUATION
  - O MINIMUM ALLOWABLE BWST FLUID TEMPERATURE
    NO FLOW MIXING IN COLD LEG PIPING OR RV DOWNCOMER
    INSTANTANEOUS COOLDOWN OF RV METAL TO HPI FLUID TEMPERATURE
    OPERATOR ACTION TO MAINTAIN 100F SUBCOOLING
    MOST LIMITED PLANT SHOWS ADEQUATE RESULTS THROUGH ADDITIONAL .5 EFPY
  - O ASSUME ~30F DOWNCOMER MIXING
    ALL OTHER ASSUMPTIONS THE SAME
    MOST LIMITED PLANT SHOWS ADEQUATE RESULTS THROUGH ADDITIONAL ~1.5 EFPY

ONGOING ACTIONS

INVESTIGATE MIXING TESTING - EPRI, PRIVATE LABS

PLANT SPECIFIC ANALYSIS