UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

- - -

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

SUBCOMMITTEE ON
THREE MILE ISLAND
NUCLEAR STATION UNIT 1

- - -

Room 1046
1717 H St., N.W.
Washingto., D.C.
Thursday, June 25, 1981

The meeting of the Subcommittee convened, pursuant to notice, at 8:30 a.m.

SUBCOMMITTEE MEMBERS PRESENT:

D. W. Moeller, Chairman
W. Kerr
W. M. Mathis
H. Etherington

DESIGNATED FEDERAL EMPLOYEE:

R. K. Major

CONSULTANTS:

I. Catton
W. Keyserling
W. Lipinski
Z. Zudans

POOR ORIGINAL

8106290155

ALSO PRESENT: Harley Silver, John Stolz, Tom Novak, D. Dilanni, L. Phillips, S. Chesnut, E. Chow, D. Jeng, C. K. Leu, W. Pasadag, L. Crocker, R. Ramirez, D. Haverkamp, V. Stello, N. Moseley, B. Grimes, Mr. Fraley, Mr. Abbott, R. C. Arnold, P. Clark, T. C. Broughton, R. J. Chisholm, D. K. Croneberger, G. Giangi, H. D. Hukill, R. W. Keaten, R. L. Long, J. P. Moore, R. Rogan, M. J. Ross, D. G. Slear, E. G. Wallace, R. F. Wilson, W. Dickey, Mr. Adler, and Margaret Riley.

* * *

PROCEEDINGS

8:30 a.m.

MR. MOELLER: The meeting will now come to order. This is a public meeting of the Advisory Committee on Reactor Safeguards Subcommittee on the Three Mile Island Nuclear Station Unit 1. I am Dade Moeller, the Subcommittee Chairman.

The other ACRS member present today are William Kerr, William Mathis and Harold Etherington. Also present are the following ACRS consultants: Ivan Catton, W. Monroe Keyserling, Walter Lipinski and Zenon Zudans.

The purpose of this meeting will be to review the modifications made to the plant hardware, organization, procedures and so forth as a result of the accident at TMI-2 in preparation for the restart of TMI Unit 1. This will be the third time the Subcommittee has met to discuss these matters. The other Subcommittee meetings were held on January 31 and February 1, 1980, in Middletown, Pa., and on November 28 and 29, 1980, in Washington, D.C.

An agenda has been prepared for the meeting which we in general plan to follow. Item number II, labeled miscellaneous, will be covered either the last thing today or the first thing tomorrow morning. Within this item there are three additional subjects we would like to cover. These are:

One, the interactions between Units 1 and 2;

Number two, the responses of the management to the health physics appraisal review conducted a year or so ago;

And three, plant security, with particular comment on the implementation of the recommendations of the review that was conducted by the group from the Los Alamos National Laboratory.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act and the Government in the Sunshine Act. Mr. Richard Major is the Designated Federal Employee for the meeting.

The rules for participation in today's meeting have been announced as part of the notice previously published in the Federal Register on June 8th, 1981. A transcript of the meeting is being kept and it is requested that each speaker first identify himself or herself and speak with sufficient clarity and volume so that he or she can be readily heard.

We have received several written statements from Marvin Lewis of the public and items taken from these statements are on our agenda for discussion. There have been no requests for time to make oral statements from any members of the public.

One last item concerning the agenda. I notice that lunch is written down as at 11:30 "p.m." It will neither be, probably, 11:30 p.m. or a.m., but probably about a half-hour past noon today.

(Laughter.)

MR. MOELLER: We will now move on with the meeting.

Let me first ask if any of the members of the Subcommittee have comments, questions, or suggestions at this time?

(No response.)

MR. MOELLER: Do any of the consultants have questions or comments or suggestions?

(No response.)

MR. MOELLER: There being none there, I will call upon Harley Silver of the NRC staff to begin the presentation. And he will be covering a summary and status of the review and hearing summary of primary issues on which the Boards have focused.

MR. SILVER: Good morning. I'm Harley Silver of the NRC staff.

(Slide.)

To start off with the first agenda item, the first portion of it is a summary and status of the review. I prepared this slide as a little bit of history to indicate the progression of requirements in very superficial form from the start of the TMI-1 restart proggam, which of course was the August 9 order of 1979 by the Commission. That order was modified several times by further order of the Commission. And of course, the other requirements are -- that is, some of the requirements embodied in the order were developed into the action plan, NUREG-0660, su. sequently NUREG-0694, which was then subsumed in NUREG-0737.

So just to indicate how that applies to this particular plant, the order itself contained eight short-term items and four long-term items. O.der items 1, 2, 3 and 8, I can explain what those are if it's necessary, but I think for this purpose perhaps not.

Order items 1, 2, 3 and 8, and long-term items 1 through 4 became items in NUREG-0737 ultimately, a total of approximately 54 items of 0737. The remainder of the August 9 order is unique to TMI-1. It covers such items as separation of Units 1 and 2, waste management, management capability, and financial matters.

I mentioned the modifying orders of the Commission. The March 6 order of 1980 defined in more detail the management issues which the Commission wished the parties to examine or the Board to examine. And the March 3, 1981, order did a variety of things.

It first defined that, contrary to the position that the Staff had previously taken, that thi. particular plant was to be considered an operating reactor rather than a near-term operating license applicant insofar as the requirements of NUREG 0737 and some others, but instructed Paul not to go back and disturb the record unnecessarily on positions already taken; and also eliminated financial matters as a subject to be considered by the hearing board, and permitted Met Ed to use pump heat to hot functionally test the unit prior to restart. The original order had required it remaining in cold shutdown and departure from cold shutdown presumably constituted restart.

As I said, those items are unique to TMI-1. They were reviewed in NUREG-0680, the so-called SER and its various supplements, the supplements as indicated. NUREG-0746 is the SER covering emergency planning matters, and it to was supplemented.

There are of course other items in 0737, other items other than those that were included in the original order which are in fact applicable to TMI-1 and other plants as w ll. That is the total of 28.

Again, these totals depend a great deal on how you count. Don't hold me to the exact numbers. These are guides. We evaluated those items in rather short SER's, individual SER's, enclosed with two letters of April 22nd to Met Ed, which I believe everyone has seen, and also NUREG-0752, which is the control room design review report, which also has been suppemented once.

In addition, there are a number of non-TMI-2, that is non-accident-related, items which are both applicable to both plants. There are a variety of those, of course, and they're all over the map. They also have been evaluated in individual SER's.

Any questions on this?

MR. MOELLER: Any questions?

(No response.)

MR. MOELLER: There are none. Go ahead.

(Slide.)

MR. SILVER: Just to give an indication of the status of the hearing, the year apparently is open over here. We'll fill that in as we get to it.

The issues in the hearing have been divided essentially into four major chunks, for convenience really: design and analysis, separation of the units, management, and emergency preparedness.

The record has essentially been closed on the design analysis issues, with the exception of one contention dealing with environmental qualification which is to be heard starting next Monday, and hopefully finishing next Monday. But who can tell.

The separation of the units, the record is effectively closed and proposed findings are filed.

Incidentally, on the design analysis issues other than UCS-12, the environmental qualification contention, proposed findings have been filed by all parties, I believe, on each of the issues.

The record is closed on management issues and proposed findings filed. Emergency preparedness, we have gone a considerable ways through the hearing on that subject but we are not quite done. We will resume the hearing on that subject after the environmental qualification issue is concluded next week and presumably conclude that some time during the following week, around July 9 or so. So that effectively, barring other complications, the hearing will be completed by July 9 or 10 or mid-July, let us say.

(Slide.)

MR. MOELLER: Excuse me. Under "design and analysis," to help me with it, where it says the record is closed, that does not mean that everything is resolved, or does it simply mean everyone has stated their position?

MR. SILVER: It means that all testimony has been taken and that proposed -- Well, the "record closed" means all testimony has been taken. As I say, proposed findings have been filed. There is in no way agreement between all the parties on many of the subjects.

MR. MOELLER: Okay, thank you. That helps me.

MR. SILVER: The next item in agenda item 3 is a summary of the issues on which the Board has focused. This is a difficult one to be very specific about. What I have done essentially break down the design and analysis issues, and for that matter all of the issues, into a little finer group and attempt to show by subject matter the groupings of the contentions which were heard in the case.

I have indicated the number of contentions in that subject matter and the number of formal board questions in that area, as a very rough guide of perhaps where the emphasis has been. The asterisked items -- emergency feed reliability, safety classification, and detection of inadequate core cooling -- are a rather subjective judgment of three of the issues which perhaps received greater emphasis than some of the others.

I don't know if there's any point in simply reading the names of the titles of the subject matter. I think most of them are fairly self-evident. I did not break down separation of the units, management, or emergency planning very fine. As you might note, emergency planning had a very large number of contentions, and again this is an approximation of the number. There were many parts and subparts and overlaps and things of this nature.

MR. MOELLER: Mr. Zudans has a question.

MR. ZUDANS: What is the significance in this number of formal board questions, the "zero" and the "dash"? What does that mean in general?

MR. SILVER: The significance is, change the zeroes to a dash, and -- I missed one -- there is no difference.

MR. ZUDANS: What does it mean, for example, in detection of inadequate core cooling where you have three contentions and no questions asked?

MR. SILVER: The questions -- Let me define what a "Board Question" is. A Board Question in this context is a formal question, written or dictated by the Board, which in effect is essentially in a way a contention of the Board. In other words, it's a formal specific question which requires testimony to be prepared to answer it.

The board obviously had a myriad of questions of a cross-examining nature during the hearing, which I made no attempt whatever to indicate on this chart.

MR. ZUDANS: Could it be understood to mean that if the Board did not have such a formal question, that the Board did not consider that an issue?

MR. SILVER: No, I would not construe it that way. And again, this is the difficulty of trying to construct a chart of this kind.

The board is quite interested in the case of inadequate core cooling. The principle conflict, if you will, was between the Staff and the Licensee as to the need for a water level indicator, and we will get into that a little further later in this session. But it does not indicate the Board was not interested, simply that the contentions perhaps covered the ground that the Board was concerned about.

MR. ZUDANS: Because you said in a previous slide that the design and analysis essentially was closed.

MR. SILVER: I didn't say the issues were resolved, though.

MR. ZUDANS: You said the process was closed.

MR. SILVER: Right.

MR. ZUDANS: And I understand when you explained Dr. Moeller's question that that doesn't mean resolved. That doesn't mean the books may not be opened again. Is that a correct interpretation?

As long as there are no questions, could we construe this as the end of the story?

MR. SILVER: The board, of course, must decide, and ultimately the Commission must decide, as to whether the requirement as stated by the Staff holds or not. In this particular case, the requirement is essentially for a commitment and some preliminary work prior to restart, rather than the installation of the device prior to restart.

And the argument -- and again, I'm sure that you will hear more about it later -- is the need for such an instrument.

MR. MOELLER: Mr. Catton?

MR. CATTON: How many of these contentions originated through the Intervenors?

MR. SILVER: All.

MR. CATTON: All?

MR. SILVER: Yes.

MR. CATTON: Are there any --

MR. MOELLER: Use your mike, if you will.

MR. CATTON: Well, detection of inadequate core cooling, that's a contention that originated from the NRC staff?

MR. SILVER: There are contentions which duplicate requirements of the order or requirements of the Staff. I use the word "requirements," recommended requirements of the Staff. And in fact, some of them simply repeated the requirements of the original order.

Some of them did such things as attempt to require short-term items in some of the long-term requirements. Some of them, of course, were entirely new, not covered by the order in any way, and additional requirements which intervenors felt should be either short or long-term requirements.

MR. CATTON: Thank you.

MR. MOELLER: I think I have a related question.

If an item is not in contention, does the Board ask questions about it? I mean, are there items that they submitted formal questions on that you don't have listed?

MR. SILVER: Yes -- No, not formal questions. The board did of course examine the mandatory issues, that is the issues of the order, that were not in contention. And although that occupied a relatively short fraction of the total time of the hearing, most of which was spent on contentions.

MR. MOELLER: Harold Etherington?

MR. ETHERINGTON: I'm still a little bit unclear. Where the Board has no question, does that mean that they have dismissed any contention on that item?

MR. SILVER: No, sir, it does not. It was simply an identification of the -- perhaps the Board felt that the contentions were not comprehensive enough or that they did not address things that the Board felt should be addressed on that subject matter, and raised their own questions on the subject.

MR. ETHERINGTON: Where does that stand, if there is a contention but no questions?

MR. SILVER: It's still in litigation. Again, the questions are all related in some way to contentions, I do believe, going through that instantaneously in my memory. So that the proposed findings I believe address the questions as part of the contention, that is within the same discussion or the same package of findings. The contention related to an issue is addressed with the proposed finding on the contention.

MR. ETHERINGTON: Thank you.

MR. MOELLER: And you are also stating that, even if no formal questions were asked, these matters were discussed?

MR. SILVER: At length in many cases.

MR. MOELLER: Thank you.

MR. SILVER: I would say a wide variety of time was spent on issues, from perhaps a couple of hours at the shortest to several weeks on the longer ones.

(Slide.)

MR. SILVER: If I can go back to this slide, the very first one, I indicated a number of open items in the extreme right column. And again, they are related to the review document or documents. In other words, there was one item in NUREG-0680, one in emergency planning, six in the 0737 items, and essentially three in the non-TMI 2-related items.

(Slide.)

Agenda item 4 essentially discusses the items requiring resolution prior to restart, that is open items which the Staff feels should be resolved prior to restart.

As a summary sheet, let me use this chart. These are identified in terms of the NUREG-0737 identification, and in fact all but the first one in the TMI-related items are 0737 items. These six are the six open items indicated against NUREG-0737 items on the first chart.

II.F.2 was in the original order, and that is the instrumentation for detection of inadequatec core cooling, and that is open insofar as the water level indicator is concerned. The other aspects of inadequate core cooling we feel are satisfied and that is the only open aspect. We will have another discussion on that in a moment.

While I am up here, perhaps I should discuss the remaining six TMI-2 related, or I should say five of the seven of the open items. I can do that quickly and we will have separate presentations on II.F.2, the water level indicator and emergency preparedness, which is III.A.2.

That may have to be delayed a little while. The FEMA and PEMA people who arranged to come down and make parts of their presentation today plan to be here after 10:00, in accordance with your second schedule of the -- were there was another item at 8:40, and could not change their travel plans. So if we may, we can discuss that when they arrive.

MR. MOELLER: Fine.

MR. SILVER: To do this quickly, since these items are I guess relatively minor --

(Slide.)

II.K.3.2 involves -- again, these are open items which the Staff feels should be resolved prior to restart. II.K.3.2 requires a report on PORV failure. The Licensee did in fact submit a report in April, and in reviewing it the Staff identified further analyses regarding probability that we felt were required. Licensee has not yet, as far as I'm aware, not yet responded to that request.

As far as the safety significance with regard to restart, of course this item merely would determine if automatic PORV isolation is required. And that item, of course, is II.K.3.1, authomatic PORV isolation, which again, because the Licensee concluded as a result of II.K.3.2 that this is not necessary, their submittal simply said as much.

When II.K.3.2 is completed, if in fact the conclusion is that in fact automatic PORV isolation is required, then NUREG-0737, modified slightly for this case schedule-wise, would require a design prior to restart and installation six months after the first reload after the design is approved. So that clearly there would be no implementation of any hardware or anything else with regard to these two items with regard to restart.

MR. MOELLER: Mr. Kerer has a question.

MR. KERR: Has any other plant been required to install, or is it going to be required to install, this automatic PORV?

MR. SILVER: I don't know what the result of the review of the plants has been.

MR. MOELLER: This is a generic issue.

MR. SILVER: Yes, it is applicable to all plants. I am sure that all other plants have in fact submitted a report.

MR. KERR: Is the requirement for installation based only on the operating experience of one plant, rather than the generic operating experience of PORV's?

MR. SILVER: I don't know, frankly, Mr. Kerr, how the Staff will evaluate this. It is being done generically, that is across the Board.

MR. MOELLER: Have the decisions been reached on other B&W plants?

MR. SILVER: As to whether there should be automatic PORV isolation?

MR. MOELLER: Yes.

MR. SILVER: I strongly suspect not. I expect Mr. Stolz may have some comment.

MR. CHOW: My name is Ed Chow. I am an employee of the U.S. Nuclear Regulatory Commission and I was responsible for doing the review on the B&W generic report on this item. And based on my review, I believe that they have used operating data on all the B&W plants.

MR. ZUDANS: I guess that would make sense, because there's not enough statistics on TMI to cover the item II.K.3.2 and it would have to be all of them. And if it is all of them, it applies to all of them without question.

MR. KERR: I guess I'm not sure why it is --

MR. ZUDANS: Right. Why it's not here.

MR. KERR: So it is not just a TMI issue. It's a general question.

MR. SILVER: That's correct.

MR. MOELLER: And if there's been one report prepared --

MR. ZUDANS: That's it.

MR. MOELLER: -- why don't they all use it? I guess that's what confuses us.

MR. CHOW: As a matter of fact, I believe they use the same report. For the other Licensee, for instance, they use the report too.

MR. MOELLER: So everyone has submitted -- there is a common report that everyone is using?

MR. CHOW: That's correct.

MR. MOELLER: Fine. Well, now, is it being reviewed by someone else in terms of the other B&W plants? And what decision did they reach?

MR. CHOW: I'm not sure about the other plants, but as far as I know I am the only one who is reviewing, who has reviewed this report. And the application is just for the TMI-1.

MR. SILVER: As a generality, I believe I can say that we have not reviewed, we have not completed our review of items that are due July 1 and later. But of course, the analysis in this case was due January 1st and I do believe that all plants have in fact submitted analysis. I don't know the state of the reviews from all of the plants.

MR. ZUDANS: But it is still not clear, at least to me, that there should not be more than one report, period.

MR. MOELLER: We will be taking this up in detail later in the agenda, and perhaps we'll delay it until then, and we can then ask.

MR. KERR: Yes, I think we'll understand it better then.

(Laughter.)

MR. MOELLER: We can ask the Licensee at that time to comment. We will hear from both parties.

So if that's all right with the Subcommittee, why don't we move ahead. But I hope people are alerted as to what is troubling us, so that you can prepare some answers.

MR. SILVER: I'm sure we can add to the general fund of knowledge before the day is over.

The next item is kind of a combination of II.K.3.7 and II.K.2.14 having to do with the PORV and safety valve flood frequency and the probability of lifting. Licensee did respond to that in April and indicated the PORV will actuate in less than 5 percent of overpressure transients.

MR. MOELLER: Now again is this TMI-1 specific or is this being looked at generically?

MR. CHOW: This is a generic item.

MR. SILVER: The Staff in general concurs with the method used by the Licensee, but did request additional information of a statistical nature to verify certain aspects of this.

MR. ZUDANS: Would it not be obvious that this item is required in order to evaluate II.K.3.2, because you have to know how frequently you challenge it before you can decide whether it is failing or not? Are these treated together or not?

MR. CHOW: This is incorrect, because you have to relate both topics together, and the same report addresses both topics.

MR. ZUDANS: At the same time?

MR. CHOW: Right.

(Slide.)

MR. SILVER: The remaining two open items that I will address briefly are II.K.3.17, which is a report on emergency core cooling system outages -- the Licensee has not responded to that one as far as I know, and we are awaiting a response on that item. Control and --

MR. MOELLER: Again, is that being approached generically or simply for TMI-1, the ECCS outages?

MR. SILVER: Mr. DiIanni will speak to that.

MR. Di IANNI: My name is Dominic DiIanni and I'm the project manager also on TMI-1.

To answer your question on that particular item, it is handled generically.

MR. MOELLER: Thank you.

MR. SILVER: The control room habitability item --

MR. KERR: Excuse me, Mr. Silver.

MR. SILVER: I beg your pardon.

MR. KERR: Then when one refers to ECCS system outages, one is referring to general experience with all B&W plants and not the experience with that specific plant?

MR. Di IANNI: All the plants are to give their history on the outages, and whenever we are referring to generic that means all the plants would have to respond to that item as far as giving the history of the outages.

MR. KERR: I guess I'm not making my question very clear. When a decision is reached on TMI-1, is it reached on the basis of the experience of TMI-1 or on the basis of the experience with all similar plants?

MR. Di IANNI: It will be for all the plants.

MR. KERR: And what is the requirement of availability that is being used to decide whether the availability is adequate? Or maybe we will hear this later on?

MR. Di IANNI: This really has not been determined, because we haven't really reviewed all of the responses yet.

MR. KERR: I don't see why you have to review the responses to know what availability you want. You can review the responses to find out what availability has existed. But I don't see why that is necessary in order to determine what is needed. I must be missing something.

MR. NOVAK: This is Tom Novak of the Staff.

Perhaps I can put it, at least suggest what the direction of the requirement is. Obviously the concern of the Staff is to look at the reliability of the ECCS system. Many of these systems are very similar as you go through the B&W designs. So there is an opportunity to combine data, to get a more reliable data base, something that stands the statistical test.

What our goal is is to see if in fact there is a better way to define the technical specification regarding how much time an ECCS system may be out of service. Our goal then is to look at this data to decide if in fact a cumulative outage requirement might not in fact be the better type of technical specification, which says that rather than say the system might be out for 72 hours any number of times during the year, you might decide that the ECCS system may be out for 72 hours for a given period of time, but in fact that the cumulative time that that system may be out over a year should not exceed so many hours, and if it would then that would be a basis for having the plant come down and make the necessary maintenance to bring the system back into what I would call an acceptable operating regime.

So I don't know that we have a specific point in mind. I think our idea here is to look to see if in fact an improvement in safety can be accomplished through a modification to the existing technical specifications regarding the ECCS systems.

MR. ZUDANS: So this is no issue; it's rather a collection of information.

MR. KERR: Well, I guess it seems to me that one can always imagine that improvements can be made in almost any system. What I'm trying to find out is how you determine what is an appropriate availability and what is not.

Are you going to determine that by finding out sort of what the average availability is across all the plants and then saying everybody has to be above average?

(Laughter.)

MR. NOVAK: I don't think that's our course of action.

MR. KERR: Well, what are you going to do with it?

Is this going to be discussed later?

MR. MOELLER: Yes. It's on the agenda.

MR. NOVAK: I apologize for my lack of real detail on this issue. We do have some clarifying statements in the NUREG reports, and I think perhaps as more people arrive we will be able to amplify.

MR. KERR: Okay, I will wait. Thank you.

MR. SILVER: The last item on the list is in a sense almost similar to the previous one, having to do with control room habitability, where our goal is to determine whether any modifications should be made or need to be made to improve the possible availability of the control; room for the operators. The Licensee has not responded to this one, either.

But I would point out that, again, the purpose is to simply identify the modifications. There is no requirement at this time, no scheduled requirement for when such modifications should be implemented for this plant or any other one.

I believe we should go back now to the first open item, II.F.2, covering inadequate core cooling. And to make that presentation, Larry Phillips has brought some information.

MR. MOELLER: All right. Let me comment at this time on how we will proceed. We can for each item have the Staff give us a report and then the Licensee. Is that all right, Mr. Clark?

MR. CLARK: However you wish.

MR. MOELLER: I think we will take that approach. But at this point, since Mr. Silver has finished his opening statement, let me call upon Mr. Clark for any remarks or opening words he may have on behalf of the Licensee. Is that all right, Mr. Silver?

MR. SILVER: Certainly.

MR. CLARK: I think that represents a very fair description of the present status. We will be discussing individual items later.

I think the only general comment I have is that on some of the issues where we have not responded by say the 0737 dates, it's been a question of priorities as to which were most important and we felt these items were not as important as some of the others we had to do. And recognizing we wouldn't start until after July 1, we just have not gotten some of those in yet.

We will be prepared to talk about them today.

MR. MOELLER: How have you established your priorities? I realize you do say in backfitting the plant you have selected certain items to begin with, and in terms of reports and studies you have selected a certain sequence. How do you go about that?

MR. CLARK: I think it's the judgment of our people who are knowledgeable in the area as to how likely it is that that item will result in a physical modification. For example, the ECCS outage item that was discussed briefly. We have a sense of what that is and the task of accumulating the data and interpreting the data is a fairly large task, which we think is not going to result in any modification to the plant. So that's an example of the kind of judgment we have applied.

MR. MOELLER: All right. And in terms of actual modifications on the plant, what has determined the priorities there?

MR. CLARK: Well, I would say the technical significance, we are making the modifications essentially that all the other plants are making in terms of NRC-required modifications, plus several modifications that we decided ourselves were of safety significance.

MR. MOELLER: Well, for example, have you undertaken the more difficult or the more lengthy backfitting modifications first and left what you consider to be the more simple ones for later? Or are you just completing them all?

MR. CLARK: We took the more difficult ones and started on them first. We are making as many of the modifications by restart as we can. We aren't deferring them just because they're simple.

I'm not quite sure I got the point of your question. Does that respond?

MR. MOELLER: I think that is responsive.

All right, then why don't we -- does that complete your comments?

MR. CLARK: Yes, sir.

MR. MOELLER: Why don't we move on then back to the NRC staff, and we'll take up the items one at a time, beginning then with item II.F.2, the new instrumentation for detection of inadequate core cooling. Did any members of the Subcommittee or consultants have questions at this time?

(No response.)

MR. PHILLIPS: Good morning, gentlemen. I'm Larry Phillips, Core Performance Branch. And the subject I'm discussing is TMI Task Action Plan II.F.II, instrumentation for detection of inadequate core cooling.

(Slide.)

(Slide.)

There were a number of modifications made to existing instrumentation which have been required by the Staff for TMI restart. That includes extending the existing core exit thermocouple cabling outside of containment and to the process computer, with a full range of zero to 2300 F. on the readout. The RTD's in the hot legs were extended to end range of 120 to 920 F.

Redundant saturation meters have been installed with appropriate pressure and temperature inputs, and calculators to compute the margin to saturation. As a backup, saturation margin is computed in the plant computer for logging, printing and alarm. And in addition, the Staff is requiring the Licensee to provide a backup thermocouple display.

The interim guidelines rely primarily on core exit thermocouple information for response to inadequate core cooling conditions. I don't believe all the details of this particular item have been resolved. But I understand that the Licensee has committed to provide such a system.

MR. ZUDANS: This is independent of process computer?

MR. PHILLIPS: Correct. And part of the reason for requiring such a system is that the -- we consider that the computer is not completely reliable for this particular purpose, since emergency procedures do rely on the thermocouple information.

MR. ZUDANS: They would be coming from the same 52 sensor signals?

MR. PHILLIPS: That's correct, yes.

MR. ZUDANS: I see that you have saturation meters, and the Licensee has not volunteered to put dual scale pressure or temperature gauges in?

MR. PHILLIPS: That's correct.

MR. ZUDANS: Aren't you guys curious why they don't do that? Isn't that the best saturation meter?

MR. PHILLIPS: By "dual scales," I believe you're referring to something you brought up earlier.

MR. ZUDANS: Yes, many, many times. And I will continue until someone does it.

(Laughter.)

MR. MOELLER: I think you should pursue that, Mr. Zudans. Why don't they do it?

MR. ZUDANS: It beats me.

MR. MOELLER: Does the Staff think that the suggestion is a poor one?

MR. PHILLIPS: No.

MR. MOELLER: Then you see no benefits from what he has repeatedly suggested?

MR. PHILLIPS: No, I didn't say that. I haven't seen anything where that is a Staff requirement. Of course, it is part of the control room design review of the Human Factors Engineering Branch, and I would just assume that maybe, if ample consideration has been given to it, that they may consider it overprescriptive as an absolute requirement. But --

MR. MOELLER: Are you saying, then, that a judgment or a decision or a recommendation on this would be made by the human factors group, not by your group?

MR. PHILLIPS: That's correct.

MR. MOELLER: So we are going to talk about the control room and the human factors items in it later on in the agenda.

MR. ZUDANS: I understand that saturation meters do have microprocessor computers in there. They do the same darn thing that the scale would do, except that it's all in one instrument. And I can't see how such a microprocessor can be more reliable than simply a printed scale.

MR. MOELLER: Right.

MR. ZUDANS: It just beats me, and I don't know why the Licensee doesn't react to this simplistic thing, just take the existing scale and just draw another one. They won't be linear -- one of them won't be linear, but so what? You compute it once and that's all you have to do.

I thought that there was a utility that did that, one of the utilities did it, and I would like to know whether anyone did. Something in my memory tells me that someone already did that.

MR. PHILLIPS: Yes. I have no knowledge of that myself.

MR. MOELLER: Has anyone on the Staff discussed this with operators and asked them if this would be helpful and what they thought of it?

MR. PHILLIPS: Again, this would be the Human Factors Branch's prerogative to do this, and I don't know.

MR. MOELLER: Have you made a recommendation to them in any way?

MR. PHILLIPS: No, I have not.

MR. MOELLER: Mr. Clark, has the Licensee considered this and reached any decision on it? Do you understand what Mr. Zudans is suggesting?

MR. CLARK: I understand the dual scale on the meters. I do not understand whether he considers that would replace the saturation meter or be in addition to it.

MR. ZUDANS: No, there's no need to replace it. There would be an additional reading more reliable than the saturation meter can possibly be. It requires some intelligence. You need a thermometer and pressure gauge to know where you are. But the logic after that is extremely simple.

MR. CLARK: We have considered it and have decided not to implement it prior to restart and have it in the longer-term considerations of human engineering of the control room.

MR. ZUDANS: That's good.

MR. MOELLER: And your human engineering review of the control room, then, has been divided into short-term and long-term goals?

MR. CLARK: Yes, sir.

MR. MOELLER: Okay. Excuse me. Harold Etherington.

MR. ETHERINGTON: Larry, your last item is in capitals. Is that just a stenographic aberration or are you trying to point out something in particular there?

MR. PHILLIPS: That was at the discretion of the typist.

MR. ETHERINGTON: That's a nice way of putting it. I withdraw my comment.

(Laughter.)

MR. PHILLIPS: However, it is a little bit unique, that particular item, in that the details of it have not been completely resolved, although we have a commitment.

MR. KERR: What does that mean? Nobody knows how to do it?

(Laughter.)

PHILLIPS: I haven't seen any submittals which describe what they're going to do. They've committed, I understand, in testimony that they would provide something that's in accordance with NUREG-0737. Basically, our requirement is that it meet the criteria set forth in NUREG-0737.

MR. KERR: I know. I've read those criteria and that's the reason I asked the question.

MR. MOELLER: Mr. Zudans, remind us to cover your point when we do the human factors.

MR. ZUDANS: Yes.

(Slide.)

MR. PHILLIPS: So in a nutshell, staff position so far as inadequate core cooling instrumentation for restart of TMI is that the existing instrumentation, with the commitment to upgrade as required by NUREG-0737, is acceptable for restart. With respect to the additional instrumentation, which is water level instrumentation, the Staff will require evidence of reasonable progress before we will agree to restart.

MR. CATTON: May I ask a question similar to Zudans', but in another direction? There was a series of calculations made for a PWR that showed the water level as a function of time for a whole range of breaks. One thing that became kind of obvious in looking at it was you could go 1,000 seconds and then within 50 to 100 seconds you would drop down into the core. And this was in almost all cases where the level dropped into the core that it occurred in this fashion.

So you had a long period of time where you would sit at saturation with no information, and all of a sudden you would see the level flash by in front of you and it would be gone. When you think about that, that there's only 20 percent of the inventory in-core, why are you asking for liquid level and not asking for inventory, when inventory is the name of the game?

MR. PHILLIPS: We're asking for liquid level instrumentation in order to monitor the coolant inventory.

MR. CATTON: But you're only getting inventory in the core, and that changes so fast when the operator is looking at it he may not be able to do anything with it anyway.

MR. PHILLIPS: No, we're monitoring from the top of the vessel all the way to the bottom.

MR. CATTON: That's the part I'm referring to. If you look at the results that came out of the study of Westinghouse PWR's for a range of breaks, and you look at those cases where the liquid level dropped into the core, it occurred relatively fast when you take the whole time period of the incident in hand.

In other words, you would have 1,000 seconds of nothing, 50 to 100 seconds of something happening very fast.

MR. PHILLIPS: But I believe the 1,000 seconds of nothing is while you're essentially depleting the inventory above the core, is it not?

MR. CATTON: That's right. So you have no idea where you're at until it drops down into the vessel and you can see it.

MR. PHILLIPS: That's the way it is now. But if the liquid level instrumentation is installed, you will be able to monitor that progress of depletion.

MR. CATTON: Only if you pick up the level somewhere above the core, like at the pressurizer.

MR. PHILLIPS: It's picked up at the top of the vessel.

MR. CATTON: I don't believe that's --

MR. PHILLIPS: And it is knowing when the pressurizer is -- Well, not necessarily with existing instrumentation. It's knowing when you go saturated, and the level instrumentation, if it's installed as required, monitoring from the top of the vessel. The top of the vessel will be voided early in the game.

MR. CATTON: When you start to void the top of the vessel, I think you've already lost over 50 percent of your inventory, at least in Westinghouse PWR's.

MR. PHILLIPS: It is the hottest point.

MR. ZUDANS: There's something in what he's saying. If you lost ten percent of inventory, would the reactor vessel level indicator show it?

MR. PHILLIPS: Ten percent of total inventory? I don't recall what the pressurizer inventory is, but if we're talking about inventory of the system after the pressurizer has been drained, yes.

MR. ZUDANS: Well, I guess I would like to hear in terms of the indicator that's supposed to be installed.

MR. PHILLIPS: They haven't proposed one.

MR. ZUDANS: The others have proposed. They have to have some idea. With a delta P meter that goes from the bottom to the top of the vessel, if you lost ten percent of the inventory would that indicate anything?

MR. PHILLIPS: Well, if we speak in terms of, for instance, of the Westinghouse delta P system, that system is designed to indicate an increase in void content in the primary system with the pumps running.

MR. ZUDANS: With the pump running that would be sensitive enough to show such change?

MR. PHILLIPS: That's what Westinghouse claims.

MR. ZUDANS: With the pumps not running, it wouldn't show anything?

MR. PHILLIPS: With the pumps not running, it would monitor level.

MR. CATTON: If the level is above, it won't measure anything.

MR. ZUDANS: The issue is how much inventory is there above the reactor vessel top. How much normally resides in that area.

MR. PHILLIPS: Are you speaking now of TMI-1 or of a Westinghouse reactor?

MR. ZUDANS: I guess we are now talking about TMI-1, right.

MR. PHILLIPS: For TMI-1, Duke Power is looking at a system where the delta P would be taken from the top of the candy cane at the vent.

MR. ZUDANS: Ah-hah! Well, that's okay. That's what he's saying.

MR. CATTON: That's correct, that's right. And between the top of the candy cane and the bottom of the vessel you probably have 90 percent of the inventory accounted for, and you have indeed an inventory system, which is what I think is needed. I have no further comment.

MR. ZUDANS: That's good progress. Nice to hear it.

MR. CATTON: With pumps on or off, it turns out the semi-scale tests have shown that the Westinghouse system looks very good, that they use a little bit of software to take care of the pumps-on aspect.

MR. ZUDANS: The pressure varies with the mixture.

MR. CATTON: They did a very [illegible] job from what I understand. I have not seen the report yet.

MR. ZUDANS: That's good.

(Slide.)

MR. PHILLIPS: This slide shows the criteria to show evidence of reasonable progress on additional instrumentation, and they are taken from NUREG-0737. And basically we require the Licensee to select a system and to define a development program and schedule for development and procurement of the selected system, which may be an existing system which is well underway in development, and to provide evidence of a tangible commitment to participate in any test program if that is required for the system selected, but to justify why they selected the particular concept that they did if it results in significant schedule delays, that is as opposed to a system that is more ready; And if it is a system which is not sufficiently developed to provide contingency plans and a schedule for procurement of an alternative concept; and to provide appropriate analyses to incorporate water level status information into guidelines for operator actions.

MR. MOELLER: Now, in terms of showing evidence of reasonable progress, which we understand the Licensee has not done, but if they came in with a system that told when you were losing water beginning at the top of the candy cane as opposed to the reactor level -- I assume here you mean in the reactor pressure vessel -- would that be acceptable?

MR. PHILLIPS: Oh, yes.

MR. MOELLER: You're not -- when you say reactor water level, do you term that or consider that equivalent to reactor water level inventory or a number of other words?

MR. PHILLIPS: Yes, right. We are looking at at this point more or less synonymously between reactor water level and reactor coolant inventory.

MR. MOELLER: Ivan Catton.

MR. CATTON: Where could I get a plot of the primary system inventory as a function of elevation? Are these available anywhere, starting from the bottom up to the top?

MR. PHILLIPS: I don't know where such a plot is. We have computations, of course.

MR. CATTON: A computation is fine.

MR. PHILLIPS: I'll have to dig it up and send you something.

MR. CATTON: I would like to see that.

MR. PHILLIPS: For a B&W plant, I assume?

MR. CATTON: For a B&W. I have such a calculation for the Westinghouse plants. I would also like it for Combustion Engineering if you happen to have one.

MR. MOELLER: Mr. Lipinski?

MR. LIPINSKI: Such a plot would go hand in hand if one were to insist that they install a delta P system, that the operator have information that he be able to translate from his delta P indications to his inventory in the control room. Just having the delta P here only gives him a rough indication, but the other one tells him how many gallons of inventory are missing.

MR. PHILLIPS: We're hoping that the information is transmitted a little better than that, and that however it is displayed will convert it for the operator and tell him where he is in terms of pertinent information.

MR. LIPINSKI: I haven't seen any requirements specifying beyond the level indication into inventory. That was part of our earlier discussion, as to whether we were concerned with level or whether we were concerned with inventory. The NRC specifications to date have not emphasized inventory.

MR. CATTON: If they put those delta P cells into the system, it's simple software to get to inventory.

MR. LIPINSKI: I know it is, but it's got to be part of your requirement.

MR. ZUDANS: It's nice to hear that they are turning around. When we reviewed Reg Guide 1.97 that was the big issue, at least as I understood it. I'm very pleased to see now that the NRC is now thinking more about inventory and delta P for level measurement is only a tool to achieve that detection. And I think Ivan is quite right, that's the only important thing there is.

MR. PHILLIPS: We have emphasized in all of the clarification meetings, meetings that -- at Idaho on technical merits of various systems, et cetera, that the display of the information is a very important consideration. And while you may not have found that in writing, we have indicated that we have not been really prescriptive in this item, but we have indicated that it would be a very heavy subject for review.

MR. MOELLER: In terms of helping licensees and applicants in dealing with this matter, the Advisory Committee on Reactor Safeguards wrote a letter entitled "Instrumentation for Detection of Inadequate Core Cooling," dated June the 9th. And Mr. Zudans and Mr. Lipinski wrote letters to Professor Kerr, the Chairman of our Subcommittee, on this matter on June the 1st, 1981.

Have these letters been provided to the Licensee, for example, and people who are in the midst of considering this question? Mr. Clark, are you aware of these reports?

MR. CLARK: Yes, we have those letters.

MR. MOELLER: Fine. So that answers that.

Go ahead, then, Mr. Phillips.

I think, Zenon, that your comments are very important, that this is the first time I also have heard the Staff talking more about inventory than they are pressure vessel level.

MR. ZUDANS: Yes.

MR. PHILLIPS: And to prove that this was not contrived --

(Laughter.)

(Slide.)

-- on the next slide we are indicating some reasons, the basis for the Staff's position, since it is an item of contention with the Licensee and our primary, by far the most important, reason is to detect an approach to inadequate core cooling.

The Licensee currently has saturation meters which would give the firs indication, but that indication is ambiguous.

Overcooling transients can overdrain the pressurizer and cause it to go saturated. It also has core exit thermocouples which will indicate superheat when the coolant level drops into the core. But there is an awful lot coolant; you do not know what is happening between the time you go saturated and the time the level drops into the core. And basically, as you see by the third item there, a knowledge of the coolant inventory is needed to monitor the continuing approach to ICC and the effectiveness of any recovery actions that are taken.

Secondly, the instrumentation will provide an indication of void at vent locations to assist in evaluating the use of the vents, which are another TMI requirement, to supply vents for the system.

Thirdly, they provide evidence that the core is covered during recovery from a TMI-2 type flow blockage condition where some thermocouples may show superheat.

And fourthly, they provide coordinating information to assist the operator in restoring his water solid primary system and normal level in the pressurizer and assisting as another piece of information as to when it is proper to terminate his recovery, terminate HPI.

Let me emphasis that this information may not necessarily be used as the primary motivation to the operator for actions that he mioght take, but it certainly, as a minimum, it is useful information for him to help him confirm that he is doing the right thing.

It also will provide diagnostic information to assist in the evaluation of anomalous events both by the operator and by engineering teams or staff or whoever are looking at what happened in an event after it has already occurred.

So those are the reasons that we require instrumentation. And at this point the Licensee has not agreed to it.

MR. MOELLER: Yes, Mr. Mathis.

MR. MATHIS: Larry, in your criteria on your previous chart you say "Show evidence of reasonable progress." Do you have a timescale associated with this?

MR. PHILLIPS: We have a timescale associated with the installation of water level instrumentation. And that timescale is January 1, 1982. It is quite obvious that unless the Licensee has been working very much behind the scenes, that there is no way that he isgoing to have instrumentation installed by January 1, 1982.

There are a number of other plants who also will not have it installed by January 1, 1982. This subject, along with schedules on another TMI action items, are under review by the Commission in rulemaking proceedings. However, we do not consider that for restart the schedule is an issue.

Basically, at this point we want to see that they ar committing to doing it.

MR. MOELLER: Have the other B&W plants, the Licensees, committed, or are they making progress on this?

MR. PHILLIPS: As I mentiond, Duke Power --

MR. MOELLER: Oh, yes, you told us about that.

MR. PHILLIPS: -- is making a proposal, and we are studying that proposal.

MR. MOELLER: Well, if that completes your presentation on this subjec, why don't we switch to the Licensee and ask Mr. Clark to state the Licensee's position.

First, Mr. Zudans.

MR. ZUDANS: Let me ask a quick one. Larry, although you stated just a while ago that level monitoring and inventory monitoring is used synonymous by you now. I would suggest in future usage you should stay away from level monitoring and just talk about inventory. It does not matter how they are accomplished.

MR. PHILLIPS: I certainly will do that in front of this committee.

MR. ZUDANS: The other thing is that would disqualify many of the water monitoring systems immediately.

MR. PHILLIPS: Yes. As you know, we have really, in most of our statement of criteria and requirements and for which we have received considerable criticism, we have really referred to additional instrumentation for monitoring. Inadequate core cooling, we have tried to stay away from specifically saying "water level."

MR. MOELLER: Yes. I guess that is even a step beyond inventory.

Mr. Clark.

MR. CLARK: First, I think, from our standpoint, the discussion illustrates very well why we have not committed to install the specific reactor water vessel level measurement system. We do believe that the real issue is instrumentation that will really assist in determining inadequate core cooling.

We have been working very carefully on that, and we have a presentation which we believe will show you that we have given a lot of thought to it, that we have got a pretty clear definition of how to approach it, and that we are approaching it.

We feel that a premature decision to go put in a reactor vessel water level measuring system, which is the context of the original discussion and requirements, in fact would have been improper. So we think we are operating it responsibly and fairly aggressively to determine what is really needed.

And with that, I would like to turn it over to Bob Keaten, who is the director of systms engineering for the technical functions division of GPU Nuclear.

MR. MOELLER: As Mr. Keaten comes forward, I guess my question is if you have been studying this and considering this, why don't you share that information with the NRC?

MR. CLARK: I believe we have been and that the disconnect is that we have not committed to install a system by a date, because we feel the question of what should be installed is not clear.

MR. MOELLER: Would you agree with that, Mr. Silver? Is that your impression?

MR. SILVER: I think I detect somewhat more of a disconnect. But we do seem to be getting closer than we have been.

MR. MOELLER: Okay, Mr. Keaten.

MR. KEATEN: Yes. And in fact, I hope the discussions this morning may help this process of convergence between us and the Staff and the subcommittee.

Before I start talking about reactor vessel water level or inventory and related matters, let me go back to a little bit of the discussion a few minutes ago on the subject of the in-core thermocouple readout and also on the issue of dual scale readout for the saturation margin meter.

With respect to the in-core thermocouples, the NRC Staff, as was reported, required that we develop a plan for a backup readout device that would back up the existing plant computer. I simply want to clarify what was said earlier: that there really are two separate requirements that we are working to meet there.

One is the requirements as they are spelled out in both 737, which not only requires a backup thermocouple readout or hardwired backup thermocouple readout device but also specifies a considerable amount of criteria on that device exactly what kind of criteria it must meet. And we are working to meet that, and we are working to try to meet it on the schedule as defined in 0737.

The other issue that arose is that given that 0737 did not require that on a schedule that is prior to our planned restart date, what would we do in the interim before that device is available, consistent with the schedule of 0737. We have proposed to the Staff that in that interim period before the final hardwired readout device is available that we use as our backup readout device the new computer system which we are installing in the control room which would be available and could read out the thermocouples independent of the Bailey 855 computer, which was the original readout device, so that we would have two readout devices.

So that has been our proposal in discussion with the Staff as an interim measure of what we would do prior to restart.

MR. ZUDANS: Will your two computer systems exist side by side for a long period of time, certainly long enough for the schedule of 0737 to be implemented?

MR. KEATEN: Yes. In fact, we intend to keep both of the computers available for operation during the first refueling cycle.

MR. ZUDANS: All right.

MR. MOELLER: Does that answer you?

MR. ZUDANS: That says that they have two devices. Now both are unreliable but --

(Laughter.)

MR. KEATEN: We very much hope that the new computer system will be more reliable.

With respect to the dual scale readout from the saturation meter, I would like to point out that as a result of our human factors review we elected to make the readout from the saturation meters a digital readout rather than an analog readout. So in order to get a readout that would have both pressure and temperature margin, it is not simply a matter of having two scales.

MR. ZUDANS: I am not talking about that at all. It is completely divorced from saturation meter. You have a pressure gauge that indicates pressure in the primary system. You have temperature meters to indicate temperature. I am saying on these instrument with the dual scale on the pressure gauge you put the saturation temperature scales on the temperature gauge pressure saturation scale. It has nothing to do with your saturation meter.

Now, your operators have saturation tables in drawers and they look it up from time to time. I am saying put them on the scale so you don't have to consult a table somewhere in the drawer.

MR. KEATEN: I am sorry, I did misunderstand. I do understand what you are saying, and I did misunderstand you. I think my answer there is that we will have to take that one under advisement.

MR. MOELLER: Why don't you be the leader and just put the dual scales on? It seems so simple. And if you can show us that it is going to do harm, then that is another question.

MR. KERR: I would urge, however, that you not let the ACRS, even a subcommittee, design your instrumentation for you around this table.

(Laughter.)

MR. KEATEN: I think what I can commit to, standing here, is that we will go back and take a look at it.

MR. MOELLER: Fine.

MR. KEATEN: I agree with you that, in principle, it sounds like it may be very simple. A concern I might have might be in the specific area of the console: Do we have really enough room to put the scale in?

MR. ZUDANS: Yes. That is a human-factors aspect. I would not quarrel with that. If you can prove that that will hurt the guy, that he dos not have to run to the drawer and pull out a table, that is something else

MR. KEATEN: Yes. Now that I understand better than I did earlier, we can certainly consider that.

MR. MOELLER: It might even free up one of their desk drawers.

(Laughter.)

(Slide.)

MR. KEATEN: Let me now turn to the discussion along the lines of the previous NRC Staff witnesses. I am sure all of you are aware the requirement that we are trying to address is Requirement II.F.2 from NUREG-0737, which requires that Licensees evaluate additional instrumentation for inadequate core cooling and specifically that that evaluation must include reactor vessel water level.

As I am sure all of you are aware, we have discussed this with you on previous occasions, and as part of the discussions we were really, I think, in our presentation concentrating on the issue of whether the plant could be operated safely in our opinion without this instrument.

I would also like to call to your attention, if you are not aware of it, that this was really the issue which was litigated as part of the hearings. It was not the question of whether the instrument might be desirable or whether there might be some usefulness of it, but as defined by the Board, the Board said the question that it felt like it was charged by the Commission to consider was the issue of whether or not it was necessary.

So we have some fairly extensive testimony, both of written presentation of testimony and verbal testimony on the part of both ourselves and the NRC Staff and extensive Board questions on this. Plus, there are now proposed findings by GPU, by the NRC, and by the State of Pennsylvania on the subject of suggestions of what the Board should find as a result of this.

So if the subcommittee is not aware of that and is interested, there is a lot of reading that is available on the subject.

I would like today to shift gears a little bit and rather than continuing the discussion of whether this is absolutely necessary or not, to instead stand back and take a little bit broader view of what we at GPU have been doing in trying to address the requirement as it is written, to understand whether there are advantages or disadvantages, as the case may be, to additional instrumentation, and what maybe we think that instrumentation would look like.

(Slide.)

In so doing, I would like to try and show you what we have been doing, where we think we are, and where we think maybe we have some answers and where we think there are areas where we do not have answers.

The general approach that we have been trying to take in addressing this requirement is basically three-fold. The first one is to develop the criteria that would apply to the instrument. As you heard the discussion around the table this morning and and as I am going to try to point out to you in some other areas, what you end up with in the way of an instrument is a strong function of what you finally settle on as the criteria.

An instrument that, for example, is ideal for detecting an early approach to loss of system inventory might not be the same instrument that you would want to use, particularly in a B&W geometry, to detect the existence of a bubble at the head, as in the St. Lucie incident.

So it becomes important to understand what thing or what combination of things that we want to use the instrument for in order to know what we really want to do.

In trying to pursue these criteria, we have participated in the B&W owners group evaluation. And in addition, we have done some in-house evaluations ourselves in looking at how this might be used in conjunction with the operator guidelines, which is part of the requirement.

And one of the things we have been doing is saying even if there are areas where we do not think it is a direct trigger for operator action, are there other things the water level might be used for? I think in some cases the answer might be "Yes."

(Slide.)

The second thing is to understand what is really available in the way of detectors. Here we have participated in the B&W Owner's Group evaluation on potential detectors. Again, we have done some work ourselves in trying to look at these detectors, and I am going to show you some of the results of this.

In addition, deciding that we were not completely satifsifed with either what the Owner's Group had sponsored or with what we ourselves have done, we have taken the initiative on our own part to hire a consultant who is now under contract to us who is evaluating both the work that is being done around the country and evaluating particular detectors, and also who is looking at the question of are there other possible means of detection which might be preferable to those that are currently under development.

That is a reasonably short-term study. It should be finished this summer.

MR. CATTON: Could I recommend that your consultant speak with Peter Griffith at MIT?

MR. KEATEN: You certainly can.

MR. CATTON: He has some rather interesting ideas on how to put together this whole process, with little new instrumentation.

MR. KEATEN: I certainly will.

In addition, Penn State University came to us sometime ago with an idea for a water level detector based upon the use of neutron level signals. We have subsequently agreed that we would cooperate with Penn State in pursuing the development of such a program if they could find a sponsor for it, and they are actively pursuing that right now.

Finally, we are also following the EPRI evaluation of detectors. And their report we understand is due in October of this year.

So in all of these areas we are trying to make sure we really understand what are the pros and cons of the various detectors that are available. Based on the results of those first two things, we think that then it would be reasonable for us to commit to whatever the appropriate action is, one of which might be to install one or more of these detector systems. One might be a conclusion that although it is useful that the existing systems are not really adequate for what we would like and further development is necessary, or that there might be in fact some alternative approach.

I will tell you right now that we do not today think we have the answer to this.

MR. ZUDANS: Mr. Keaten, would it be appropriate to suggest that you change your water level and scope into inventory scope?

MR. KEATEN: In technical terms, yes. I very much agree with the discussion around the table. This is called "water level" because the requirement in NUREG-0737 says you must evaluate water level.

MR. ZUDANS: The new reg will probably come up with a supplement that will change that -- hopefully.

(Laughter.)

MR. KEATEN: Yes. We are certainly considering inventory considerations as well as just water level.

MR. ZUDANS: That is good.

MR. KEATEN: One of the questions we tried to face early on is that if we are looking at instrumentation to detect inadequate core cooling or to detect the approach to inadequate core cooling, what is inadequate core cooling? We elected to take the definition as it is spelled out in the regulations, which defines specifically what are the criteria that must be met by the core under all of the accident conditions.

And we said that for the purpose of our evaluation we would define inadequate core cooling as that set of conditions that would exceed the limits of those regulations. Other definitions have been proposed, but --

MR. KERR: I am sorry? Would exceed the limit of what?

MR. KEATEN: In this case, particularly clad temperature.

MR. KERR: I thought you said exceeds the limit of something regulations, and I didn't get the "something."

MR. KEATEN: I think what I intended to say was to extend the limits as they are spelled out in the regulations--

MR. KERR: Thank you.

MR. KEATEN: -- which has to do with clad temperature and degree of isolation, and so forth.

MR. CATTON: But that does not necessarily meet the anticipatory requirements of 0737.

MR. KEATEN: My point is that in order to understand what is anticipatory, I first must understand what is the condition that I am trying to anticipate.

MR. CATTON: Certainly.

MR. KEATEN: This was not the definition of where you needed to start detection. It was simply a definition of what is inadequate core cooling. And then I want to be able to detect the approach to inadequate core cooling, which means I have to do it at some point before then, maybe very much considerably before then.

The other thing we did in addition to looking at the criteria that are in some cases similar to those given in 0737 -- and I will be talking about some more -- we took these four criteria. They really came out of the results of our human engineering review of the control room, which we discussed with you last time. I would like to talk about these a minute because I think we have come to some useful ideas using these criteria.

(Slide.)

The first one is one you have heard from me before in previous meetings. We believe that we should put instrumentation into the control room only if people in the control room are going to be able to use that under some set of conditions. So one of the things that we have concentrated on right from the beginning is, given that we have a water level or inventory device or void fraction meter or whatever it was, how can it be used?

The second thing is we have found that we think it is very useful to distinguish between the different types of personnel that will be in the control room. It is very easy to talk about providing information to the operators, but in fact there are several different types of people that are in the control room, under the kind of conditions where something like water level device might be useful, or the control panel operators who are the guys with their hands on the panels and are used to responding according to the procedures using the hardware and instrumentation and controls that they have staring them in the face.

And then there is a foreman, who is trained to stand back a little bit and coordinate the actions between the panel operators and perhaps take a little bit broader view of what is going on.

Then there is the shift supervisor, who is trained to stand back farther and take a much broader, bigger picture of what is going on.

And there is the shift technical advisor who will be standing beside the shift supervisor, someone with a different type of technical background, again trying to take an overview situation.

Then, finally, depending on the type of event that it is, there will be engineering personnel in the technical support center. There will certainly be personnel that are trying to evaluate one of these events after the fact.

And so there are a lot of different persons who have somewhat different needs for information. And so in looking at how we might use water level or core inventory-type measurements, we have been trying to keep an eye on who would be using that because that would have an effect on how we would install it and how and where that information would be read out.

We thoroughly agree with the NRC criteria that is so important to avoid ambiguous indications. And I will come back to that with respect to some of the existing instrumentation.

Finally, we think that it is very important that we avoid the temptation to simply put somebody, something, in the control room in hopes that somebody someday will figure out how to use it. We think that if we know enough to put an instrument in the control room, we should also know enough to give the operator specific training on how to use it and in providing procedures on how to use it.

And in fact, there are scenarios which we have considered and which B&W has considered where that kind of training and procedures have not been provided but something like water level indicator could actually lead the operator to do the wrong thing.

So, we are again tying it back to the real needs of the operator and our ability to tell him how to use it.

(Slide.)

With respect to the criteria, let me show you in very summary term where we stand today in trying to understand how the operators might use the instrumentation if it was available.

For the purpose of constructing this slide, I have assumed that there is an ideal detector. I have not worried about the limitations of current detectors. You can interpret on this slide water level as being equivalent to core inventory. I am assuming there is a meter that will do the kind of things that all of us intiutively think that a meter should do.

I have taken four types of events where information that might be related to inventory or water level which might be considered to be useful to the operator. And for each of those I have taken two or three of the key actions that the operator is intended to take. And I have looked at how he knows whether to take that action or whether not to take the action on the basis of existing information, and then to what extent would a water level or an inventory system help him.

Taking, first, then, the response to a LOCA, the first thing an operator must do is verify that he has got adequate high-pressure injection flow. Here I am basically assuming it is a small-break LOCA where the high-pressure injection system is being relied on. He has a status panel that tells him the valves are in the right position; the pumps come on, and he has got flow meters and procedures that tell him what the minimum flow should be as a function of the pressure of the system.

We see no way in which a water level in the inventory system would help on that particular aspect. What he is interested in is the rate of addition of inventory.

MR. CATTON: He has flow meters, but the flow meters are external to the primary system. I think the "adequate" is a rather strong word over there. Just because his flow meters are reading high does not necessarily tell him he is getting the water in in an effective way. The change of inventory is the only thing that would tell him he is being effective in getting the coolant into the primary system.

MR. LIPINSKI: There are certain assumptions that go with this that HPI lines are in fact intact. If they sever, you have got a different incident, and he is inferring information.

MR. KEATEN: But you have also more than one flow meter. And if you just severed one line, you also have the flow information on the other lines.

MR. LIPINSKI: That is something I would like to discuss about procedures. When these procedures are written, they assume certain things are going to take place. If indeed they do not -- and it happens in more than one place -- then you draw the wrong information; namely you say you have got HPI flow. If both my HPI lines are connected and indeed the flow gets into the primary system, if something has happened to cause both of those to fail, I draw the wrong conclusion.

I am looking at information upstream to infer something that is happening downstream, that is a very low-probability event. But when that event happens, I then draw the wrong conclusion.

MR. KEATEN: You understand, of course, that we have four HPI lines, not two.

MR. ZUDANS: I think I would be willing to take an even stronger position. None of your arguments here really tell me that you do not need inventory indication.

MR. CATTON: Inventory is the goal. Nowhere are you measuring it.

MR. ZUDANS: That's the whole thing.

MR. KEATEN: Let me come back in a moment and talk about the inventory some more, because I do not want to imply we have a closed mind on the situation. We do not. But we see some problems in trying to use this inventory information, and I would like to show you.

MR. ZUDANS: Why? What would there be any problems? What would be the trouble?

MR. CATTON: If your inventory is increasing, you know you are successful.

MR. MOELLER: Ivan, use your mike. Apparently, they are having trouble hearing you.

MR. KEATEN: It is true that under certain circumstances if the inventory is increasing, you can say you have been successful. The problem is that if the inventory is decreasing, it does not mean you have been unsuccessful.

MR. LIPINSKI: Let me take you back to your previous slide, "Avoid ambiguous indications." Certain measurements give you inferred information if things are going as planned. If they are not, you are getting ambiguous information.

MR. KEATEN: Let me jump ahead in my presentation and see if I can address this point.

(Slide.)

The problem is in knowing what to expect. This is the analog of a slide that was referred to earlier by I think Dr. Catton. This is done by B&W rather than for Westinghouse plants. This is a plot for a certain range of small-break LOCAs. The predicted water level is a function of time depending upon the size of the break.

MR. CATTON: Elevation-wise, where is the flap across the top there? There is a long plateau at the top of your curve.

MR. KEATEN: The top of the active core here is 12 feet. That is about 8 feet above the top of the active core.

MR. CATTON: Eight feet. And to put things into perspective, what percent of the inventory is still in the core when you reach that point?

MR. KEATEN: I do not know. You have lost quite a fair amount of inventory at that point in time.

Mike, do you have any idea?

MR. CATTON: That is all right. Somebody is going to give me these curves.

MR. KEATEN: You have drained all of the elevated portion of the hot leg and you have drained a substantial amount of the reactor vessel above the top of the fuel, so you have lost a substantial percentage of the total inventory.

As I mentioned, these are for small break LOCA's. And as you know, for large break LOCA's the level can drop down very quickly down below the top of the core and then refloods over a period of time. The problem that we see-- and to date we haven't been able to solve this one-- is knowing that you get this variety of responses for different sized LOCA's and given that the operator is not going to know early on what size LOCA he has got, how do I tell him to use information on the inventory to determine whether he's successful or not?

Because in some cases he can drop right down; in other cases he can flatten out and drop down. In other cases he can stay flat for a very long time. And again, this is for a limited range of small breaks. As you know, for smaller ones the level may not even get down to this point.

So we haven't been able to figure out a useful method of telling the operator how to look at inventory and say, look, if you've got this much inventory at this point in time you have or you do not have, alternatively, adequately high pressure injection flow.

MR. LIPINSKI: Where is the location of the break that size is varying on? That has to be somewhere in the system.

MR. KEATEN: Yes, and I have to tell you, honestly

I don't know where it was.

MR. LIPINSKI: Because assuming you move that break around to different points in the system you'll get a different family of curves for each point.

MR. KEATEN: I think that's right, and that simply compounds the difficulty of using the information.

MR. CATTON: Well, wait a minute. If you are monitoring inventory, the first thing you can do is probably save enough money in not having to run all those codes to cover the cost of the inventory system.

(Laughter.)

MR. ZUDANS: It's more than that. You don't have any of this information to the operator. This is a calculated result.

MR. KEATEN: That's correct.

MR. ZUDANS: So when the operator sits there he doesn't have these curves.

MR. KEATEN: Right.

MR. ZUDANS: He just doesn't have to make a choice; and he knows nothing.

MR. KEATEN: I wouldn't agree that he knows nothing.

MR. ZUDANS: He doesn't know what's on this curve and he doesn't care. He knows when inventory is reaching a certain point, he has something to do, and it's serious.

And if the inventory is above that point, he knows he has adequate cooling.

But if he doesn't have these curves he doesn't have to make the choice of these curves. They are meaningless to you to calculate a result.

MR. KERR: There is in NUREG-0737, I remind you, something that says it isn't enough to know that you're okay; you've got to know whether you are approaching a loss of coolant situation. And the fact that you have inventory, unless you know what's happening to it, does not, if I understand what 0737 requires, give you the information that they want you to have.

MR. CATTON: You know it's time to make a change.

MR. KERR: You don't know time rate of change if you don't know inventory. If you were adding an additional requirement that one needs to know inventory and time rate of change of inventory, that's different.

MR. ZUDANS: They have to be able to show trends in particular parameters, so they could show the time for the past five minutes.

MR. KERR: That's another set of requirements. That's okay with me, but that's not what you gentlemen have been talking about. You've been talking about inventory.

MR. CATTON: I think that we assumed that was part of it.

MR. KERR: I'm sorry, I wasn't able to read your mind.

(Laughter.)

MR. LIPINSKI: Let's go back to your figure where you referred to that top plateau and you said you didn't know how much inventory you lost up to that point. Had you had a level device that took you from the top of your candycanes down, you would have had that information well above where that plateau occurs.

MR. KEATEN: I understand. I think we're talking at cross-purposes here. Let me try to express the concern I have, but first let me tell you that I am not using this chart as an attempt to argue that there is no use for a level device. I'm attempting to use this chart to say one specific use that has been defined for a level device, we don't know how to do it.

MR. ZUDANS: What is the specific use? I lost the point.

MR. KEATEN: The specific use is to try to detect the approach to inadequate core cooling. The problem is whether I have level or inventory or inventory plus rate of change of inventory, I don't know what to tell the operator to do with that information because those parameters can vary very widely depending on the size of the break and the location of the break, neither one of which the operator will know.

MR. KERR: I have even a greater difficulty than you. Not only do I not know how to do it, I don't even know what it means to talk about an approach to loss of cooling. It seems to me any time you have a hole in the system you are approaching a bad situation. So beyond that I'm not quite certain what the requirement means.

I had assumed that discussions that you had had with the staff had probably removed that ambiguity.

MR. KEATEN: No, sir, they have not.

MR. KERR: They have not?

MR. KEATEN: No, sir.

If I could return for a moment to the earlier slide.

(Slide.)

The point that I was trying to make was that as far as initiating high pressure injection flow, basically what the operator looks at is flow rate. When you get down here to the second item, which is the issue of how do you know whether it's okay to throttle flow or not, here is a case where on the one hand we believe that the existing information tells the operator fairly unambiguously whether or not he should throttle high pressure injection flow. The procedures and training are very specific on that case.

So on the one hand, as far as we can see if we have an inventory or a level measurement device what the operator would do would probably not be changed. But on the other hand, as was mentioned this morning, and we would concur, that you might use an inventory device or a level device as a confirmatory measurement to the instrumentation that already exists.

In this case we don't think the operator would end up -- as far as we can see today, we don't think that he would end up doing anything different other than having one more method of confirming that he knows it's all right to terminate high pressure injection.

MR. ZUDANS: It's very easy to agree on that because nobody's suggesting he would do anything different. But he would know much better that he's on the right track.

MR. KEATEN: And as we say, we're willing to accept that that is a useful consideration. The thing I was really discussing was the third item, the approach to inadequate core cooling. And I don't want to stand here and claim that we have all the knowledge or we're claiming that no one will ever figure out a method, a way to use this.

But in our own investigations we have, and B&W in its investigations, have not been able to figure out how we would take an ideal level measurement and use that as a determination of an approach to inadequate core cooling. Now if somebody does, we'll certainly be glad to consider that. We just don't know how to do it.

MR. CATTON: I can offer you a use for an inventory system: the pumps-on/pumps-off question. You can decide immediately from knowledge of inventory and pressure whether or not you should terminate the pumps, just strictly based on that. You just monitor inventory versus pressure. If you're starting to lose pressure fast, you lose inventory and pressure fast, you trip the pumps.

If you somehow get into another regime where you're low on inventory and your pumps are running and your pressure is low, you should leave them running, and that eliminates the whole controversy of whether to turn the pumps on or off.

MR. KEATEN: Again, understand what our position is. I'm not trying to prove here that we don't need an inventory system. I'm trying to understand what we would use it for if we had it.

MR. CATTON: I'm responding to your statement.

MR. KEATEN: I understand that. What you're saying is that I have an action here that I didn't get on the chart, which is to decide whether or not to turn off the pumps.

MR. CATTON: That's right.

MR. KEATEN: And then if you had an inventory system it might be used for that. And I am not prepared to dispute that.

MR. ZUDANS: Maybe you should, instead of reasoning that you don't need such a device at all.

MR. KEATEN: Excuse me, sir. That's not our position.

MR. ZUDANS: I mean, that is what you say here.

MR. KEATEN: No, sir.

MR. ETHERINGTON: The last column certainly gives the impression that you don't think very much of an inventory.

MR. KEATEN: Perhaps it would be useful if I finished with this slides, to get the total of what I'm trying to say.

MR. MOELLER: We'll hold off for a while.

MR. CLARK: Bob, let me interrupt and go back to the question on the first line of that chart in terms of HPI flow. I think the chart is meaningful and correct in the sense, what you want the operator to do if he doesn't have HPI flow and what he's able to do is to go start the pump, open the valve, and do something to get the flow going. That is the action he can take.

If all four pipes are broken downstream of the flow meter, he cannot do anything about that in the HPI system. So in terms of operating the HPI system, the inventory question really doesn't enable him to do anything. I think that is the way you should interpret that.

That doesn't say that it isn't important to worry about inventory. But in terms of what that procedure and what that instruction to the operator is saying, is make sure that the pump is on, that it's started, that the valves are open, that the flow is going through those pipes. And if they are broken inside there, he can't do anything about it in running the HPI system.

MR. LIPINSKI: But there is one other thing he can do, and we'll discuss that when we get to emergency procedures. He will have his advance notice in terms of when a major emergency has occurred, and he makes a decision as quick as he can.

MR. CLARK: He has other indications of that.

MR. LIPINSKI: But don't discount the fact that he can't control the plant because something has happened. He has other measures to take if he can't control that plant in terms of giving notice.

MR. CLARK: I don't question that, and I again don't want to give the impression that we are saying that nothing more is needed. But I think we do feel very strongly that you need to think through very carefully what it is you're trying to do and what you really do with that information.

MR. MOELLER: Go ahead, Mr. Keaten.

MR. KEATEN: Let me cover overcooling response very quickly. The only two actions that are identified here are the same as the type of things that are needed for a LOCA. As I'm sure everyone knows, as a matter of fact an overcooling event and a small LOCA look very similar early on in the event, and the types of things that the operator looks at and the types of things they have to do are similar for the two events, and again in terms of being able to know when to throttle HPI flow, we don't think that his actions in terminating HPI flow would be different if he had water level, but it might be useful to have it as a confirmation of the other indications he has.

MR. ZUDANS: But I guess you would agree, or maybe not, that the inventory indication would be an instant recognition of the difference between LOCA and an overcooling transient?

MR. KEATEN: No, sir, I would not agree with that.

MR. ZUDANS: Instantaneous recognition of the difference between LOCA and an overcooling transient?

MR. KEATEN: No, sir. As a matter of fact, I'm going to address that on my next slide.

MR. ZUDANS: It's not going to be?

MR. KEATEN: No.

MR. ZUDANS: We'll get to that later, I guess.

MR. KEATEN: We will get back to that. Now there are two other types of things that have been addressed with respect to the possible use of a level or an inventory device where frankly our evaluation is still underway here.

This chart is not intended to be negative with respect to the use of water level for these. It is simply intended to say that we are presently in the process of trying to understand on the one hand what if anything we would do different if we knew that we had a steam bubble in the head, how that would be known, and whether having a water level or an inventory indicator would make that easier or safer to operate or different actions. And we just have not taken a position on that yet.

As far as determining that a bubble exists, that can be done partly by looking at the unusual behavior of the pressurizer level, and that in turn then can be confirmed by doing a boil slow type measurement on the primary system, as in fact we did at TMI after the accident. It's not a very direct measurement of bubble indication.

The whole issue of the bubble response is not only a question of how to determine if it exists and what to do, but it's the question of how important it is for the operator to know that he has a bubble and what he might do differently if he knew there was a bubble, and that continues to be under evaluation at the moment. We don't have an answer on that yet.

Likewise with respect to the venting. The two actions there would be one to open the vents under certain situations and the other would be to close them. We are presently evaluating, as is B&W, what kind of guidelines the operators might use for those operations, and we do not have any position as to whether level or inventory is necessary, helpful or what. We still have that under way.

(Slide.)

Now with respect to a couple of the other questions that were raised, this first one sort of repeats what was on the previous slide, that a possible use of wa level measurement is just as a confirmatory measurement for actions that are already spelled out. Yes, that might in fact be a good use for water level, but there -- and this is a little different from the previous slide. I'm no longer assuming an ideal detector here.

If what I really want to use the water level measurement or inventory measurement for is to confirm whether or not I need to keep injecting water, then just how useful it is depends on the details of the design, and we'll go into that in the next slide.

Now, the point that was raised earlier about being able to use it to distinguish between a LOCA and an overcooling accident, we don't understand how that could be done. The early behavior of the primary system for certain size small break LOCA and certain size overcooling events is exactly the same.

MR. ZUDANS: I can see how they could be the same. I guess it depends on the sensitivity of the device that will establish the inventory. But if you're losing inventory in one case, you're not losing it in the other, why wouldn't it be different? It's a question of sensitivity, how much you have to lose before you notice it. I would agree that perhaps the first five percent you wouldn't know the difference. But if you had a correct inventory measurement, then there is an obvious distinction between those two cases. In one you lose the inventory and the other you don't.

Why would that not be useful? I can't see it.

MR. KEATEN: I guess my answer is in terms of the kind of measurement devices that we know exist, which tend to measure the volume of the inventory.

MR. ZUDANS: But we agree we do not talk about any specific device in your presentation.

MR. KEATEN: No, I said in this chart --

MR. ZUDANS: Then you are not fair, because you say you are talking about an ideal device.

MR. KEATEN: On the previous chart, yes, sir.

MR. ZUDANS: And then here, you will switch to whatever is in the marketplace.

MR. KEATEN: I guess I would agree that if there were a device that gave an integrated mass inventory --

MR. ZUDANS: That's what we're talking about.

MR. KEATEN: Then in fact, yes, there might be a distinguishing --

MR. ZUDANS: Could you find a single negative attribute to such a system?

MR. KEATEN: I couldn't, no, without knowing the exact system.

MR. ZUDANS: Well, forget about that. You define an ideal system just the way you define it --

MR. KERR: Why don't you agree with Dr. Zudans that you can't think of any at this point? That will make him happy.

(Laughter.)

MR. KEATEN: I will have to be real honest and say I haven't been thinking in terms of an integrated mass inventory device. So it is true at the moment I can't think of any.

MR. KERR: See.

MR. ZUDANS: That's good, that's good.

MR. KEATEN: Although there is the general principle that we talked about the last time we went around, which is that we don't like to add complexity unless there's some reason to do so.

MR. ZUDANS: That's fine. So your objective ought to be, not just by you but by everybody, to develop such a system. Whether it exists today or not is somebody else's decision. But then all of your negative comments with respect to such a system certainly no longer are valid.

MR. CATTON: And isn't a DP cell system sort of approaching that, measuring the mass between two points?

MR. KEATEN: I'm going to talk about those in a few minutes.

But the other thing I want to point out about the overcooling versus the LOCA is that we do not believe it is important early in the transient for the operator to be able to distinguish between the two because he does the same thing in the two systems.

MR. CATTON: He turns off the two pumps.

MR. KEATEN: Under today's criteria, that's true.

MR. CATTON: And I think that's part of the whole issue. A good system might eliminate that need.

MR. KEATEN: Then the third item on here is one that was mentioned earlier, where I don't think we have any disagreement with what was said. If one had a good instrument for measuring inventory, certainly in the context of post-accident evaluations, understanding what really occurred during the transient, that information would be used.

(Slide.)

The next chart is just a summary of what we understand from our own looking and our discussions with others what are generally considered to be the front-running devices. I don't think I need to dwell on this. The vessel delta P system developed by Westinghouse has been used by EG&G. I put General Electric on here because as you know in boiling water reactors we use that kind of level device, although during normal operation that level is measured in the downcomer and not in the core.

Our comments on this are, in the case where there are reasonably quiescent conditions -- in other words, where you can define a level as contrasted to a void fraction -- this is presumably a correct indication of probably more accurately inventory rather than level.

If it is a low flow, by which I would mean natural circulation or a very low forced flow, it probably indicates some sort of an equivalent level. We've seen this in the boiling water reactor that we have. In cases where the plant is shut down and there is low natural circulation flow, you get an equivalent level.

I don't claim to have in any sense a final answer on this. But I have to tell you that not only myself but everyone else at GPU that has considered this is very skeptical about the ability of this device to measure void fraction under a high pump flow condition. I think it would indicate void fraction under certain sets of ideal conditions, but I think under real conditions it would be highly dubious that it would be a reliable indication.

MR. CATTON: Without having seen the report, there's some feedback that I'm getting from the Semiscale people in Idaho that tested the Westinghouse delta P system, are very good. With some small amount of software plus the delta P cells they're apparently getting all the information they need. It's looking very good.

MR. KEATEN: Dr. Catton, again I'm not trying to imply that we have a closed mind on the subject. I haven't seen the report and we will get the report and evaluate it, and if that conclusion is wrong it's wrong. I'm just telling you, from what we know today this is the result of our evaluation.

MR. CATTON: I think we would all like that report.

MR. ZUDANS: Mr. Keaten, the comments that you have really apply more to the concept of level indicator rather than inventory. That's the second comment that you have, indicates equivalent level for two-phase. That would be just as correct a it is for single-phase. It just depends on gravity.

MR. KEATEN: That's correct. I was addressing level because that's what the requirement is.

MR. ZUDANS: Right. But if we really address it as an inventory, then it is better than what you say there.

MR. KEATEN: Those two I think are fine. Actually, I intended this to be a positive comment and not a negative one. Even if you're thinking of level, talking in terms of some equivalent level, it's a meaningful thing.

MR. ZUDANS: The difficulty in the forced flow, there is no disagreement that it's difficult, but that it's manageable. You can callibrate that while you're not really operating, but not for all conditions. So I don't know how to solve that problem completely.

MR. CATTON: You need to see the Semiscale report as well.

MR. ZUDANS: Yes.

MR. KEATEN: I think we're all in the same boat there.

Let me tell you, one of our concerns is that under the practical conditions where this kind of a condition might arise, I think it is a very questionable assumption that you would have a homogeneous, two-phased mixture flowing through the vessel. And trying to then calculate back to the pressure drop to the void fraction appears difficult to us, but as Dr. Catton said we need to see that report.

MR. CATTON: I'm as eager to see the report as you are. I was quite skeptical beforehand.

MR. KEATEN: This is the system which was mentioned earlier that Duke has been discussing with the NRC staff. The work has been done by B&W and Duke. It is based upon the unique characteristics of a B&W reactor coolant system, in which the hot leg is very much elevated relative to the reactor vessel.

So if you're thinking in terms of a level, that is certainly the place at which you would expect to see a change in level first. And in that sense, this is very much of an anticipatory signal. This is the system that's been discussed by Duke. It does not cover the full range even of the hot leg and does not go at all down into the vessel. It's only at the very top of the hot leg. I think it's the top ten feet, if I remember the numbers.

So again, it has some of the same characteristics of any delta P system. It's a good anticipatory system. One of the requirements of 0737 is that it be full-range, and it does not meet that requirement.

Heated thermocouples are being developed by Combustion. It gives the discrete response. We have still some questions in our mind and these are questions based on ignorance as to how these really respond in the presence of a two-phased fluid. And this is an area where we simply need more information in order to clarify in our mind the pros and cons.

And obviously, for a practical system we have to have the right kind of penetrations in the vessel head in order to be able to install these.

Neutron detectors were previously being developed by EPRI. They have now terminated that program and are now looking at all types of detectors. As I mentioned earlier, Penn State University has made proposals to various groups to develop such a system. It's attractive in that it's a non-intrusive detector.

The tests that have been done to date indicate that sensitivity to water level above the top of the core was very good as long as the level was within about eight feet of the top of the core. For water level higher than eight feet, the sensitivity dropped off very much.

There has also been the suggestion, although it's not shown here, that really gamma rays might be better than neutrons for this purpose. There has been some analysis. I'm not aware of any really serious testing that's been done in that area.

Finally, the question has come up, well, could the core exit thermocouples be used for level detectors for a certain type of level. Obviously, if the level is above the top of the core the answer must be no. Below the top of the core, it was indeed suggested by the NRC staff witness at the TMI-1 hearing that it might be possible to correlate the thermocouples with level, provided the level were below the top of the core.

This becomes of interest because there are some types of detectors that inherently would have a great deal of difficulty in covering the full range of the vessel, for example heated thermocouples, where it might be possible to install heated thermocouples at the top of the core --

MR. CATTON: There is also the problem of your heated thermocouples might indicate a loss of water due to the de-entrainment on top of the core support plate.

MR. KEATEN: Yes.

MR. CATTON: And the others, it would depend upon their location. You might get into the same sort of difficulty.

MR. KEATEN: In the case of our in-core thermocouples, I don't think we would have that problem.

(Slide.)

As I'm going to show you, one of the points of these detectors is if you're really going to try to meet all of the different criteria that people are talking about, it's not at all clear to us that you're talking about a single system. You may be talking about a combination of several systems.

This is an attempt to rack up these five, what I have called front-runner detectors against some of the criteria of 0737. That's not a complete list, but it's the ones I think are perhaps the most challenging. This is our evaluation of how the various things stack up against the criteria. A question mark means that we simply don't feel we have enough information to take a position on it. Where I have here a no followed by a question mark, we say that's our opinion but we recognize it's sort of a subjective opinion and it's subject to question.

As you see here, there are not any of the detectors that as we see them today meet all the criteria. The ones we think are the toughest to meet are how do you handle the pumped void fraction versus pool boiling, how you get really full range, and remember in a B&W reactor full range means from the top of the candycane to the bottom of the vessel. It doesn't just mean across the vessel. And this question of how you really check out these things with the plant in operation, which is a suggested requirement for 0737.

Our conclusion with that is that there is not one of them, based on the knowledge that we have today, that clearly leaps out as the front-runner. As Dr. Catton pointed out, there are different problems with different types.

MR. ZUDANS: Would you go through a mental exercise and add another column and say reactor coolant system delta P. Where would you get -- yes, reactor coolant system delta P, the lowest point to the highest point. Where would the yesses and noes come in?

MR. KEATEN: I would leave that one the same, that one the same; that would change to a yes; that one would be the same. This continuous indication, I've got a question mark here because I wasn't sure from the wording in 0737 exactly what is meant. As I understand, there are some computations required, and this may be periodic and it may be that meets the requirement of 0737. I just wasn't sure. Ditto for "recording." I would still have a question of how you check that thing during normal operation.

So I think the main difference would be to change the full range of noes to yes.

MR. KERR: You said at the beginning of the slide that you were reasonably -- well, I think you said you were convinced at this point if one had to install something, one would have to use several systems.

MR. KEATEN: If in fact one wanted to meet all of these criteria plus the additional criteria we've developed.

MR. KERR: I was puzzled by that statement, and maybe this is because I had previously misunderstood the NRC position. I thought it was their position that indeed one needed a combination of the saturation meter, the core exit thermocouples and something else in order to get unambiguous indication of a lack of core cooling. So I had assumed we were all working in an environment that said it's going to be a combination of things.

MR. KEATEN: That is right. I didn't mean to imply otherwise.

MR. KERR: Okay, all right.

MR. KEATEN: I think that both we and the NRC staff in the hearing clearly testified that it would be in combination with other things. My statement was intended to say something a little different, that in addition to the instrumentation we already have that -- the T-set margin, the in-core thermocouples and so forth -- if you want to meet all of these criteria you need more than one of these systems.

MR. ZUDANS: Wait a minute. You don't, because you have core exit thermocouples as a separate requirement. That is there, so you have to assume that already exists. So you can answer all of those questions, you point out yes. Then a number of these systems would apparently satisfy the total "yes" requirements.

MR. KEATEN: If you're going to interpret it that way, that's correct.

MR. ZUDANS: Well, that is the way you have to interpret it.

MR. KEATEN: But that is not the way I interpret the requirements as they are written in 0737. For example, the requirement that it be able to undergo operation checks during normal operation, as I understand the requirement, I wouldn't assume that that would be satisfy it for the delta P just because I could do it with in-core thermocouples and check the thermocouples.

MR. ZUDANS: Well, the ICC requirement it would satisfy; not just the level measurement requirement.

MR. KEATEN: I guess to some extent that's a matter of how you interpret the requirements. We regarded these requirements as those imposed on the level measuring system itself.

MR. CATTON: As a matter of fact, if you look at that, you would see that a combination of delta P cells and thermocouples give you all that.

MR. ZUDANS: That's correct.

MR. CATTON: And I don't think anybody would disagree with that position --

MR. ZUDANS: Except for the full range.

MR. CATTON: Full range just means more delta P cells. But you do need tne combination of the delta P cells and the thermocouples, and then you get your yesses everywhere on your chart. As a matter of fact, the only place -- the full range is taken care of by more DP cells.

MR. KEATEN: That's right. You can get the full range by adding more DP cells.

MR. CATTON: And thermocouple plus DP cells gives you "yes"s everywhere.

MR. KEATEN: Yes, if you assume that it's --

MR. CATTON: I'm just reading your chart.

MR. KEATEN: I'm not assuming that a "yes" plus a "?" equals a "yes."

MR. CATTON: Well, I am taking the critical question marks, and the thermocouples is a great questionmark. The yesses come from the other columns.

MR. KEATEN: That's what I'm saying. The fact that I can check my core exit thermocouples during normal operation, I don't read that as satisfying the NRC requirement that I be able to check this system.

MR. CLARK: I think for example the core exit thermocouple would be yes for the range it covers, but you would still need a yes for the other system for the range it covers. We need to meet the requirement, so therefore we don't see a combination that meets them all.

MR. MOELLER: Let's wrap this up if we can.

MR. KEATEN: Let me then conclude by telling you where we think we are at the moment and where we think we should be going. The first thing -- and this has not been a disputed conclusion between us and the staff nor betweenn us and the Subcommittee -- is we don't believe it's necessary to install hardware prior to restart, on the grounds that we don't see any need to input the safety signals. I believe that if such an incident occurred right after we restarted that the operator could take the necessary actions based on his existing information.

We have pretty much concluded, on the basis of the work that we have done so far, that where we would install such a system it probably would not be directed primarily toward the control panel operator, the guy with his hands on the knobs. It is more likely to be directed toward confirmatory or later diagnostic information and probably directed toward the more senior operating people, such as the shift adviser or the shift technical adviser.

(Slide.)

We also see there could be some use in terms of the long-term actions, such as venting. And as I showed you, there are several areas where we don't think we concluded the evaluation and we still have work to do.

As far as the detectors themselves, we don't believe that there's any ideal detector, and certainly none of the individual systems meet the NRC criteria. Even after the discussion this morning, I'm not sure that there's a combination of systems that we know today would really meet all the criteria in NUREG-0737. And there seems to be some incentive for looking at new approaches, although again, if there is test results in the mill that we haven't seen yet, that criteria of course could be affected by the results of those tests.

We are and have been reluctant, as Mr. Clark said at the beginning of the discussion, to install instrumentation until we know what we want and until we know how to use it. And so our conclusion is that, on the one hand I'm certainly not up here trying to tell you that we know there is no usefulness of such a detector. In fact, we have been able to find areas where it might be useful. On the other hand, we don't think that we really know yet what all the criteria area, and so we think that the appropriate action at this stage is for us to continue with the evaluation of both the criteria and the detectors.

MR. MOELLER: Thank you.

Well, I think for the staff, you have heard a report on the Licensee's response. Do you have any comments on this?

MR. PHILLIPS: Larry Phillips. I would only comment that many of the questions raised, that the answers have been readily available both from presentations that the staff has given in the regions, and many of the questions raised concerning the vendors' systems could be answered by the vendors positively.

MR. MOELLER: Are there any other questions or comments by the Subcommittee?

Mr. Clark, do you have anything?

MR. CLARK: Two comments. First, I want to assure the Subcommittee that the bottom line there of further evaluation by GPU is not a pro forma kind of commitment. We are actively evaluating this question. Management is supporting it, is pushing to get those evaluations done. So that is a real commitment.

Second, it seems to me that perhaps out of this discussion, since the requirements and a lot of other discussions, since the requirements were articulated that a restatement of the requirements aimed more at inventory than at water level, or aimed at the purpose of the requirements, might be helpful to a lot of people, including ourselves; that when you start off talking about reactor water level, I think that gets everybody's mind headed in the wrong direction. So it seems to me that some restatement might be useful.

MR. MOELLER: Mr. Kerr.

MR. KERR: I guess I did not understand Mr. Phillips' statement.

Did you mean to imply that the answers to most of the questions being raised by GPU already exist and that indeed there is enough information so that they could make a decision if they just had this information? Is that the thrust of your question?

MR. PHILLIPS: I meant to imply that many of the questions implied by them, especially concerning the criteria, have been answered by the staff and that many of the questions raised concerning some of the individual systems have been answered by the vendors, or at least that they have a case concerning those questions.

The Staff, as you know, has not completed evaulation of the Westinghouse Delta P system or the heated junction thermocouple system. So I do not mean to imply that they can positively say this system will meet all the Staff requirements and, therefore, we can install it comfortably.

But I think the Staff has indicated time and time again that we believe that when this review is complete and the vendors have responded to our review, that those systems will meet the staff requirements.

MR. ZUDANS: Is Staff still requiring installation of these systems by 1 January '82?

MR. PHILLIPS: That is the current requirement.

MR. ZUDANS: Well, I guess there is no point in discussing it here. That affects everything, not just TMI.

MR. PHILLIPS: That is true.

MR. ZUDANS: And why should this be related to TMI restart in any fashion whatsoever?

MR. PHILLIPS: It is not related to TMI restart. What we have said is that it is already clear they are not going to meet schedule. As a very minimum, we require to see some strong movement. The procrastination can go on forever, and likely will, if that is the direction that we permit it to go.

MR. ZUDANS: You want them in a forward gear rather than in neutral; right?

MR. PHILLIPS: Right.

MR. ZUDANS: I agree with that.

MR. CLARK: I certainly feel I need to respond to the term "procrastination." Obviously, it is not our view that we are procrastinating, but that it is very complex and that the definition of exactly what is wanted has been evolving from the initial water level into total level in the system in terms of total reactor coolant and perhaps the fact that everybody did not sign up immediately to put in a reactor level water. Delta P has been helpful in elucidating the real requirements in leading us all to a better answer.

MR. MOELLER: Okay, that completes the discussion of the first item under agenda Section 3.

We are going to take a break. We will resume at 11:00 o'clock. And at that time we will pick up item III.A.2, emergency preparedness with discussions by the Staff, Licensee, FEMA, and Bureau of Rad Protection, State of Pennsylvania, or should I say Commonwealth of Pennsylvania. We will take the break then until 11:00 o'clock.

(Brief recess.)

MR. MOELLER: The meeting will resume.

As I announced at the break, we ar taking up the subject of emergency preparedness, and then we are going to begin on emergency preparedness, with the discussion by the NRC Staff. Then we will call on FEMA, then the Bureau of Rad Protection, Commonwealth of Pennsylvania. And lastly, we will call on the Licensee.

Brian Grimes, are you in charge or who is in charge of NRC?

MR. GRIMES: I guess I can just introduce Steve Chesnut to lead off. He is our Emergency Preparedness Team Leader for the TMI-1.

MR. MOELLER: Okay. Steve.

(Slide.)

MR. MOELLER: Go ahead.

MR. CHESNUT: My name is Steven Chesnut, the team leader for the Pennsylvania Powerpla with regard to emergency preparedness. We have completed our review of the emergency preparedness around TMI Unit 1. And I would first like to give a little background information on the standards that were used with regard to emergency preparedness.

Following the accident, a restart order was issued for short-term items, including about five points:

First, upgrading emergency preparedness plans under Reg Guide 1.101, including emphasis on action level criteria used to declare emergencies and to take emergency actions;

Establishment of an emergency operations center, including improved communications;

Upgrading off-site monitoring capability, including additional TLDs;

Assessing the relationship of state/local emergency plans to Licensee's emergency plan to assure the capability to take emergency actions;

And to conduct a test exercise of Licensee's emergency plan.

Subsequent to the issue of that order in August of

1979, the NRC in its review of the problems at TMI developed a more rigorous requirement of 10 CFR Appendix E and NUREG-0654, which took into account and actually superseded many of the standards that we were using and reviewing the emergency plans around Three Mile Island.

The NRC has filed an emergency planning evaluation report in December, which included a few open items, and just recently, on May 29, 1981, the Staff filed an emergency planning evaluation report supplement. In that supplement all of the previously identified open items have been resolved, with the exception of one which, as NRC Staff indicated in its position, that the Licensee's emergency operations facility should be staffed and functional within approximately one hour of declaration of an emergency of a site area emergency or a general emergency.

The Licensee's provisions in this plan call for staffing emergency operations facility in approximately six hours in an interim period between the declaration of an emergency and the six hours they would perform those functions in an alternative method; and that would be performed either from the control room or the technical support center on site.

Essentially, the conclusion of that supplement reported that with that one exception that the Licensee's emergency plans were in compliance or met the criteria of

NUREG-0654.

Also, in conjunction with the hearings that were going on with regard to TMI restart, we were requested to do an emergency preparedness inspection, which followed the health physics inspections on site. And an early inspection in August of 1980 resolved about 30 open items with regard to new emergency planning rules and plans.

Just recently, a follow-up inspection was conducted, closing 36 of those open items. Those four items are dealing primarily with training on the new emergency preparedness plans, which has been started. But as the most recent provision, which was implemented in April, that training has not been completed although it is well underway and on track. And a few post-accident instrumentation, which had been reviewed but not yet installed, have not been factored into the accident assessment scheme. As the equipment had not yet been installed, we could not test equipment that was not in place.

The Office of Inspection and Enforcement will track these remaining items to completion.

(Slide.)

One additional item, the last element of the short-term order indicated that the Licensee should conduct an exercise test of its emergency plans. Such an exercise was conducted on June 2, 1981. Just to summarize, the performance of it was acceptable. We found no significant deficiencies.

Off-site, the FEMA report contained recommendations, and the results of that exercise, comments and recommendations were made in seven basic areas. However, the results are reported that the State's four counties within the plume-exposure emergency planning zone performed acceptably during that exercise.

I should point out also that York County did not participate in that exercise. York County is one of the five counties in the plume-exposure emergency planning zone.

MR. MOELLER: Are the five counties then roughly equally within this zone, or is York, is it geographically a very important area as far as the plume emergency zone is concerned?

MR. CHESNUT: York County, I believe, has the second largest area of the five counties within the emergency planning zone.

MR. MOELLER: Why did they not participate?

MR. CHESNUT: There was a variety of reasons. I think there were some scheduling problems and also some funding problems. The Federal Emergency Management Agency is pursuing a method to review implementation of the York County plans to include some sort of exercise.

MR. MOELLER: Thank you.

MR. CHESNUT: Overall, the Licensee has exceeded the requirements in the short term, the short-term items, August 9, 1979, order. And it has complied with the new emergency planning rule as well as the criteria in NUREG-0654.

MR. MOELLER: Okay. Questions for Mr. Chesnut?

(No response.)

MR. MOELLER: Let me ask a couple. I noticed in this NUREG-0746 that in the body of the report, section G is called "Public Information," and in the table of contents it is called "Public Education and Information."

Is there any significance to that? Are you downplaying that education?

MR. CHESNUT: No, sir, we are not downplaying. It should be "Public Education and Information" in both cases.

MR. MOELLER: Okay. What is the basis for this 1R per hour at the site boundary as a trigger for declaring a general emergency? Is there a technical basis for that number, or is it simply based upon what some agency has recommended? Can you tell us or someone else?

MR. CHESNUT: Although I was not part of the task force that developed those criteria, essentially there was an attempt to just make a dividing line of where a major response and a major off-site impact would be seen and also a trigger level to where protective actions could be taken to hopefully prevent protective action guides from being exceeded.

MR. MOELLER: Well, if you have 1R per hour at the site boundary and you declared a general emergency, what would the integrated dose be for the maximum individual in the population? I realize that that does not have a simple answer. But obviously, someone must have gone through this type of an exercise.

MR. GRIMES: Perhaps I could speak to that.

MR. MOELLER: Thank you, Brian.

MR. GRIMES: This 1 rem per hour comes out of Appendix 1 to NUREG-0654, which sets forth the four classes of emergencies. And the example initiating conditions.

Basically, that 1 rem per hour whole-body or 5 rem per hour thyroid was an attempt to convert the PAGs into a directly measureable number.

MR. MOELLER: So these are based on -- is it EPA's guidance?

MR. GRIMES: Yes. The EPA's PAGs are 1 to 5 rem total body projected.

MR. MOELLER: Right.

MR. GRIMES: This is an instaneous measurement that indicates you are now in the range where you are definitely going to have to take protective action at the site boundary. And this is under actual meteorological conditions, not under hypothetical conditions.

So you actually have a great deal of material at the site boundary, and you do not reach those doses for reactor at the site boundary unless you do have a very degraded situation in the plant. So it is one direct indicator that you do have a substantial problem in the plant and there should be a general emergency plan for preparing to take protective actions at least at the site boundary.

MR. MOELLER: And how would they know it has reached 1 R per hour?

MR. GRIMES: The Licensee is required to have emergency action levels in their procedures, which include values of specific parameters, and one would have an effluent monitor, for example, that if it exceeds certain levels, you would do a calculation based on current meteorological conditions.

MR. MOELLER: So it might be an estimate? You are not saying that you require them to have a parameter at the site boundary, a series of external --

MR. GRIMES: No. That is a separate matter. That is under consideration.

MR. MOELLER: At the moment it could be well based upon an estimate or some airborne release?

MR. GRIMES: Or it could be a hand-held monitor at the boundary. This type of condition does not necessarily develop immediately. You may well have teams out, but if a team at the site boundary does detect these levels of radiation, it is an indication that off-site authorities should be alerted to go into the general emergency class and very seriously consider protective action at the site boundary.

MR. MOELLER: Mr. Kerr has a question.

MR. KERR: Do you have a feeling for what sort of dose rate you would see at a typical boundary if you had a TID 14.844 source in a large dry containment?

MR. GRIMES: With the --

MR. KERR: With no leak rate at all, just the penetrating radiation.

MR. GRIMES: Penetrating radiation would be below this level.

MR. KERR: In terms of a measured dose rate at the boundary you could have that sort of release in containment without declaring -- there would be other things that might make you declare an emergency, but at least that dose would not?

MR. GRIMES: Right. We will have action levels which will indicate that if you do get more than gap activity in the containment you should be in emergency situation.

MR. KERR: Yes. That is it, there would be other indications that would take care of that. But as far as the dose rate at the boundary, this is bigger than what you would see even with that large source as long as it stays inside the containment.

MR. GRIMES: Yes.

MR. KERR: Okay. Another one, maybe still with Brian, there seems to be a discussion here at one of the open items is this reactor coolant level activity for declaring an alert. Is that still unresolved?

MR. GRIMES: Maybe Steve can speak to that. I believe it has been resolved.

MR. CHESNUT: At the hearings the Licensee has committed to changing its emergency action level to be consistent with Appendix A and NUREG-0654. We have not received the submittal.

MR. MOELLER: It seems like it is resolved?

MR. CHESNUT: Yes, sir.

MR. MOELLER: Well, to help me, is that a total fission product activity level or iodine? Which of the iosine isotopes? What is the activity you are talking about?

MR. CHESNUT: It would be an iodine equivalent 131.

MR. MOELLER: Okay. How is that information obtained? How do they know the iodine-131 in the primary coolant? Was it available, for example, during the TMI-2 accident? Maybe I should ask them.

Mr. Clark, how will you know the iodine level, the equivalent I-131 in the primary coolant, and was that information available during the TMI-2 accident?

(GPU Staff conferring.)

MR. CLARK: The current way of determining that is to take and analyze the primary coolant sample.

MR. MOELLER: You mean you have to take the liquid sample and take it over to a lab somewhere? If that is it, I want to know.

MR. CLARK: For iodine, yes. That was done during the TMI-2 accident, at the cost of a considerable dose. And, of course, one of the modifications, or lessons learned, is to provide methods for shielding and what not to enable you to get that sample without the same dose.

Longer term, there is an effort underway to provide an iodine monitoring capability.

MR. MOELLER: Is that -- can you elaborate, Steve, on that? What are the long-range requirements? In other words, to me, if you have to take a sample and take it to the lab -- and, I gather, you probably have one or two or three hours in which they have to get their results -- but if you use that to declare an alert, that troubles me.

MR. CHESNUT: Well, the current requirements are for being able to obtain a sample and analysis within about three hours. And there is no current on-line capability required.

MR. MOELLER: You are thinking of that, of requiring an on-line capability?

MR. CHESNUT: I believe the Staff is investigating it.

MR. MOELLER: Brian, could you help me with that? I realize, of course, there are many other indicators that you could use for declaring an alert, but this seems like a very sluggish way of doing it.

MR. GRIMES: I am trying to recall what the requirements for upgrading those instruments are, and I am afraid I do not have it in my mind right now.

MR. MOELLER: You can report to us later.

MR. GRIMES: I would appreciate it if I could do that.

There are some direct indicators, of course, and general levels of activity in the primary coolant, to give you an idea.

MR. KERR: I cannot imagine that if the primary coolant was very hot and they do have a way of taking samples fairly soon, that it would take three hours to get the results. It just does not take that long to run a spectrum on iodine. The three hours may be something plenty of time, but it would not take you three hours to get an iodine spectrum for a relatively hot sample.

MR. MOELLER: Mr. Giangi apparently can help us.

MR. GIANGI: Yes. The three-hour limit is really used as a guidance to both obtain and analyze the reactor coolant system sample for the chlorides, boron, and total gamma spectroscopy.

MR. KERR: I did not word my question very well. I was really wondering whether you could not measure the iodine in the primary coolant sooner than three hours after you took a sample. My guess it ought to take 15 or 20 minutes. Am I wrong?

MR. GIANGI: No, sir. For a typical reactor coolant system sample -- and we are talking typical being approximately 1 microcuries -- it would take on the order of a half-hour.

MR. KERR: That is the kind of activity you would see in a normally operating reactor. I am talking about one in which you would see some sort of incident, say, your iodine is up significantly.

MR. CLARK: The analysis of the order of 15 minutes after you have the sample.

MR. KERR: That is about what I had anticipated.

MR. MOELLER: Brian.

MR. GRIMES: I do know that we do have a written requirement, Dr. Moeller, on your question that there be a failed fuel limit indicator for the alert condition. If one thinks there is on the order of 1 percent failed fuel, you would be into the alert condition. That would probably occur about the same time as you get this kind of iodine activity. But it is another check, another way of determining that you have substantial fuel problems.

MR. MOELLER: And the iodine spike that you get through changes in power and so forth, it will not anywhere near approach the alert level you are talking about here?

MR. GRIMES: Generally, it will be lower than that. We have seen a fuel up in the 100 range. But, in general, this is higher than one would see.

MR. ZUDANS. Mr. Chairman.

MR. MOELLER: Yes, Mr. Zudans.

MR. ZUDANS: I was left with a not fully answered question. I guess the normal sampling-taking procedures that allow you to take the sample fast, would they be usuable in the case of a highly contaminated sample, or would they have to devise additional steps?

MR. MOELLER: I think we should ask the Licensee to answer that. I mean he implied or he stated, Mr. Clark stated, that they had modified the system so you can take such samples more readily with less dose.

MR. CLARK: The sampling procedure after an accident with high activity level is different than the normal sampling. It does involve some remote kinds of operations and basically getting the sample takes the bulk of the allowed three hours. Getting the sample takes you on the order of two hours to gear up and do it. The analysis for iodine then is the additional 15 minutes.

MR. ZUDANS: Then in that case the way you have gotten it is that it is a sluggish way?

MR. KERR: Well, but if you know that the sample is that hot, you do not really care whether it is iodine or what. You will have done something long before you analyze that sample.

MR. CLARK: THere is a real-time total activity monitor on the reactor coolant letdown system --

MR. MOELLER: Right.

MR. CLARK: -- which is what gets you the early indication that you have a problem.

MR. ZUDANS: Then you do not make the decision on the basis of iodine.

MR. MOELLER: But you do. This says you do call an alert on the basis of the equivalent, the I-131 equivalent, in the primary coolant.

MR. ZUDANS: But that is two hours and 15 minutes, according to what I heard last.

MR. GRIMES: It is simply covering another parameter. Most likely in this case, you will have already declared the alert based on the gross activity in the letdown line.

MR. ZUDANS: It would be just like a confirmation that you didn't make a mistake.

MR. GRIMES: Yes. If you did not pick it up on that source, you took a sample and found high activity, you should have a level at which you would go into the emergency.

MR. CHESNUT: Furthermore, if you had another emergency action level that was exceeded it, it would not wait until the results of the iodine sample were back before it was declared.

MR. KERR: It would be interesting to see if there would ever be a conceivable situation in which this particular indicator would be useful. I would wonder whether it would.

MR. ETHERINGTON: To what extent --

MR. MOELLER: Harold Etherington.

MR. ETHERINGTON: To what extent was the public informed in advance of this exercise?

MR. CHESNUT: There were numerous newspaper articles, and I believe there was a press conference a week before; of further details, I am not aware of.

MR. ETHERINGTON: There was no possibility of their finding out it was an exercise and not knowing about it in advance then?

MR. GRIMES: Do you mean --

MR. ETHERINGTON: It could, of course, alarm if they had not known it was to be --

MR. CHESNUT: The public was notified. There were numerous articles during preparation for the exercise.

MR. MOELLER: What were the main key factors you learned from this exercise or changes that you are going to make?

MR. CHESNUT: Well, first of all, we had a team of about ten observers at the exercise in numerous areas. We had comments on various matters which communications were proceeded in coordination with press releases between the state and the Licensee. Generally, the comments were more of a recommendation nature, and generally the performance was extremely good; in fact one of the best exercises that the team who observed this one had ever seen. The command and control of the exercise was very good.

MR. GRIMES: And I think we would like FEMA to speak to the points on off-site.

MR. MOELLER: Fine. One last question on this. You say you had the exercise or the drill, and one of your problems or one of the areas in which you encountered some problems, you said, was communications.

At TMI-2 one of the major problems was a lack of information, the lack of transmittal of important key information in terms of parameters within the reactor out to the State, the people who are making the decisions and so forth or even to NRC back here at headquarters.

What has been done in revamping the TMI-1 emergency plan from the NRC's point of view? What has been done to assure that if an accident occurred in TMI Unit 1 that there would be a free flow of the information, the types of data that you really need?

MR. CHESNUT: Well, I think a tremendous amount has been done in that area. Specific responsibilities have been assigned to individuals in the emergency organization, just to accommodate that information transfer. People are assigned to be phone talkers, and there are people who direct them what to say. There are numerous direct lines.

MR. MOELLER: You have key people in the NRC, and then they have counterparts there with the Licensee to talk to to get what they need to know?

MR. CHESNUT: I was reporting on what the Licensee's plan has. The NRC's emergency response team will include people, usually a resident inspector, who will initially go to the control room and man the ENS line, which is an NRC line. Then there is also an NRC health physics network line which can be activated to transfer health physics-related information.

So the NRC will have its team responding and some parallel information will be going, and we will be able to observe the Licensee's and confirm their assessments. In addition to that, the Licensee's communications have included not only people who are specifically assigned to communicate that information, but additional direct lines to the key elements of not only the Licensee's emergency organization but the State, the counties, and the NRC.

So in that regard, I believe a tremendous amount has been done, and I do not believe that problem will reoccur.

MR. MOELLER: That sounds reasonable.

Brian, one new item, too, of course, is the Nuclear Data Link. Now, is the emergency planning organization or, say, the State, will they be provided any information through the NRC's Nuclear Data Link?

MR. GRIMES: First, let me say that we have not gotten a go-ahead from the Congress to proceed along these lines yet. But presuming that we do, the Commission is recommending that we do, this will, we hope, take the place of a lot of the telephone traffic between the Licensee and the NRC and between the Licensee's own centers. We would have a subset of the information which we are asking them to transmit automatically between our own places where they make decisions.

We have provided the option for the State to receive some information. We think they would be primarily intersted in effluent and meteorological information rather than the plant data. We have not excluded that, but we have not come to any decision on what should be done.

MR. MOELLER: Okay. Thank you.

MR. CLARK: Dr. Moeller, could I comment on that?

MR. MOELLER: Yes, Mr. Clark.

MR. CLARK: Over and above the dedicated lines in the communication things, in the case of TMI there is a provision in our emergency off-site facility for a State representative, and they do plan to man it, and they have manned it during the drills. So he is there, and he has all the access to the information in that emergency off-site facility.

In addition, to be absolutely clear what the shift supervisors and the operating personnel with regard to their responsibility to fully and promptly report, there is an instruction to them which calls this an essential element of protection to advise off-site.

And it says: "Observe the following principles: Promptly report all facts and information concerning plant conditions and the potential threat to the public. Be totally and thoroughly candid in your reports, and do not withhold any information. Answer any questions asked to the best of your ability whether or not they appear to be pertinent to the situation at hand. Make every reasonable effort to convey information so that the recipients have the understanding of the significance of the report, including the degree of uncertainty that may exist as to plant conditions and the prospect for further degradation in the situation."

MR. MOELLER: Thank you. That is very good.

MR. ZUDANS: That raises one question, though. Who can direct those questions to him? Anybody from the streeet?

MR. CLARK: No. And the preamble to this talks about State, NRC, and company officials.

MR. ZUDANS: You may create more chaos than you would do good.

MR. CLARK: He is not in touch with the public.

MR. MOELLER: Okay, Mr. Chesnut, does that complete your presentation?

MR. CHESNUT: Yes, sir.

MR. MOELLER: Thank you.

We will then move on to the FEMA presentation.

MR. GRIMES: Mr. Adler has a few remarks on the exercise.

MR. MOELLER: Wait a minute while we fix your mike.

MR. ADLER: On the whole, the State and the county has participated or demonstrated adequately their ability to respond. There were some 38 federal observers, and in fact FEMA participated as well, by locating itself at the State EOC. FEMA's role was to meet unmet resource demands that the State and counties might have.

So the bottom line was that there was an overall adequacy demonstrated.

With one of your questions earlier about that county that did not participate, I can tell you that we have received a letter from General Smith inviting our participation in a meeting with York County. It looks like it wil be towards the end of next week, at which time a discussion of which testing and exercising York County should be involved in will take place. So I fully expect York County will be exercising in the near future.

The BRP at the State, PEMA, demonstrated excellent coordination one with the other and with the Licensee as the incident progressed. There was some confusion at one point when the State declared a state of emergency, in that some of the emergency personnel interpreted this to be a state of general emergency, which it was not, among the four levels of accident progression.

I do not know how we fixed that, but one of our suggestions was that the State's declaration might be -- use other terminology to prevent that conclusion. That is really a small point.

But one of the things that the exercise demonstrated is a need for continuing training and drills in such areas as exposure control, where when you get down to the very local level -- by "local" I mean municipalities and boroughs -- that some of the emergency personnel workers, who are the fire and police persons, have not got the familiarity with dosimetry that we would like to see. And, of course, this is a continuing and ongoing process by the State in the counties and the training and drilling of these people.

That, I think, underscores the value of the exercise in that it is not just a test where you come in as you would to the university and answer questions and then leave. The very process of the exercise is a training proceses itself from which all parties learn.

There were some weaknesses in coordination that we saw, primarily at the local governmen levels, and the lack of coordination among the counties with the State as the level of accident progressed. That is, the word would go out that we are moving from a site to a general emergency condition, and that word would go to the counties and the time intervals taken by the counties to alert their citizenry varied, so that different things were going on in different counties at the same time. Not entirely a good situation.

And we have recommended feedback loops to the State EOC on where the counties are at any given moment in order that the State be better able to coordinate what is going on at the lower levels of government.

One of the things we would like to see -- of course, there are numerous items that will be reflected as changes to the State and county plans over the coming months. These plans have not yet been formally submitted to FEMA and a lot of the lessons learned in the exercise will be factored back into plans, changes and improvements. That, too, is a continuing process.

One of the things we do want to see in the plans is the posture that is taken in general by the State for evacuation throughout the ten-mile EPZ, since it is rather an unwritten posture at this point. And either BRP or the State can talk to it. But it is one of the things that we would like to see more clearly defined in their standard operating procedures.

MR. MOELLER: Are you saying that there is no clear-cut criteria on which to make a decision for evacuation. Is that what you are saying?

MR. ADLER: The criteria are there, but the conservatism in the minds of the people interpreting this, primarily BRP, as a result of the history since TMI-2 is something that we want to see more clearly written into the plans as they are updated and probably before they are formally submitted to FEMA.

All of these points are embodied in some 72 recommendations which are summarized in the seven points made in our transmittal to NRC of observations and recommendations and which Mr. Chesnut referred to on his slide.

MR. MOELLER: As a bottom line, do you, representing FEMA, would you at this point judge that the emergency preparedness was adequate for the restart of TMI Unit 1, or do you still have questions in these seven points yet to be answered?

MR. ADLER: I know of no specific items that would suggest an inadequacy for such a decision, although, as you know, our agency does not make that decision.

MR. MOELLER: Right. You transmit your findings to NRC, which, in turn, does it.

MR. ADLER: Yes, sir.

MR. MOELLER: And you have transmitted your findings to them?

MR. ADLER: Yes, sir, we have done that.

MR. MOELLER: Any questions or comments for Mr. Adler?

(No response.)

MR. MOELLER: There being none, we will move on to the report from the Commonwealth of Pennsylvania, the Bureau of Radiation Protection, and Margaret Riley.

Up here, whatever, whichever you are more comfortable doing.

MS. RILEY: My name is Margaret Riley. I am from the Bureau of Radiation Protection in the Department of Environmental Resources. And anything I have to say here would represent actions and such things of the Bureau and not necessarily of the Commonwealth as a whole.

The prime agency in emergency planning in Pennsylvania is the Pennsylvania Emergency Management Agency, which is the state analog to FEMA. Our role at the Bureau is one of accident assessment and evaluation of radiation conditions, making health physics evaluations, and advising PEMA, who is the generic implementer of protective action; they cause protective actions to be made through their advising county and local governments.

As far as the Bureau's experiences with the exercise goes, we thought we sort of got a lot out of it. One thing we found beneficial to our situation was our participation in several preliminary drills with the Licensee in the accident assessment area, which helped us iron out several things ahead of time.

Probably the greater set of issues that became clear to us as being things that we needed to do something about involved those things having to do with passing information -- not recommendations, but information -- to PEMA on interim basis so they have some feeling of what is going on and so that they could talk somewhat intelligently with the counties and help a little bit with the understanding of the situation.

We have also found that it is sometimes difficult, say, when we have made a protective action recommendation, for us to be able to get information back as to what is the status of that recommendation; you know, "Did you do it? Is it underway? Have you ignored us?"

Another item is we think we are probably going to have to follow the example of several other entities and establish a role of communicator so that we have fewer people talking to the outside.

Things that we did differently since the accident that are in the plan are in practice is that we have -- well, as you would imagine, the old story goes, if you want to get funds for an activity in radiation protection, you have to start with a good accident, and the result is that in 1979 that indeed came true.

(Laughter.)

We have had substantial increases in equipment in terms of analytic capability, survey instruments. We have had substantial inflation, so a substantial increase. We finally have communications capability now, something other than Ma Bell. We have also gotten several dedicated or several vehicles that are ours and ours alone.

Our emergency plan has been revised several times. Our emergency organization changed a little bit in that we have finally bitten the bullet and sent a BRP liaison, to PEMA to help the interface there. We also have it chiseled in granite now that the nuclear engineer will indeed go to the EOF.

Also within our office we have a physical facility that is at least in part dedicated to accident assessment. We have the communications equipment there and the maps are there and the bugging equipment is there and everything else.

Something was said earlier here about the Nuclear Data Link. I think there is a little bit of a misunderstanding about what our interests are. At least in Pennsylvania we are interested in things other than meteorology and source terms. We are interested in hardware, but we do get this at least to some extent through our dedicated phone line to the Licensee, although the information on that line is more likely to be the information between the health physics and the NRC.

We have tried to patch into the HP line in the Nuclear Data Link. We looked into the feasibility or the permissibility of doing this. And it seems that both options would create a delusion effect, and it really is not possible. But as Mr. Grimes, said, with placing our nuclear engineer at the EOF, he is privy to everything that everyone else has.

I think, in general, we are substantially better off than we were a year ago, but we do have some small areas where we do feel we need some kind of improvement; for instance, the layout of the assessment center, it is awful. Those are little things we ourselves have to deal with. We have a few pie-in-the-sky things for down the road that are really not germane to the exercise.

MR. MOELLER: Questions for Ms. Riley?

(No response.)

MR. MOELLER: There is one that I have then, and I think you probably already answered it. At TMI-1, according to what we read and what we have learned from talking to people there is there is a lack of flow of adequate information. Did you find that to be true, Ms. Riley?

MS. RILEY: I certainly think more information could have been used. But at that time the processes were not set upto automatically cue things to pull information out of them or for them to dump information on us. I feel confident that had we asked for information, we would have gotten it.

MR. MOELLER: So as opposed to both the case of not being provided the information but, more importantly, the fact that nobody asked for it or knew to ask for it?

MS. RILEY: We had the problem of people in important assessment decisions being pulled away to do things like brief elected officials. And you sort of need to do that. But at the same time, I think, the primary job is accident assessment, and I think we have to make up our minds whether we are going to offend people or have a repeat of past history. I do not really know how to fix that. And I think other people have the same problem.

MR. MOELLER: Well, from what you have described, though, with your nuclear engineer at the EOF and with your dedicated phone line and with your ties at FEMA and so forth, you have certainly done about everything you can think of to assure adequate flow and exchange of information?

MS. RILEY: Yes.

MR. MOELLER: And on the one item that you brought up that you could not always be sure that people had implemented what you had called and suggested they do, how is the feedback to take place?

MS. RILEY: This is one of our internal unfinished items. We have to find some way of fixing that.

MR. MOELLER: You are working on it?

MS. RILEY: Yes. It is an internal message transfer and update thing. Part of the problem is -- it is not really a problem -- but part of the situation is that our activities are staged in an area where we are not in the State EOC, so we have a facility separation thing which in some circumstances is a problem and in many circumstances is not. So it is the matter of being able to get something back through something as small as a telephone line.

MR. MOELLER: And as a final bottom line -- and I do not really know how to ask it -- but do you believe that your capabilities are adequate to keep up with a restart of TMI-1?

MS. RILEY: I think they are adequate for restart. There is still grounds for improvement, but I would think it would be all right for restart.

MR. KERR: Did I interpret your comments to say that if one has another emergency, one has to be a little careful that people are not so busy passing out information to everybody that they forget to worry about the accident?

MS. RILEY: What I said was something like that.

(Laughter.)

MS. RILEY: But what could euphemistically be called "brass counseling," when the boss says, "Tell me what is going on," you do not say, "Sorry, sir, I am just getting a pile of information in here," although that is what you should say.

I think there are ways and means of dealing with this, but it is an ever-present problem with how do you say "No" to the boss and should you say "No," but you should assure yourself that you have adequate assessment capability in place.

MR. MOELLER: Any other questions or comments?

(No response.)

MR. MOELLER: Well, thank you very much. That was interesting.

We will move on. If I am keeping up with the agenda properly, the next group to respond on the emergency preparedness is the Licensee. And that will be Mr. Rogan; is that correct?

MR. CLARK: Yes. I think from an overall standpoint, we obviously have made a lot of changes. We think the drill went quite well, and I do not know that there is much in the way of prepared presentation that would be useful at this point, unless there are specific questions.

MR. MOELLER: I tend to agree with you.

Do we have specific questions for Mr. Rogan from the subcommittee?

(No response.)

MR. MOELLER: We have, of course, received a rather complete picture from the other groups.

MR. ZUDANS: The only question would be is do you agree with everything that was stated by the previous speakers on this point?

MR. MOELLER: Good point.

MR. ZUDANS: If you do not, tell me where you disagree.

MR. ROGAN: I think the evaluation has been a very thorough one. We certainly acknowledge that there are some areas where we would like to make some improvements. We do feel we have come an awfully long ways and that we have demonstrated a capability to manage an accident properly and efficiently. And to that extent, I can find no objection to the comments that were made by the Staff. And certainly with regards to our interface with the Commonwealth and the local municipalities, their participation was excellent and very enthusiastic and very dedicated.

So we were very pleased with the outcome of both the exercise performance itself and the results of the evaluations by the Staff and by the other observers.

MR. MOELLER: To what degree does the Licensee work with the counties around the State in terms of helping with training or whatever other types of assistance they need?

MR. ROGAN: We have several programs. First, as part of our formal emergency training program we provide on a periodic basis training to the various off-site support agencies that would be called upon to support us, such as fire, ambulance, local police, state police. We offer occasional programs to BRP and to the Pennsylvania Emergency Management Agency.

MR. MOELLER: Do you bring them to your facility and put on a course, or do you help them at their own facility to put on a course?

MR. ROGAN: We have done both. Typically, before this exercise we were just starting a new program and we invited people to come to the site, depending on who we were training. For instance on the fire department, we not only go to their stations and present training on radiological hazards in firefighting, but we actually run drills on our site. We have actually taken fire companies into the protected area and they have driven as much as 1500-2000 feet inside the buildings and actually drilled on the site, so they have an idea of what the requirements are. So we try to make it as realistic as possible.

And we also have with the counties themselves both in the planning exercise and in the training exercise we have both our personal communications -- that is, our emergency staff with the coordinators of the various counties -- but we have a consulting services group that assists us in the emergency planning effort and helps us out and assures that we have a continuing dialogue and interface in terms of upgrading the plan and information and so forth.

MR. MOELLER: Okay. Thank you very much.

Does the Staff have any further comments, or does that wrap it up on this subject?

MR. GRIMES: I would like to comment on the State of Pennsylvania's note about communications. Of course, that is common to all organizations. And I think the way to assure that that problem is minimized is to have frequent exercises which involve high levels to all the organizations. And indeed in this case I understand the lieutenant governor was directly involved in playing a role in the States's participation.

MR. MOELLER: Very good.

Okay, let us then move on or move back on our agenda and pick up where we left off this morning. And my plan is to go perhaps sometimes between 12:30 and 1:00, and then we will recess for lunch.

The next item was II.K.3.1, which is the auto PORV isolation. And we will begin with the Staff comments on this?

MR. SILVER: Perhaps there might be some misunderstanding. The Staff has no further presentation on those items other than what I gave earlier.

MR. MOELLER: Fine. Thank you, Harley.

Well, then, let us move to the Licensee. Mr.

Clark.

MR. CLARK: Mr. Keaten will both address II.K.3.1 and II.K.3.2.

MR. MOELLER: Fine. They are closely tied. Let us do that. We are covering the PORV isolation and the report on PORV failures.

MR. KEATEN: Actually, I'm going to go one step further than that.

MR. MOELLER: Fine.

MR. KEATEN: I'm going to also cover II.K.3.7.

MR. MOELLER: Okay. We will also cover the opening probability for PORV.

MR. KEATEN: Let me call your attention to an error in the handout. The sheet that's shown on the first page of the handout should be the last page. I apologize for that. That was done in the rush of leaving yesterday.

(Slide.)

What I am going to say is really a slight elaboration of what Mr. Silver said this morning. These three requirements, actually four according to the original numbering scheme, in which II.K.14 and II.K.3.7 were very similar requirements and have since been combined, was to perform an analysis having to do with the opening probability of the PORV in the even of an overpressure transient with the new set points of the reactor pressure, hot pressure trip, an the new set point on the PORV opening.

II.K.3.1, as was discussed this morning, is a requirement or possible requirement for an automatic system to close the PORV block valve, and that requirement, the implementation of it, has been deferred until the completion of the analysis in II.K.3.2.

MR. MOELLER: Excuse me. When you say "deferred," deferred by you or the staff?

MR. KEATEN: It is deferred in NUREG-0737, which says the implementation of that will depend upon the results of II.K.3.2, which is then to perform the analysis of the improvements which have been made on the PORV and also to evaluate safety valve failure rates.

As was indicated this morning, the work which has been done in response to these requirements was sponsored by the B&W Owner's Group, and B&W at the request of the owners group put together a generic report, which GPU evaluated and then submitted to the NRC as representing our position. I believe that it is correct that the other B&W owners also submitted the same report.

We have subsequently received a staff response to that, as I will be discussing.

(Slide.)

This is a fairly brief summary of what was in the report. First, with respect to the evaluation of the PORV opening under overpressure transients, the evaluation was done by two methods: that is, one strictly analytical and one based on actual operating experience with PORV's at B&W NNSS systems. The analytical estimate was done on the basis of defining three random variables which are shown here, the high pressure trip set points; the pressure overshoot -- that is the amount that the pressure rises above the trip set point; and then the pressure at which the PORV will open.

So for each of those there was a mean value and a standard distribution defined. They were assumed in all cases to be no[illegible] distributions. And then a Monte Carlo analysis was [illegible]rmed to determine the probability of the PORV opening in the event of an overpressure situation.

The result is, as shown here, a very small number, about 4×10^{-6} per reactor year of operation.

The estimate based on operating experience --

MR. MOELLER: Excuse me. Now the 4×10^{-6} is the probability of what?

MR. KEATEN: Of the PORV opening per reactor year. It's not the probability of it opening per overpressure transient, but the probability of it opening per reactor year.

MR. LIPINSKI: What is the main number that goes in to determine the challenges, because that's directly proportional to this number, isn't it?

MR. KEATEN: There are three numbers.

MR. LIPINSKI: The trip set point is one, the pressure overshoot is another, and the PORV opening pressure is another. But I have to have an initiating transient with a certain frequency. That's the key to the whole result, isn't it?

MR. KEATEN: We elected in the case of this analysis to state the results in terms of per reactor year. But as I will show yo· in the other case we have also related it in terms of per overpressure transient.

MR. LIPINSKI: Well, per reactor year has a preceding number of challenges per reactor year --

MR. KEATEN: Right.

MR. LIPINSKI: -- and depending on the severity of the transient, namely how high is the transient going, where is the trip point set, what is the PORV opening pressure, that then gives you the conclusion: Did the PORV open? But the key number is how may challenges per year, because they have a distribution then of different characteristics that these random variables respond to.

MR. KEATEN: That's correct, and I think on the next slide I have that number for you. Certainly we have it in the information down below based on the actual operating experience. As you can see from the operating experience, prior to the TMI-2 accident in the B&W reactors there were 148 PORV actuations -- that is, on the basis of the data which is available. And that of course is with the old set point for the PORV, and the old set point for the reactor trip system.

Since the TMI accident there have been 42 transients, which would have resulted in a PORV actuation with the old set points. Combining those into a total of 190 transients which with the old set points would have opened the PORV and looking at the actual data from those transients as to how the system would have been expected to respond with the new set points, B&W determined that only three of those would have opened the PORV with the new set points on the PORV and the RPS. So that is 3 out of 190, or about 1-1/2 percent of transients, which would have previously opened the PORV that will now be expected to open the PORV.

So if I define "overpressure transient" as being a transient that would have previously opened the PORV, well then this analysis would indicate that between one and two percent of those would now.

MR. MOELLER: Help me, and then Mr. Kerr has questions.

The reason the PORV's are not now opening is twofold: the pressure has been set higher and the reactor trip has been set lower?

MR. KEATEN: That's correct. And in fact the two have been basically reversed.

MR. MOELLER: Right; from what they were.

MR. KEATEN: In the earlier design it was intended that the PORV open to prevent reactor trip on certain transients, and now the opposite is true.

MR. MOELLER: Mr. Kerr?

MR. KERR: Is it a valid interpretation, then, that the 190 incidents will under the new set of set points produce 187 scrams?

MR. KEATEN: Yes.

MR. KERR: That wouldn't have occurred before?

MR. KEATEN: No, I'm not sure about that. I'm not sure that all of these 190 did not result in reactor scrams. Excuse me. I'm not sure that all the 148 did not result in reactor scrams.

MR. MOELLER: Do we have that data as to how many of those 148, even though the PORV opened they still scrammed?

MR. KEATEN: I don't think we have it here, unless you have it, Ed.

MR. KANE: Ed Kane of B&W.

The data there, all 148 of those are actual reactor trips. In those occurrences they were all trips. The reactor did trip.

MR. MATHIS: In that connection do you consider it a good tradeoff to scram the reactor versus opening the PORV?

MR. KERR: Before he answers the question, let me make sure I understood his answer to the earlier one.

You said -- I'm sorry. Did you say that of the 148 PORV actuations, each also resulted in a reactor trip?

MR. KANE: Yes. Those trips that were referred to were high pressure trips, so the PORV was left open during those trips.

MR. KERR: I'm misunderstanding.

MR. MOELLER: Yes. I am confused.

MR. KERR: I thought the earlier setting of the PORV was a setting which was designed to permit one to get a turbine trip without a reactor trip, and that that's the reason the PORV actuated.

MR. KANE: Before the PORV that was there did not eliminate all the trips.

MR. KERR: I thought you just told me that of the 148 actuations, which I assume counts all the actuations, every one resulted in a reactor trip?

MR. KANE: The 148 reactor trips, the 148 actuations here, come from data wherein the pressure got up to the reactor trip set point, therefore the PORV would have actuated.

MR. MOELLER: Where are the data --

MR. KANE: That number does not include events -- as we said in the report, it does not include events where the turbine ran back and the PORV may have actuated. It's a conservative analysis in general.

I see we're getting lost somewhere in here and I'm not quite sure where the confusion lies.

MR. NOVAK: One thing I might add that might help, I don't think you have data every time the PORV actuates. You have it by inference: If I had a reactor trip, in the old way of saying things, then I assumed that the PORV moved.

I think what you are looking for, Dr. Kerr, is data that might be tracked only by going through a lot of traces of pressure to see if there were blips, which might then have been assumed to be --

MR. KERR: At this point I'm not quite sure what I'm looking for, because I had understood from some sort of lore that is in the field that the B&W design which had the PORV actuate without a reactor trip was a design which permitted one to get a turbine trip without necessarily getting a reactor trip. Now you tell me that when that occurred nobody keeps up with it. I guess it's just normal. You only kept up with the PORV openings that also resulted in reactor trips, and these are the ones that I see referred to here?

MR. KANE: Let me clarify it. The PORV prior to 1979 would open during, for example, a turbine trip where the plant successfully ran back. It may also open during loss of two main feedwater pumps, okay? In that case, regardless of whether the PORV opened, the plant would have tripped on loss of main feedwater.

Subsequent to that they were putting in place anticipatory trips on loss of main feedwater. It would probably also have opened during loss of a single main feedwater pump. In that case, the reactor would have stayed on line.

We did not for this analysis attempt, nor do we have all the data, to say all the PORV openings. We do have data that said, on 148 reactor trips the pressure was such that the PORV opened. By only using that data, the results that we generate are conservative. So we just attempted to provide conservative results for the analysis.

MR. KERR: I don't know what conservative and non-conservative results are. If you're trying to find out how often a PORV opened, it seems to me if you have inaccurate results they are inaccurate results.

MR. KANE: Let me give you an example. If you have say five failures of the PORV and you only count 148 events, the reliability of the PORV is much lower than if you try to go back and count the --

MR. KERR: But, you see, I don't want conservative results; I want accurate results, because conservative results are wrong. And that is one of the problems we have had in this business for a long time. We use the term "conservatism," to cover ignorance, and I think we ought to stop.

MR. KANE: Well, the requirement was to justify, I believe, not a significant contributor to 10^{-3} and the analysis was done and demonstrated that. Therefore we didn't feel that it was appropriate that we should try and justify every opening and then perhaps begin to haggle about whether it was an opening here or not, when it really didn't matter in the final analysis.

MR. ZUDANS: But it matters in this percentage, is that correct, 1.6 percent?

MR. KANE: For the purposes of this report.

MR. ZUDANS: In terms of reliability, it's a conservative result, because you simply put a smaller number--

MR. KERR: You see, the problem is, I don't know whether it's conservative or not because I don't know what the data are going to be used for. That's the problem with talking about conservatisms.

MR. ZUDANS: But read this last statement. They say "Result, 1.6 percent PORV opening on overpressure transients," but not all transients are equivalent, so there are a lot more.

MR. CATTON: But Bill is asking how many scrams do you have.

MR. KERR: I'm probably diverting things too much, but what I'm trying to find out is whether we're substituting scrams for PORV openings. I gather we're --.

MR. KEATEN: Well, let me address that.

MR. MOELLER: Give Mr. Keaten the floor.

MR. KEATEN: As you will see on the next slide, although as Mr. Kane said B&W didn't have enough information to really closely tie down the number of PORV actuations, they did make a total number of the PORV actuations, which this is not, and that estimate was 150 or more.

MR. MOELLER: So you are saying roughly 60 percent.

MR. KEATEN: In 60 percent of the cases where the PORV opened, there was also a reactor trip, if that 250 is an accurate number.

MR. LIPINSKI: Mr. Chairman?

MR. MOELLER: Mr. Lipinski.

MR. LIPINSKI: I was going to try and tie down your analytic estimate -- your operating experience estimate. How many reactor years does it take to get these 190 actuations, so I can do the division and translate 1.6 percent to reactor years?

MR. KEATEN: The number 45 sticks in my mind, but I'm not sure that's right.

MR. LIPINSKI: Because you say that the two methods give you significantly different answers, but they're not cast in the same units, so I can't compare them.

MR. KEATEN: Right. Right. But that was based upon this, so if you take 45 as being roughly right.

MR. KANE: That's correct.

MR. KERR: Does the new system result in more scrams?

MR. KEATEN: Very definitely.

MR. KERR: A significantly larger number?

MR. KEATEN: As we said, the estimate we have here is maybe in 40 percent of the overpressure transients the reactor would not scram with the old set point and it would scram --

MR. KERR: Is your view that the system is thereby less risky because one is now scramming rather than opening the PORV?

MR. KEATEN: We are in fact going to address that to some degree in our presentation later today, when we talk about the pros and cons. But let me just say that it certainly does reduce the number of times that the PORV is called upon to act and it does increase the number of times that the high pressure trip set point is called upon to act.

MR. KERR: I understand that, and what I'm looking for -- and you're going to give me that -- is your conclusion about the resultant risk reduction or increase.

MR. KEATEN: We have not at this time done a quantitative risk evaluation that would give you a cleancut answer to that question.

MR. KERR: Has anybody, do you know?

MR. KEATEN: I have not seen it.

MR. ZUDANS: Maybe a related question. The anticipated number of scrams will increase with these new settings. Will that still be less than the design number of scrams for the particular number of reactor vessel, or say other components? I am now talking about structural aspects.

MR. KEATEN: I believe the answer is yes, but I'm not prepared to defend that answer. I believe that has been considered in analysis. I just don't have that information here with me.

MR. ZUDANS: B&W just said there were 250 total openings?.

MR. KEATEN: That was an estimate.

MR. ZUDANS: For all B&W plants? Does a record exist on pressure-temperature on the tailpipe beyond the PORV?

MR. KEATEN: I suspect that's probably very plant specific and transient specific.

MR. ZUDANS: I'm talking about the record. If the record exists, it does not relate to transientse.

MR. KEATEN: I'll have to say I don't know.

MR. ZUDANS: That would be an obvious way to pick all those openings, because every time the temperature went up you would have to open.

MR. CLARK: We do not have that data for TMI-1, according to our operating people here. We do not have strip charts or any recorded temperatures or tailpipe temperature downstream.

MR. ZUDANS: You do not?

MR. CLARK: Correct.

MR. ZUDANS: It's just a continuous indication, but no recording?

MR. KEATEN: Actually, the normal readout of the tailpipe temperatures is via the computer.

MR. ZUDANS: If you have it in the computer, do you store it on magnetic tapes or something you can play back and count those peaks?

MR. KEATEN: No, sir, not on the computer system as it existed at TMI-1. There were only a limited number of data points for which historical storage of data was maintained.

MR. KERR: Maybe if you asked the computer it would tell you.

MR. ZUDANS: But you have to ask.

(Laughter.)

MR. ZUDANS: So that actually means there is no way to say whether 250 is a reasonable or an unreasonable number.

MR. CATTON: POEV is a valve designed for steam flow, gee, I think 20 or 30 years ago. Have you given any consideration to just designing the valve right and replacing it and avoiding all of these problems that we are discussing? I think it would be cheaper in the long run.

MR. KEATEN: I guess I'm a little bit unclear of what you mean, Dr. Catton, when you say designing it right.

MR. CATTON: It was designed for steam valves only. It's been in the catalogues for years, and now it's called upon to flow both steam and water, and the result is it's continuously getting into difficulties, and you can count the number that stuck open.

If you design a valve for two-phase flow at time zero, you avoid all the difficulty. And what I'm asking is, have you given any thought to putting in a valve that's designed for the job rather than designed for steam alone?

MR. KEATEN: Dr. Catton, I believe I'd like to have some help here from our valve people.

MR. CATTON: Maybe it wasn't designed for that flow of steam. If you design a valve to open and close, the valve should open and close. If it's not doing that, then it should be redesigned.

MR. CLARK: We believe the EPRI valve program is looking at that question.

MR. CATTON: They are not. They're looking at flows through those valves and that still is begging the issue of why doesn't somebody just design a valve right.

MR. CLARK: I will check my source.

MR. ZUDANS: The EPRI program just takes the valve as it exists.

MR. CATTON: It has nothing to do with the redesign of the valve.

MR. MOELLER: Go ahead, Mr. Keaten.

MR. KEATEN: I wanted to see if some of the people--

MR. CATTON: The answer is he's answered my question.

MR. KEATEN: I think a general answer, Dr. Catton, is there's no way we're going to design a valve or anything else that is 100 percent right.

MR. CATTON: There's no doubt about that. But there's a lot of technology around that points to how you design a valve correctly and there are people in the business that want to design that valve. Yet I see here a tremendous program including instrumentation, fancy sonic devices, accelerometers being attached to pipes. It seems to me that what you're doing is you're building yourself one huge headache, where a proper valve would eliminate all that.

I have no more comment on that.

MR. MOELLER: Mr. Keaten was saying you have some valve people here. Do they want to comment on that?

MR. CLARK: While they compare notes there, I think it would be our belief that regardless of the reliability of the valve we got that we would still want a reliable valve position indicator, and that --

MR. CATTON: I didn't say anything about the valve indicator. I'm afraid of the accelerometers.

MR. CLARK: That's what the accelerometers or the temperature detectors or the delta Ps are, an attempt to know the position of the valve.

MR. CATTON: There are positive ways to detect valve closure rather than using an accelerometer on a pipe. Having a shaking a pipe tell me it's open seems to me a rather weak way to determine whether it's open or not.

MR. KERR: My concern has to do with I have very real doubts that you decrease risk by substituting scrams for opening PORV valves, because I think a scrammed reactor is in a situation which one would like to avoid.

MR. MOELLER: Has the staff examined this, and do you have any information or numbers on it?

MR. NOVAK: This issue has been discussed. Specifically, for example, on the Midland plant I know that we have stated that we would review a design modification that Midland was proposing which would provide a system which would provide sort of single failure-proof advantages to the closing. You would have a double block valve, for example, but then go back to the original pre-TMI set points.

We have said that this design modification would be reviewed by the staff. So we are not locked to these set points as the only solution. If a proposed design that provided us the assurance that the PORV would have the kind of reliability that one would want and that it would close with a degree every time it is challenged, then I don't see why the staff would be locked into saying, no, you can't let it open, you must trip the reactor.

We recognize the risks involved with unnecessary reactor trips, in a sense. There are many times during the startup of a plant where you may in effect bump against the high pressure set point just due to small transients. This causes you to bring the plant down, come back up again, and certainly the opportunity for other kinds of transients developing.

So I do think we are open to this issue, but I have not seen a concerted effort by the B&W Owner's Group to come back and say, given we make these criteria as criteria we would design to in terms of valve reliability both opening and closing, most assuredly --

MR. KERR: The staff has made a judgment that one decreases risk by cutting down on the number of PORV openings, even with existing design, and increasing the number of trips. And I would wonder if there really exists or if one can demonstrate that that decision has decreased risk. I haven't seen any evidence it does.

I realize that motivation, because one had a serious accident where a PORV failed to close. But it's not clear to me that anybody has demonstrated that the fix has really decreased the risk.

MR. NOVAK: I'm not arguing that question. I think, as you say, at the time of the accident there was a judgment that continued operation of these plants could be supported if we could reduce the challenge to the PORV. Obviously agrees that that accomplishes that. The question is on balance are you operating the plant more safely under this mode or under the previous mode, in terms of reactor trips and so forth.

MR. MOELLER: Could you refresh me as to what the main deficiencies or problems are in using the PORV block valve, you know, with an automatic closing after a certain le gth of time? What are the pitfalls there? I mean, I gather -- isn't this what the Germans do?

MR. NOVAK: The one point that we have held onto is that with the use of the PORV, it is the only opening in the reactor coolant system. So if you want to accomplish the depressurization through the PORV line, you can open. And automatically closing the block valve, there is a certain chance that you may have isolated that line and in fact it wouldn't open. So I think that there is that residual concern that we're looking at to maintain that flexibility.

MR. CATTON: I would like to make a comment with respect to interest in valves. The Fluid Dynamics Subcommittee met in San Jose and we invited in a group who manufactured valves to talk about the kinds of valves that might answer some of these questions. It was extremely interesting. Everybody left, including the staff, and the Subcommittee listened to the valve manufacturers? So the interest was very low on the part of the vendor, the utility, and the staff. It goes a little bit further than you said.

MR. ZUDANS: I think that is correct.

MR. CATTON: You were at that meeting.

MR. ZUDANS: Yes, I was. I saw what you said.

I am just wondering whether anybody ever did a total picture of seeing what happens to the risk by shifting, reducing challenges to PORV and reducing scrams. The question was raised many, many times in many meetings, and I thought by now staff would have a very strong answer.

I understood it was acceptable because the increased number of scrams was still below the design number. That's why I asked this question before. That means the plant will survive. Whether it's 200, 300, it was designed for 400, so it'll be all right. If that's the answer, it's probably acceptable.

MR. CATTON: Are you thinking survive structurally?

MR. ZUDANS: That's what I'm referring to.

MR. CATTON: I believe Dr. Kerr is referring to other aspects.

MR. ZUDANS: Well, you need structures to keep that demon in there.

MR. CATTON: That's only part of it.

MR. MOELLER: Let's go back to Mr. Keaten and see where it leads us.

MR. KEATEN: In response to the question whether it really reduces risk or not, we have had some discussions. They have been qualitative discussions within GPU, and I have to tell you honestly that we've had people on both sides of the argument. I think the conclusion we drew, that that kind of qualitative discussion was unlikely to give us a clear evaluation of it, that we would have to have a more quantitative evaluation, and we have not done that.

Our conclusions from this part of the study was that with the criteria that were set up in NUREG-0737 was, while these two methods of analysis gave somewhat different, in fact somewhat more different results than we might have expected, that we met the criteria.

Coming back to the point of whether 1.6 percent is a good number, if you use 250 as being a better estimate of the total number of actuations then the number would be a little less than one percent, still well below, though.

MR. LIPINSKI: Before you take it off, there's a factor of 100 difference between your so-called analytic and operating experience?

MR. KEATEN: I think that's right.

MR. LIPINSKI: Offhand I don't know whether your analytical estimate is a good one, because we haven't discussed in detail how you formulated that to come out with this answer.

MR. KEATEN: I understand that. I'm coming back to this point in a minute.

MR. LIPINSKI: I'm glad, because the conclusion would be the analytical estimate is not a good one.

MR. KEATEN: We have a presentation exactly along these lines.

(Slide.)

But first, before I address that, let me switch to the II.K.3.2. question, which was in this case the probability of getting a small break LOCA and the probability of getting specifically an opening of the PORV, and whether this was a major impact on the total probability of small break LOCA's. So the work that was done here -- and again, this was generic work that was done for the B&W Owner's Group -- was to look at the probability that the PORV would open, and then look at the probability that it would stick open if it did open, and that gives the net probability of it oening and staying open.

As far as the probability that it would open initially, B&W looked at five opening transients: the overpressure transient was really one from the previous slide; then a transient in which there was a delay in the initiation of emergency feedwater so the pressure went up; a deliberate operator action to open the PORV -- as was mentioned by Mr. Novak, this is a step in some of the emergency procedures -- then we looked at instrumentation control faults that might open the valve; and finally, an overcooling event in which the system -- in which the pressure would drop and the block valve on the PORV would be closed in accordance with existing procedure, and then the system would repressurize as the HPI refilled the inventory, and the operator delayed for one reason or another his -- excuse me.

Not with the block valve closed. In this case, the operator delayed HPI so it went back to an overpressure case, and then opened the PORV.

As a result of those five things, as you can see on the slide, it gave an estimated probability of the PORV opening due to any cause of about 2 times 10^{-2} per reactor year. Then looking at the existing failures in PORV's on B&W plants -- and here's what I mentioned earlier -- the total openings, that is an estimate and it's probably conservative. The total may be larger than that.

The net failure was about 2 times 10^{-2} per demand, so that gives us a little less than 5 times 10^{-4} per reactor year as the probability of getting a small break LOCA as the result of an open PORV.

MR. LIPINSKI: If we go back to the five initiators, since we were a factor of 100 off on the previous page, are we a factor of 100 off on this 2 times 10^{-3} result?

MR. KEATEN: The previous one was a very small fraction of the total.

MR. LIPINSKI: I'm questioning your analytical capabilities of arriving at this number of 2 times 10^{-2}. I don't know what you're doing in the risk analysis. I'm only asking, do they as well carry a 100 factor error?

MR. KEATEN: In the first place, I don't think we're convinced right now that necessarily the difference between the two estimates is associated with the analytical. So I would not concur that we can conclude right now that the analytical estimate is wrong by a factor of 100.

One of the things that we have asked B&W to do and that they're presently working on is to try and understand the reason for those differences and see if we can reconcile them.

MR. LIPINSKI: Could you comment on what is done with the other four that are in this list? Transient with emergency feedwater, is that again a Monte Carlo simulation? Somewhere operator action is not analytical. You have to assume a number for that.

MR. KEATEN: No, in the case of operator action, basically what was done was to look at the types of events in which the procedures called for operator action to open the PORV and then estimate the frequency of those events occurring. For example, one of those is the steam generator tube rupture.

MR. KERR: Do I interpret this correctly to say about once every 50 years a plant will have a PORV opening, according to this estimate?

MR. KEATEN: Yes.

MR. MOELLER: Meaning it will fail to close?

MR. KERR: Open.

MR. LIPINSKI: Once in a plant lifetime.

MR. KERR: Would your experience make you feel good about that number?

MR. KEATEN: This is with the new set points and so forth, not with the old set points.

MR. KERR: Somebody has experience with the new set points, don't they? That would mean that with four or five reactors in operation, one shouldn't have had very many PORV openings. Have we had almost zero openings since then?

MR. NOVAK: The Crystal River 3 event was an event where the PORV opened. It was due to an electrical failure, but you have the revised set points, but there was one operating plant.

MR. KERR: That's the only one as far as you know?

MR. NOVAK: That's the only one I recall at this time, yes.

MR. KEATEN: Let me just jump ahead to my next slide, which really addresses that question, because the response we had from the NRC staff on this initial report raised in fact some of the same kinds of questions that are being raised here.

(Slide.)

With the case of the PORV opening probability due specifically to an overpressure transient, the staff commented, as was mentioned this morning, that they concurred with the general approach that was used, the Monte Carlo technique. But they felt like the report had submitted insufficient information for them to be able to concur with the actual numbers that were used.

So the request from the staff asked us to submit to them additional information which would support the specific numerical values that were used, and this is what I was referring to in answer to Mr. Lipinski's question, that we were pulling together additional information there in order to support those numbers. In the case of the safety effects of PORV isolation, they asked us to consider four additional items, some of which are new or expanded and some of which go to the accuracy of the original estimate.

The first one was what would be the probability of arriving at a small break LOCA due to a stuck-open safety valve which resulted as a result of the sequence that started with the plant operating in the mode where the PORV had a small amount of leakage through it and the PORV block valve was closed at the beginning of the transient due to the leaky PORV.

The staff in its response pointed out the usefulness of this information; it would be useful in determining how acceptable it would be to operate the plant with the PORV block valves closed, as presently allowed by the tech specs at the plant. That is work that had not been done in response to the original requirements, which we have now initiated.

The second one and the third one are cases where the staff raised questions of whether their estimates that I showed you on the previous slide were accurate; did they include the probability of a sticking open a safety valve resulting from a depressurization event? And this is what I was really referring to earlier, where the transient here is where there's a depressurization event and the operator closes the PORV block valve, and then as high pressure injection repressurizes the system, the pressure in the event of inadequate operator action, the pressure overshoots and opens a safety valve rather than the PORV since the block valve is closed.

Finally, the third one here, the staff questioned whether we had adequately included ICS failures in the failure rate. And then finally, the original requirement was to generate a failure rate for safety valves based on operating experience.

As was shown on the previous slide, there have been three pressurizer safety valves which have opened and none of them have stuck open. B&W in the initial report did not attempt to estimate a failure rate based on that, because of the very small number of data points.

MR. KERR: What acceptable probability does the Staff have for these events?

MR. KEATEN: Of sticking open a safety valve?

MR. KERR: Yes.

MR. KEATEN: I don't remember that I've seen a number for what was acceptable. Maybe the Staff could address that.

MR. CHOW: This is Ed. Chow.

Acceptance criteria for a stuck-open safety valve would be the same as a stuck-open PORV. That would be 10^{-3}.

MR. ETHERINGTON: That would be less acceptable because the flow would be much greater, wouldn't it? And you can't block it.

MR. CHOW: The flow rate would be greater through the safety valve.

MR. KERR: Where does one find a description of how the staff arrived at these numbers? Could you refer me to a report?

MR. CHOW: It goes back to the WASH-1400, to the small-break LOCA.

MR. KERR: I don't think the WASH-1400 gives numbers that are acceptable to the staff, does it?

MR. CHOW: No, but we feel like this is a good number that can be reasonably achieved.

MR. KERR: So an acceptable number is whatever can be achieved reasonably?

MR. NOVAK: This is Tom Novak again.

My recollection is that the staff has been looking at the reliability of either the PORV or the safety valve and has tried to show, with the judgment that we can be assured that it is not a significant contributor to a small break LOCA, in other words it is not the dominant reason why a reactor coolant system would leak comparable to what you would get out of a valve leak, then that is the basis for, for example, letting the plants operate without requiring the PORV to be blocked.

And the recollection in my mind is that we have been able to conclude that the likelihood of a small break LOCA resulting from either a PORV hanging open with failure to isolate with the block valve and/or with the safety valve staying open is less than 10^{-3} per reactor year. I believe the probability of the small break LOCA is on that magnitude.

So I think the logic, the judgment that I recall is that when you look at the whole reactor coolant system if you can reach the conclusion that the valves that are installed are not the dominant contributor to a small break LOCA and the other contributors are poor quality of weld or something that would lead to a small break LOCA, then that's an acceptable basis for licensing.

MR. KERR: Thank you.

MR. ZUDANS: Mr. Chairman.

MR. MOELLER: Yes, Mr. Zudans.

MR. ZUDANS: I would like to go to your numbers in the previous slide, if I could.

(Slide.)

MR. ZUDANS: The estimated PORV opening probability is kind of small, and all the reasoning that you go from that point on to the end indicates that you really don't need PORV's. Why don't you suggest removing them?

MR. KEATEN: Well, there are certain cases where, I grant for low probability events, where it is very convenient to have a PORV.

MR. ZUDANS: You don't plan to use it except in 50 years or so, or 40 years.

MR. KEATEN: Well, there are quite a few safety systems I don't expect to use very often, but I might want nevertheless to have them.

MR. ZUDANS: The other number that you give, PORV small break LOCA probability is 4.7×10^{-4} and total small break LOCA probability is 1×10^{-3}, and it to me looks like PORV contributes half of the total. You said it was insignificant. If those numbers are acceptable numbers, or I don't know how it is calculated.

MR. NOVAK: "Insignificant" is a strong term.

MR. ZUDANS: It's very significant. It's half of the total.

MR. NOVAK: I agree with you. I didn't mean to suggest that our criteria was that the valve PORV had to be insignificant. And I really haven't studied the Licensee's numbers in this case.

I was trying to recall the logic of the basis for how we treat safety valves and PORV's, in answer to Dr. Kerr's question.

MR. ZUDANS: You said 10^{-3} probability of failure would be acceptable.

MR. NOVAK: Well, that is actually a fairly high number for a small break. But let's say that's one side of the range of where one might suggest you would have a small break LOCA.

MR. ZUDANS: I would like to comment to the 10^{-3}. Is this 10^{-3} accepted or looked upon as a useful number just because it is the only number in town, so to speak?.

MR. NOVAK: Well, no. I think this is an education process.

MR. ZUDANS: Or is there more of an education process behind it?

MR. NOVAK: I think this whole idea of risk assessment, we are growing and we are becoming, I think, certainly more educated. What we are trying to do is look at these kinds of events, other events, probabilities of them, and make decisions as to whether specific requirements need to be placed on the Licensee to accomplish certain things to reduce a certain scenario.

What we are trying to do when we make these decisions is determine if there is a basis that the given event, with its probability and those systems that are designed to mitigate it, permit one to look at the system as it is presently designed and see if it's acceptable for operation.

I recall looking recently at the Commission's decision on station blackout, where a board was discussing probabilities of 10^{-6} that we have used for certain siting considerations and showing that at the particular Florida site the probability of a station blackout, that being loss of both offsite and onsite AC power, was probably greater than that, and some modifications to the plant were indeed suggested.

I think what I'm getting at, we are trying to look at a number of these scenarios, look at what our best estimates are for the probabilities, and reach decisions on whether plant modifications are necessary or not. I don't think the relief valve, PORV safety valve should be considered a closed issue. I think the discussions this morning of the reactor trip is a basis to say leave it open.

There are a number of tests being run at EPRI, which I think are showing certain design characteristics of safety, relief and block valves. I think we will have a better basis for making judgments as to any changes to plant configurations when these kind of tests are concluded and studies can be performed.

MR. ZUDANS: I guess you are right that the tests at EPRI will give you a better basis to judge existing hardware. But they are not going to improve the hardware.

MR. ETHERINGTON: If the probabilities are as low as indicated, it seems to me you would be much better off with a regular safety valve than a PORV, wouldn't it? You've got quite a reliability.

MR. NOVAK: Yes, Dr. Etherington. The PORV historically has been a designer's option. There are plants operating today that do not have power operated relief valves. We are no' supporters of PORV's. Neither are we saying you must take them out.

We have historically said that as part of the inbuilt flexibility of the plant and as long as it represents a small contributor to risk it can be an acceptable part of the design.

MR. ETHERINGTON: I think it has a definite safety value in that you have a block valve behind it, but there doesn't have to be a PORV for that purpose. It could be a safety valve.

MR. NOVAK: That's correct.

MR. ETHERINGTON: That protects you against the regular safety valves getting stuck open.

MR. ZUDANS: But what is the reason to assume safety valves will perform better? It's only been challenged three times. By the time they reach 250 challenges, they may have failures just like this one has.

MR. ETHERINGTON: I'm sorry, I wasn't with you on that.

MR. ZUDANS: They were challenged three times, challenged in B&W plants, the safety valves were challenged, and there were no failures. But that is not an indication as to how good those valves were at all.

MR. ETHERINGTON: But if you had a safety valve in line with the block valve, then you wouldn't be challenging this regular safety.

MR. ZUDANS: But see what they have done, they have changed the operating parameters and set points in such a way that the challenge to PORV is so small that they might as well just not be there. I mean, what's the point in having them there?

MR. ETHERINGTON: It still protects the challenge to the safety valves.

MR. CATTON: They're set lower than the safeties.

MR. ZUDANS: Yes. But according to this, they won't be challenged in a number of years.

MR. LIPINSKI: Once per plant lifetime.

MR. ZUDANS: So what do I care?

MR. KERR: Well, we also design automobiles, if you want to talk about that.

(Laughter.)

MR. KEATEN: I think another thing about the PORV is, in addition to being the thing that opens first and being isolable, it is a component for the operator to take certain actions that he could not take if it were a safety valve.

MR. KERR: In response to one of Mr. Zudans' earlier questions, you said yes, but there are other safety systems that you don't use very often and you have them, which could have led me to believe that the PORV is not safety-grade.

MR. KEATEN: No, sir, and I did not mean to imply that. What I meant to imply was that in this case, in certain types of accident scenarios, the operating procedures called for the operators to use the PORV if it is available. There are other things they can do if it is not available. But it becomes for certain scenarios the preferred line of action if it is available.

MR. KERR: Thank you.

MR. ETHERINGTON: As a means of depressurizing, for example?

MR. KEATEN: Yes, sir.

MR. MOELLER: Well, I guess to begin to wrap this up we could ask, what is the bottom line? Tom, am I to understand from your comments that in other words these are matters that are under discussion?

MR. NOVAK: That is correct.

MR. MOELLER: But you do have certain requirements that you are imposing upon TMI-1, do you not? Like I guess on the automatic PORV isolation, you are requiring that, are you?

MR. NOVAK: No, not at this time. What we want to do first is establish whether or not it can be demonstrated that the reliability of the PORV is acceptably high, such that it is not necessary to have an automatic closing features.

MR. MOELLER: So the bottom line here really is on these items, is they are something like the inadequate core cooling. You are expecting the Licensee to conduct investigations and issue reports on these, and you want to see progress.

MR. NOVAK: I think so. As Mr. Clark mentioned earlier, this is one area their priorities suggested they would get to after July 1. And I think as long as it remains such that we can review this issue and make a decision as to whether there is any reason for modification to the plant before restart, that it is acceptable.

MR. KERR: Okay.

MR. KEATEN: I'd like to make clear to the Subcommittee that this is not in the area in which we, GPU, feels there is confrontation between us and the staff.

MR. KERR: Sure. Okay.

MR. KEATEN: They have asked for some additional information, and we have now indicated on this slide that we are intending to try to supply that information to them by about the 1st of September, and it should hopefully give them time to evaluate this and to give us time for additional dialogue if necessary.

MR. MOELLER: Very good.

MR. LIPINSKI: Mr. Chairman, I have one question.
Given post-TMI experience with the new set points, how many PORV openings have there been in how many reactor years?

MR. KEATEN: I'm sorry, I don't know.

MR. LIPINSKI: Because if you do have that number, that is the --

MR. MOELLER: I thought that's what we didn't have.

MR. KERR: Mr. Novak said he knew of one.

MR. MOELLER: Yes.

MR. LIPINSKI: Because this goes with the number that you are using, your 2.3×10^{-2} that is based on analytical work, but again you didn't support that with any numbers based on experience.

MR. KEATEN: On this chart, that is correct. Perhaps if you want to pursue this further, perhaps the appropriate thing would be for us to supply you with a copy of the submittal which we made to the NRC. That went into more detail. This was just intended only as a summary and not a detailed discussion of how all the numbers were arrived at.

MR. LIPINSKI: What is bothering me is I don't have confidence in your analytical work as it compares on the overpressure transient, and I'm a little disturbed by just accepting the 2.3×10^{-2} as being a good number.

MR. KANE: Ed Kane again.

I think there was a little confusion between the analytical and the experimental results. On one of the slides that was up there, there was a combination of overpressure protection, operator error, steam generator tube rupture. There were five different results that really ought to be classified in the analytical area. That didn't come across.

When you do that, the numbers are, I believe, 2.3×10^{-2} and 2.1×10^{-2}. So looking at those numbers, the results are very close between the analytical estimates and the previous operating experience.

MR. CLARK: I think if you take the page labeled II.K.2, PORV opening probability, which has the analytical estimate and the estimates from operating experience -- and I believe that that is a misleading comparison, that the analytical estimate is for overpressure transients only and the operating experience is from all sources, and that that was not made clear by us earlier. And it's obvious you would tend to compare them and you shouldn't. And with that properly understood, then the numbers are not that far off.

MR. LIPINSKI: Well, they are now, because now if I translate your estimate from operating experience that's 3.6 times 10^{-4} per reactor year. It's the 1.6 percent in

45 reactor years. And if I go to the next page I see a number like 2.3 times 10^{-2} and I'm a factor of 100 off in the other direction.

Now, again, if you're estimating a factor of 100 high you're conservative.

MR. KEATEN: Understand, though, that on the third page where you're talking about the PORV opening probability only the first of the five items is all of the items from the previous page.

MR. LIPINSKI: That's what he just corrected. The operating experience is all the events that have gone into opening the valve, and you have adjusted them with the new set points. Now, what events are in that estimate from operating experience?

MR. KEATEN: Well, as Mr. Kane said --

MR. CLARK: May I suggest that perhaps we regroup during lunch between B&W and ourselves and make sure we know exactly how we are using these numbers, and that that would be more fruitful than continuing?

MR. MOELLER: Fine, let's do that.

MR. ZUDANS: I would like o add an additional question. You mentioned that some of the operating procedures require or suggest that PORV's be used.

MR. KEATEN: Not require, just suggest they be used.

MR. ZUDANS: That represents additional challenges to the PORV's.

MR. KEATEN: Yes, sir. That's included in the list.

MR. ZUDANS: That's not what's in the lifetime.

MR. KEATEN: That depends on the probability that it's going to be called upon to be used.

MR. ZUDANS: I wanted those numbers, whether they're included in this number.

MR. KEATEN: Yes, sir, they are. And I'll be glad to provide the consultants copies of the reports.

MR. ZUDANS: If it's that low, my previously strong opinion may be, not very nicely expressed: What the hell do you need it for?

MR. KERR: You need it for when you need it, Zenons.

MR. LIPINSKI: It's there in case you need it.

Mr. Chairman, I think it would be beneficial to see this report, to see the backup numbers.

MR. MOELLER: Right, I agree.

Thank you, Mr. Keaten. Does anyone have any further comments prior to going to lunch?

(No response.)

MR. MOELLER: We will resume at 2:00 o'clock.

(Whereupon, at 1:00 p.m., the hearing was recessed, to reconvene at 2:00 p.m. the same day.)

AFTERNOON SESSION

(2:00 p.m.)

MR. MOELLER: The meeting will come to order. This is a resumption of the meeting of the Subcommittee on the Three Mile Island Unit 1. We will pick up with the agenda item II.K.3.17, which is the ECCS system averages.

I might mention at this point that we will be continuing hopefully along through the agenda this afternoon in the sequence in which it is laid out. As shown on the agenda, at 4:00 o'clock we had intended to have a discussion of the report prepared by the majority staff of the Committee on Interior and Insular Affairs of the U.S. House of Representatives pertaining to the accident at Three Mile Island Unit 2. We still intend to have that, but it could slip to perhaps even 4:30 or 5:00.

If it does slip as late as 5:00 and if it takes an hour or so, my intention would be to recess this evening around about 6:00 o'clock, because we are going to have to meet in the morning to finish up the other items and I would rather meet fresh in the morning than to drive too hard this evening.

So let's pick up the next item, which is ECCS system outages. Harley, you said you had already -- sometimes I'm slow. You have already made your speech.

Well, Mr. Clark, what do you have? What does the

Licensee have to report on this topic?

MR. CLARK: Mr. Ross will address that subject for us. He's the manager of plant operations at TMI-1.

MR. MOELLER: Fine. Mr. Ross?

MR. ROSS: I guess our presentation would just simply consist of the status of where we think we are in reference to the staff's item. Basically, Met Ed has submitted a letter to the NRC of April 9 proposing how to close out this ECCS outage item. Our proposal would consist of a review of LER's giving dates, causes, system component, corrective action. It would also use average outage times.

We would target our submittal for July 30th, 1981. We don't think this will be a problem with the staff. That is the status of where we are.

MR. MOELLER: Again, how many utilities are being asked to submit this type of a report?

MR. DILANNI: My name is Dominic Diani.

This is being requested of all the utility companies.

MR. MOELLER: So the report, when you receive the report from the Licensee of TMI-1, you will probably receive it simultaneously from the others?

MR. DILANNI: That is correct.

MR. MOELLER: Is this item then mainly a report on this or what in addition will be involved?

MR. DILANNI: It will be nothing more than a report of their outages.

MR. MOELLER: And what are the -- I might ask Mr. Ross. What are the main reasons you lose the ECCS?

MR. ROSS: There is required maintenance that we do do on the ECCS system. They are minimal in nature. We do require surveillance on the ECCS system. And on occasions we do have failures. In most cases they are reported on the LER system.

MR. MOELLER: You're hinting that the LER's may not turn up all the outages. Are there occasions when they are not reported?

MR. ROSS: Surveillance outage or planned maintenance outages would not be reported under the LER system, no, sir.

MR. MOELLER: Well, back again. Maybe you started to answer my question and I didn't hear it. What will the staff do with this report.

(Staff conferring.)

MR. NOVAK: This is Novak again. The intention of this report is to obtain a more quantitative data base, to suggest if there is any need for changes in the technical specifications regarding ECCS systems. At this time we cannot say specifically what actions might come. It is an area that we think is worthy of review at this time and we plan on looking at the data.

We will develop a position, and there there may be some plants that for some reason or another have a chronic situation of a number of outages perhaps there a technical specification which places an additional requirement on them that would suggest that the integrated time they're out should not exceed some given value. It is an attempt to put the system in a more ready position, although we have no specific information right now that would say any one particular licensee has a problem. We have seen things, as the Committee has, over a variety of years of particular kinds of problems, and there is a tendency to go back and make certain changes and see if in fact that does solve the problem or not, and take a look at it overall.

MR. MOELLER: Okay, thank you.

Any questions then on this?

(No response.)

MR. MOELLER: There being none, let me ask about whether it is possible to insert this item at this point. One of the three items I mentioned this morning was health physics appraisal, and I know that the Licensee's person I believe will be here in the morning on that. But I understand the staff's person is only here this afternoon. Is that person here now?

MR. SILVER: Yes, he is.

MR. MOELLER: Could we have a report on the health physics appraisal system or the health physics appraisal which was conducted?

MR. SILVER: This report will be made by Don Haverkamp, who is the senior resident inspector at TMI-1.

MR. MOELLER: Thank you.

MR. HAVERKAMP: My name is Don Haverkamp.

MR. MOELLER: How do you spell that?

MR. HAVERKAMP: H-a-v-e-r-k-a-m-p.

MR. MOELLER: Thank you.

MR. HAVERKAMP: I was given rather late notice of the request for this information. In fact, it was about 3:00 p.m. yesterday afternoon.

I would like to first say that I was not a member of the team that did the inspection. In fact, the team leader is no longer employed by the NRC.

Since the evaluation, which was last year in July and August, there were a series of letters from the Licensee and in each of those corrective actions were reviewed and they were found to be acceptable. There were 27 items that were identified that require resolution before restart, and all but nine were closed out during that inspection, which was in March.

MR. MOELLER: This was a follow-up inspection, then, this March, and all but nine of the 27 were deemed corrected?

MR. HAVERKAMP: That's correct.

MR. MOELLER: Are they developing a written ALARA program, the Licensee, do you know?

MR. HAVERKAMP: I would say yes, yes.

MR. MOELLER: We can find out more about that tomorrow.

MR. HAVERKAMP: Yes, sir.

MR. MOELLER: Do you know -- well, we'll just talk to them about what new people they brought on and what changes in organization they had.

You're saying the items here are in supplement 1, appendix B, the various items that the health physics appraisal found needed attention?

MR. HAVERKAMP: These items that are described in supplement 1 and the more recent supplement, the reviews that our staff did of the responses are discussed in supplement 2. In that supplement we stated that the corrective actions were adequate. So we have reached resolution.

Some of the items had not yet been corrected when the inspection was performed. Some of the items were reported corrected by the Licensee, but due to time constraints were not inspected.

MR. MOELLER: Okay. Does anybody else have any questions on this item?

(No response.)

MR. CLARK: Since the NRC person will not be here tomorrow, I would like to be sure that our understanding is correct that what we have proposed to do is considered responsive and adequate and the remaining questions are to see if in fact we do it. Is that a fair way to characterize it?

MR. HAVERKAMP: From our review, that is correct.

I understand that at the hearing each of these findings was discussed, or a few of the items were discussed where we had not yet reached resolution or it appeared to members of the hearing board we had not reached resolution, but in fact we were satisfied with the progress.

MR. MOELLER: Mr. Clark, tomorrow I would like to have your representative give us a rundown of some of the specific steps you have taken in the way of personnel and in the way of written procedures, whatever you have done to meet and correct the 26 items. Not one by one, but in an overview sense, five or ten minutes.

MR. CLARK: Certainly.

MR. MOELLER: Let's move on then to the next item on our list under section III, and that's III.D.3.4, which is control room habitability. Mr. Clark? Let's see, I guess I could be looking at -- you said Mr. Moore will cover that?

MR. CLARK: Yes, Mr. Moore will cover that. He is manager of mechanical components in our technical sections group.

(Slide.)

MR. MOORE: The control room habitability question consists basically of three different investigations that we've been performing with respect to TMI-1. The first item here is to evaluate the control room habitability for hazardous chemical release in accordance with Reg Guide 1.78; secondly, to evaluate the accidental release of chlorine. The Reg Guide there is 1.95. And then evaluation of protection for DBA radiation source term, and the resource document there is standard review plan 15.6.5.

MR. CATTON: Where does the chlorine come from?

MR. MOORE: Chlorine -- one onsite source for chlorine is use for the cooling tower water treatment.

MR. CATTON: Thank you.

MR. MOORE: In addition to the onsite sources of gases and possible toxic liquids that could evolve into gaseous form, we are required to evaluate the offsite transportation of chemicals in proximity to the site and also the fixed storage site tanks located in the vicinity of the site.

The approach we've take here is to evaluate the existing system, the capability of the existing control building ventilation system to adequately protect against these three types of hazards. We have completed our evaluation with respect to the accidental chlorine release from onsite. We've also evaluated the existing system against the DBA radiation source term.

MR. MOELLER: How do you do that last one? Do you assume a release in the containment and the containment leaks at a certain rate at certain elevations?

MR. MOORE: What it is, that analysis had been performed for other reasons. Basically what we are doing is evaluating the ability of an existing system to cope with that based on the guidelines contained in the standard review plan, in other words as to the leak-tightness of the system, the pressurization of the control room, all the things required in order to be able to cope with that.

MR. MOELLER: Did you also look at your experience during the TMI-2 accident? I mean, I understood there were problems of control room habitability during the TMI-2 accident. Have you reviewed those in the light of TMI-1's control room?

MR. MOORE: Not at the stage we are at right now. This is another ongoing item, which we're really statusing to tell you where we are at. This has been purely drawing a comparison of these items, what do these documents say we should have versus what are the capabilities of our system.

In the case of the chemical release, we're in the process now of performing some rather detailed analysis of offsite chemical releases. We're obtaining data from Conrail shipments. There are two rail lines close to the site. We have data from Conrail as to the transportation of these gaseous and liquid chemicals past the site.

In order to be expeditious in analyzing these without undue -- without taking too long and getting too complicated about it, we developed some rather conservative criteria and have been able to screen out a rather fair number of these chemicals and been able to determine that they are not a hazard as far as the control room goes.

We are now in the process of continuing the evaluation for those chemicals that we were unable to screen out based on those very conservative screening criteria, and hopefully a good number of those will also disappear.

At this point in time we have identified, based on the work done to date, that there are inadequacies in the existing system to meet these new requirements. Some of the major areas of concern are the lack of capability from -- not to be able to take the single failure, and this is going to be -- involve modifying or replacing dampers in the system.

We lack the capability for detecting and rapidly isolating the control room in the case of chlorine. So this is going to require the installation of some redundant safety-grade alarm systems.

MR. MOELLER: What sort of alarm systems do you have? Since you have chlorine on site, you could put in a chlorine detector and have a system for that. How do you tell what other toxic gases to have a system for?

MR. MOORE: That is the ongoing work that we're working on right now. Basically, we're working in the --

MR. MOELLER: It will be based on what is transported past?

MR. MOORE: Based on whatever we have in the control room. Then we have the toxicity limits and evaluate that, based on site meteorology, and then come up with ppm in the control room, and then we'll know what chemicals we have to address as far as protection alarm isolation.

MR. ETHERINGTON: Where would the detector be? If it's in the control room, the nose is as good a detector as any.

MR. MOORE: Well, we have got -- one of the requirements is to make sure there's an anticipatory stage to this.

MR. ETHERINGTON: That's what I meant. You would have a detector somewhere nearer the source of the chlorine?

MR. MOORE: Right. We have with the TMI-1 configuration, there is a fairly lengthy air intake tunnel. There is a separate -- there's one point of air intake for this area, for the long tunnel. So the detection will occur near the source within the control room. There is a reaction time involved here. In fact, the reg guides do anticipate early reaction.

MR. CATTON: Do you actually calculate how much of the chlorine for a particular leak will get to the intake --

MR. MOORE: Yes.

MR. CATTON: -- where your detector is?

MR. MOORE: Yes, that's the basis of our evaluation.

MR. CATTON: How do you calculate that?

MR. MOORE: It's essentially the same thing that's done for the radioactivity releases offsite, using exactly the same data base and the same analytical models that are used for that type of --

MR. CATTON: But offsite it is further away and all the inaccuracies that are possible tend to get washed out. If you're closer to the source, don't you have to do something else, with the effects of buildings and all this kind of stuff? Or do you care?

MR. MOORE: What we're doing is, most of these chemicals are just going the opposite route of the direction the radioactivity would be going. In other words, the rail line is at the site boundary, so we are tracking it backwards.

MR. CATTON: Oh, okay.

MR. MOORE: It's basically the same models we use for the radioactivity releases.

MR. CATTON: Do you concern yourself with the amount of calm you have at the site?

MR. MOORE: Yes, it's all factored into --

MR. CATTON: No, that's not factored into the normal -- I'm just curious. Do you treat it separately?

MR. MOORE: Maybe I misunderstood your question.

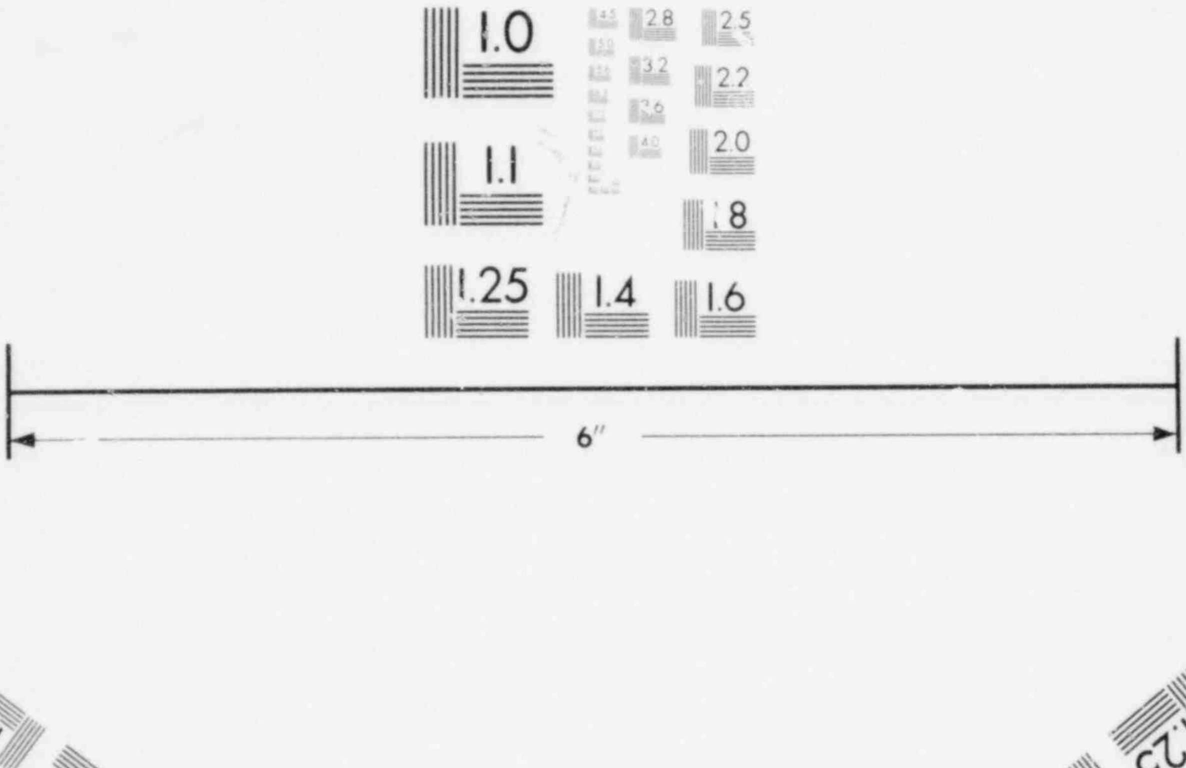
MR. CATTON: NRC usually recommends that you use the Pasquel method for calculating a dispersion. If you have a calm, the Pasquel method is no good. Do you consider calms separately?

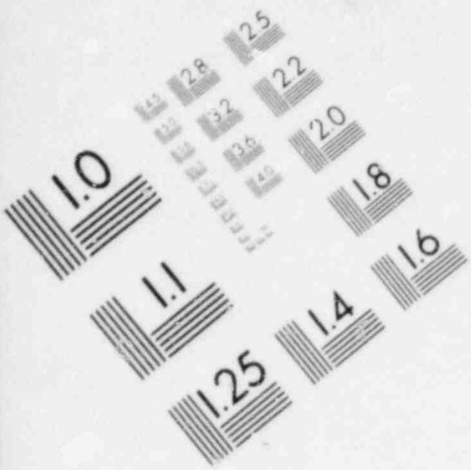
MR. MOORE: We would have to get some of the people who are actually doing the calculations. I can't speak about the details of the methodology we are using.

The bottom line on this, our current schedule calls for implementing modifications by January 1st, 1983. In the meantime, we will be making a response to the NRC staff within the next month, bringing them up to date as to where we are.

MR. KERR: Chloric gas is heavier than air, isn't it?

IMAGE EVALUATION
TEST TARGET (MT-3)





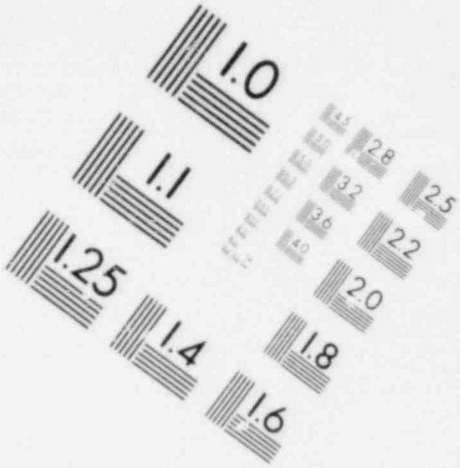
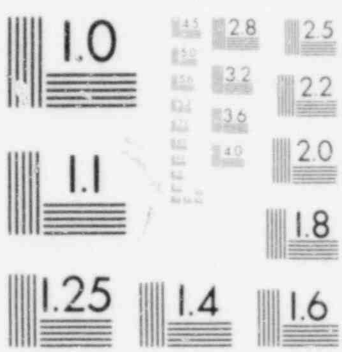
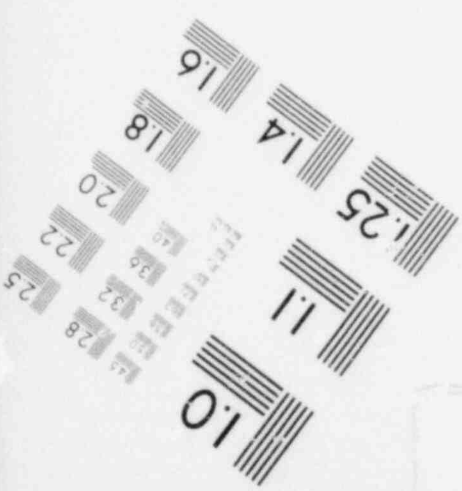


IMAGE EVALUATION
TEST TARGET (MT-3)



6"



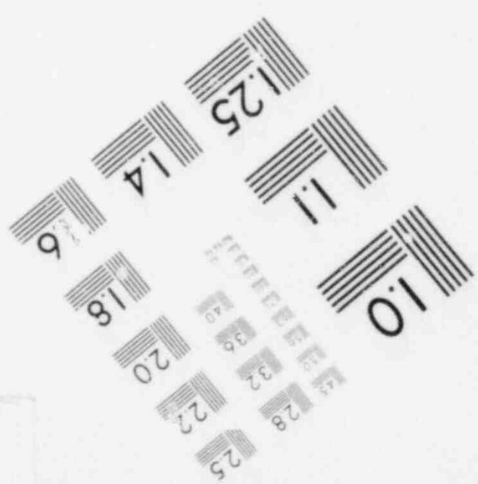


IMAGE EVALUATION TEST TARGET (MT-3)

6″

MR. MOORE: Yes, I believe it is.

That's it, unless somebody has some questions.

MR. MOELLER: Are there questions on this item?

(No response.)

MR. MOELLER: I guess I have already asked how you will know the wide range of chemicals that you may have to have detectors for. You know, that could go on and on. But perhaps there are some guides.

Dr. Keyserling?

MR. KEYSERLING: Are there specific procedures that will be undertaken in the event of different types of releases? And is that included in this habitability plan?

MR. MOORE: Yes. This will involve development of procedures for the control room. It involves the availability of bottled air onsite-offsite to be able to cope with this sort of thing. So that there are a lot of things that may have to be done in response to these reg guides to cope with the problem.

MR. MOELLER: Monroe, in your written comments you raise the question about how many air packs, Scott air packs or whatever, they had. Do you want to pursue that?

MR. KEYSERLING: Well, we could pursue it now.

In the control room design there was a question raised by the human factors review team saying that there were only three Scott air packs located in the control room, but that there might be up to ten persons in the control room at a given time. The response for the recommended procedures to deal with that problem said something to the extent that there really is not a need for the Scott air packs, therefore there would not at this time be more provided.

Now, it's not really clear to me whether that is the right answer or not. If there is a need for any air packs, it seems like there should be enough for everybody to have at least one. If there is not a need, then certainly there does not need to be three air packs around. And it really is not clear to me what the current status is of some of these emergency procedures and the availability of respirators and/or air packs.

MR. MOORE: I personally am not prepared to respond to that. I'm involved on this end in developing the need based on these particular releases, but we may have somebody here that can speak to it.

MR. MOELLER: Well, that would definitely apply to control room habitability. If you're in it you need to breathe.

MR. MOORE: I'm not questioning that.

(Laughter.)

MR. MOELLER: Is there someone who could answer the question.

MR. CLARK: Can you respond, Don?

MR. ROSS: To answer your question, I guess the best way we would respond is: we don't feel air packs are a necessity in the control room. We maintain in the control room air packs for any contingency, including responding from the control room for certain people to a fire.

MR. KEYSERLING: So that would only be for certain individuals who would be leaving the control room to go to some other point, and the air packs are not provided to maintain life or good health within the control room?

MR. ROSS: No. We like to think the control room is already designed for that where we would have bottled air, or a submarine type system where you would have a hookup of air. We don't feel that bottled air is necessary in the control room for any contingency we can think of. We like to keep them on hand as an emergency source. We always keep everything you can.

MR. MOELLER: Do you have a separate tank of air or manifold for multiple users in the control room?

MR. ROSS: We do not have such a device.

MR. MOELLER: On the control room air intake, we've heard a little bit about it. Do you have several intakes and you can switch from one to the other depending on the conditions?

MR. ROSS: The control room is designed such that it receives its air from an intake tunnel, that intake tunnel being approximately 125 feet in length.

MR. MOELLER: Are there several places from which--

MR. ROSS: Should anything happen that would cause us to isolate that source of air, the control room itself has the ability itself to have an internal recirc through radiological filters, and we could bottle it up if need be.

MR. ZUDANS: How long could you stay bottled up?

MR. MOELLER: Yes, how long can you stay bottled up? Let me ask the staff, is this standard procedure to allow control rooms with only one air intake location

MR. SILVER: Let me ask Mr. Rimirez, who was the team leader of the human factors review of the control room and who did in fact examine this question of air packs, to respond.

MR. RIMIREZ: My name is Ray Rimirez. I'm with the NRC.

We looked at the fact that they had three air packs in the control room and they, they GPU, feeling that they would not be needed in the control room ever, that they would use them only going outside of the control room. But we did not look into the number of air intakes that were involved in providing circulation in the control room. We did not look into that.

MR. MOELLER: Well, what is the standard practice? Is it acceptable to have only one air intake, without an option for switching?

MR. SILVER: This is essentially the purpose of this 737 item. The plant at the time of its licensing met the requirements of the NRC. There are other plants with equal or worse control room habitability problems. And again, the intent of this item is to rectify those.

I would point out, of course, this item is at the moment purely a documentation one. That is, the requirement is to submit specified information, including a proposed fix.

MR. MOELLER: So you're still in the process of reaching a position, gathering information?

MR. SILVER: As far as the required fix for any specific plants, that is correct. There is neither a requirement nor a date for installation of fixes at this time, generally. That is, for the 0737 requirement.

MR. LIPINSKI: Mr. Chairman, even though a control room is supposed to be bottled up, there's still a swinging door syndrome.

MR. MOELLER: You have to have some makeup.

MR. LIPINSKI: I'm talking about people coming and going during an accident. You have to have some restriction that says the door cannot be opened.

MR. MOELLER: And even if you bottle it up, you're still going to have to put something fresh in, or you'll create a vacuum.

MR. MOORE: This system handles more than the control room. It's really the control building and not just the control room itself.

MR. MOELLER: Well, I guess the basic -- another basic question I would add is saying you can go to recirculating -- what degree of flexibility do you have? What I mean is, can you go totally on outside air, all the way from that to totally recirculating, with any blend of the two? Do you have that range of flexibility?

MR. ROSS: Yes, sir, we do have that flexibility. We have a temperature control system that will automatically do that for us, to modulate, to control temperature. But we also have the ability of the operator to intercede and do that manually, mix it either full outside air or no outside air on the recirc path.

MR. MOORE: That's our normal operating mode.

MR. MOELLER: If the one air intake senses chlorine, does it automatically close the intake and put it on recirculation?

MR. MOORE: That system doesn't exist today. That is in response to 0737.

MR. MOELLER: So the bottom line is that you are doing evaluations and assessments and you are going to provide that information to the staff, and a decision is somewhere down the road?

MR. MOORE: That is correct.

MR. MOELLER: Well, that is helpful. And I hope in the course of reviewing this you will look at some of the newer control rooms, because certainly in the course of our reviews we have heard of rooms which apparently were pretty well designed and seemed to have the features are are discussing.

MR. LIPINSKI: There's one statement that was made, that this involves the entire control building, not the control room.

MR. MOORE: The system serves the building. The requirements here pertain to the control room.

MR. MOELLER: When you put it on recirculating for the control room, does that really mean recirculating the whole building?

MR. MOORE: Except it's divided into, I believe it is, three floors?

MR. ROSS: If I may again -- Mike Ross -- if you do go to recirc on the control tower, you recirc three floors of vital equipment, including the control room itself. The bottom floor being the HPE service area where the health physics technicians are has its own ventilation system and it is separate from the control tower recirc system under this particular condition. Normally we have air going down there and not being returned. Should we go to recirc, we exclude that air from our recirc path and set them up with their own internal ventilation system.

MR. MOELLER: Again, I do not know that much about it, but it would seem that you would have set the control room up on their separate air and let the health physicists share ''''ng air. But as I say, I have not looked at it.

MR. KERR: You do not want to get health physicists mixed up with the rest of the building, surely.

MR. ZUDANS: Have you figured out how long you can stay bottled up?

MR. CLARK: I do not think we have anybody here who has a definitive answer to that. We think we ought to clarify that "bottled up" is not completely airtight in the sense that you would draw a vacuum. There would be some communication in the recirculation system is designed to use some of that leakage into the building and recirc it and clean it up.

MR. MOELLER: And then you do have a charcoal system or something for the recirculation?

MR. CLARK: Charcoal and, you know, to take out radioactivity and some gases.

MR. LIPINSKI: How effective is this against chlorine gas if you have in-leakage?

MR. MOORE: The main thing we have to do is keep the levels in the control room below a certain level, where they would begin to affect the operators. And so that what you have to do is make sure that you are keeping the great in-leakage below that which would get you up to the toxic level.

MR. CLARK: But I do not think we want to go beyond the fact we are evaluating and we know there are some changes we have to make. We have not finished the evaluation nor have we designed the changes.

MR. ZUDANS: Like, for example, you do not know how much in-leakage you have through different walls, and you could not possibly decide on the adequacy of your recirculation system until you knew that.

MR. MOORE: That is correct.

MR. CATTON: Measuring it would be tough.

MR. ZUDANS: That is another question: How do they measure it; send everybody out, pump it out, and see how much it takes?

MR. MOELLER: Walt, did you have more?

MR. LIPINSKI: You made reference to a 125-foot tunnel. That is in the horizontal direction. Does that not suck on a vertical direction as well?

MR. MOORE: The structure is at ground level.

MR. LIPINSKI: And that is where the air comes in? Oh, yes, that was the white-type structure that was out and away from the main building and you traveled underground. I remember that, yes.

MR. MOELLER: What is the time schedule on this item? Can the Staff tell me?

MR. SILVER: On the submittal of the documentation.

MR. MOELLER: And then reaching a decision.

MR. SILVER: I believe it was January 1, 1981, for the submittal.

MR. MOELLER: Of 1981. So they are past the deadline?

MR. SILVER: Yes, I believe so. There is no schedule for a decision on the implementation modifications. 0737 indicates to be determined.

MR. MOELLER: Any other comments on this?

(No response.)

MR. MOELLER: Okay. Thank you.

We will go on then to the next item. We are moving into section 4. These are non-TMI-related items requiring resolution before the TMI-1 restart.

There are two items here: the loss of non-Class IE instrumentation and masonry walls. Will the Staff report that?

Yes, the third item, containment sprays, there are three items here.

MR. DI IANNI: As an introduction to the three items --

MR. MOELLER: I hope that in reviewing these three items you will help us understand how these three particular items were selected or why they were singled out.

MR. DI IANNI: Yes.

First of all, my name is Dominic DiIanni, and I am the project manager on the TMI-1 reactor. I generally handle all the items that are not related to the order.

As far as these three items are concerned, first of all, we have the IE Bulletin 79-17. In your handout you will notice that the licensee will be required to implement four items prior to restart. These four items are listed there in my handout.

As far as the position for restart and why the Staff has taken such a position is that these four items were imposed as conditions for continued operation on all other B&W operating plants. These were Commission orders that were issued between April 16 through 21 of 1981.

So the Staff feels that we should be treating TMI in the same fashion. I was not planned to go into the detail, the technical details on this particular item, because this was tackled in other meetings in the past and I am assuming that the subcommittee is aware of the problems in these areas.

As far as the status is concerned, the Staff has not issued an order on TMI imposing these four items when they were issued to other B&W operating plants. And the reason for that is because of the Commission order and the circumstances which TMI-1 is in. However, the Licensee was made aware of these items that were being imposed on other B&W plants. So they are currently familiar with the issues.

As far as the status is concerned, we can say the Licensee today is partially responsive to this issue.

MR. KERR: What does that mean?

MR. DI IANNI: It means simply this: that, you see, prior to issuing these orders, which was a result of the Crystal River event --

MR. KERR: What does "partially responsive" mean?

MR. DI IANNI: I am coming to that. You see, as a result of the Crystal River events there was a series of seven questions that all the Licensees, including B&W, was requested to respond to. That they have responded to partially.

Then there are some verification tests that have to be made. And to our knowledge, the Licensee has not completed these verification tests yet. Once these tests are completed, then I believe it is my understanding that they will give us a complete report on this whole issue.

MR. KERR: Okay. Thank you.

MR. DI IANNI: The second item I would like to talk about is the masonry walls.

MR. MOELLER: Are there any questions on this first item by any of the consultants? Zenon?

MR. ZUDANS: I guess I understood you correctly that while they were not originally imposed on TMI, because the shutdown order was in effect --

MR. DI IANNI: That is correct.

MR. ZUDANS: -- they are now made a condition for restart?

MR. DI IANNI: That is correct.

MR. MOELLER: And have all of the operating B&W plants already taken these actions?

MR. DI IANNI: Yes, they have. They have responded to these issues.

MR. ZUDANS: Have they implemented the changes?

MR. DI IANNI: I cannot answer that, because I did not review, I was not involved in the review of the other responses of the other plants.

MR. MOELLER: Can anyone answer that?

MR. NOVAK: I am sorry, I did not hear the question.

MR. ZUDANS: Have the other B&W operating plants responded with the installations to these questions? In other words, have they done the work?

MR. NOVAK: Yes, they have. This, just to summarize, was an aftermath of the Rancho Seco light bulb event and the Crystal River event, where a certain fraction of the information available to the operator was lost due to a power supply failure. And some of the tests that Dominic is referring to is after you got sufficient separation to go back and trip certain buses and get what information there is to the operator so that he will know what he can use, depending upon the specific power failure.

This was done, in effect, as a confirmatory order. And in hindsight now, we probably should have followed through in the same licensing basis on Three Mile Island at the time.

The need for the urgency, the confirmatory order aspect, we did not see the need for it. The Licensee was fully aware of the concerns. He had participated in the meetings in every other respect. So it is just a question now of him finishing up these items, us having a chance to review them prior to restart.

MR. LIPINSKI: What is the formal procedure? Because you say it is not part of the order. Was a letter ever sent to the Licensee that he had to conform to this, or is it simply a gentlemen's agreement?

MR. DI IANNI: There was not an official letter that was sent to them. As a matter of fact, I was keeping the Licensee informed on this action and other actions that were taking place.

MR. NOVAK: The Licensee did receive the

bulletin. There is an I&E Bulletin 79-27.

MR. DI IANNI: I thought he was referring to the total four issues that are on my handout. Were you talking about the four issues? He has received the bulletin.

MR. LIPINSKI: He has received the bulletin, and you are saying even though he is not in operatin, before he goes in operation he has to conform to the bulletin?

MR. NOVAK: Yes. I&E will satisfy themselves that there is resolution of that bulletin, that a certain stage of resolution is achieved consistent with operation. For example, the next problem on masonry walls is an ongoing problem; we would expect that in a number of years to fully resolve in the sense of being completed. But there is a judgment by the Office of Inspection and Enforcement as to whether the Licensee is on the right track to resolving the concern expressed in the bulletin and, on that basis, they support continued operation.

MR. MOELLER: Does that answer it, Walt?

MR. LIPINSKI: Well, there is the confirmation in terms of some of the tests to be performed. Will they be performed before they go into operation?

MR. NOVAK: Before.

MR. DI IANNI: My understanding is before they go into operation.

MR. MOELLER: That helps. Thank you, Walt.

Other questions on this item?

(No response.)

MR. MOELLER: Okay, let us go on to the masonry walls.

MR. DI IANNI: As far as the masonry walls are concerned, what we require the Licensee to commit to is the following, that the licensing walls will be evaluated in accordance with the I&E Bulletin 80-11. He is to complete the modifications to the masonry walls prior to restart. As far as the criteria are concerned which the Licensee is to follow, we are more or less leaving it up to the Licensee at the present time to follow his own criteria.

As far as the modifications, when the modifications are implemented in this item I above, that does not preclude the option of implementing additional modification that could result from the Staff's review of the Licensee's criteria.

What we intend to do here is to review the Licensee's criteria. We are doing this for all other operating plants. And as a matter of fact, we are right now in the throes of negotiating with Ames Laboratory to assist us on a consulting basis in this area.

Then, prior to restart on the following cycle -- that is, in the case of TMI we are talking about Cycle 6 -- that the Licensee will resolve any differences between the

Staff criteria and the criteria developed by the Licensee. That is, the criteria that the Licensee is working under now.

In addition, any of these additional modifications that will result from the resolution of differences will be completed by the Licensee prior to restart on the following cycle. In other words, once we wrap up the problem and review the Licensee's criteria, we expect that by the startup of Cycle 5 that the items will be implemented.

As far as why we have selected this item as a prerequisite for restart, it is requiring the adequacy of the masonry walls. It is really based on the requirements in the technical specifications. This has to do with the operability definition in the technical specifications in the license.

To expand on this a bit, we expect that all safety-related systems will be operable at all times. If, however, the safety system can be damaged due to failure of the masonry walls, then we have to find this as a system being inoperable. And we have imposed this requirement on all other operating plants. This is the reason why we are having this as a criteria for restart as a prerequisite for restart.

As far as the status of this item is concerned --

MR. KERR: Excuse me. I do not understand. Do you mean that there are plants that are shut down because their walls have not yet been anaylzed?

MR. DI IANNI: We have requested the other operating plants that they adhere to their own criteria. And any walls that were found inadequate during the next extended shutdown they were to repair the walls and have them meet their own criteria. I do not know if that answers your question.

MR. KERR: Well, if I can interpret that answer to mean "No, there are not any plants that are shut down because of this," then it answers my question.

MR. DI IANNI: No, today there are no plants that are shut down because of this, that is true. But take, for example, the case of Trojan. When this discovery was made in the case of Trojan, Trojan was kept down and they made repairs to their walls and then they went back up into operation.

MR. ZUDANS: I guess your writeup here says that, "You shall review the criteria." And you may find the criteria unacceptable, then you may direct them to make the changes during the next refueling outage?

MR. DI IANNI: That is right. In other words, we would have to resolve any differences in the criteria, and at the same time, by the start of the Number 6 fuel cycle they would be required to implement any field modifications as a result of the differences in the criteria.

MR. ZUDANS: In other words, you allow them to work out their own criteria and to do the things that they see --

MR. DI IANNI: Right now.

MR. ZUDANS: You do your review afterwards and you do not shut the reactor down even if you find the criteria they used were not exactly what you would like to have?

MR. DI IANNI: No, I do not think we would be shutting them down.

MR. ZUDANS: Except in Trojan?

MR. MOELLER: Why are you so relaxed on this particular item? Is it just something that really does not matter?

MR. NOVAK: I do not think that is the case. The history has been the problem originated at the Trojan plant. There was an extended hearing. We found that those kinds of construction practices probably occurr to some degree in every plant. Masonry walls are found in operating reactors.

The problem then is further complicated by architect-engineers' varying design procedures, which may then use those walls in some ways to support safety systems. So you must go through the plant, almost walk-through; you have to find where the walls are, find what characteristics they have, what reliance was placed on those walls for strength in terms of seismic events, how they would move, whether they were supporting walls, and then find out what you would expect any safety-related equipment to do in the event those walls have some sort of a failure. They could crack, they could spaul, they could actually crumble, I guess, depending on the severity of the event.

Now, we recognize this problem is basically a low-probability event; it is going to take a rather severe seismic event, in our mind, to cause failures sufficent to challenge "a complete safety system."

You probably are talking about a system, a situation which may reduce the reliability. You may affect some portions of systems. Yo may have to look at it. I do not know that redundant systems are on the same walls; you would have to track that, so to speak.

We believe that continued operation is merited on the basis from the reviews that have been done. There have been found no what I would call situations developing which required immediate action. There was a basis for continued operation. But I would view this as an upgrading in terms of the margin of safety.

MR. KERR: What is it that the Licensee must do before he starts up? It was not clear to me what it is you are requiring them to do.

MR. DI IANNI: Well, prior to restart, the Licensee would -- let me give you think this will all come out. By letter dated July 11, 1980, and November 17, 1980, the licensse has responded to Bulletin 80-11. Based on this study, the Licensee has identified 18 walls. Of these 18 walls, six of them were analyzed.

MR. MOELLER: Were those the six worst or something or the six most important walls?

MR. DI IANNI: That I cannot answer. I know there were 18 walls that dealt with safety-related systems attached to them. I do know that they have analyzed six of them, and the six that they have analyzed they found them acceptable as far as stress levels were concerned and things of that nature.

Now, as far as -- to answer your question -- with regard to what is required for startup, we would require the Licensee to be responsive to his -- and complete his analysis on the remaining 12 walls and implement any changes based on his criterion prior to restart.,

MR. ZUDANS: You say here that stresses are below the allowable. Where did the allowables come from for masonry walls?

MR. DI IANNI: Casey, do you think you could field the question?

MR. LEU: My name is Casey Leu. These allowable stresses are based on their own criteria, Licensee's. The criteria they used are primarily based on the current available commercial codes and standards.

MR. ZUDANS: Which specific codes handle the masonry walls?

MR. LEU: Such as ACI, and they have specific stresses for certain types of masonry construction.

MR. ZUDANS: Well, now, if the Licensees do the analysis, they set the allowables, and they pick the walls, they pick the fix, what is the problem?

MR. LIPINSKI: Because they do not agree.

MR. ZUDANS: So you can run it until the next review?

MR. DI IANNI: You can run it, Dr. Zudans. We are going to review their criteria and review their submittals. We just have not done it yet.

MR. ZUDANS: I understand that. But are you allowing them to start or not?

MR. DI IANNI: Yes.

MR. ZUDANS: So even if they have any seriosu problem with those remaining 12 walls, they will not be able to fix it until nex outage?

MR. DI IANNI: That is not necessarily true. THey may be able to fix it. Depending on the nature of where the walls are, they may be able to fix it or not.

MR. KERR: I thought when I asked you if they had to complete the review and the fix before startup, the answer was "Yes."

MR. DI IANNI: Yes.

MR. ZUDANS: Now he said "No."

MR. KERR: Mr. Zudans asked the same question.

MR. LIPINSKI: There is a recycle item at the top of his list. But then the Staffis going to analyze it, and if the Staff disagrees, they send them back to Item III where they have to correct the disagreements.

MR. DI IANNI: That is correct. And whenever I was addressing Dr. Zudans, I was talking to him about Item III. In other words, the recycle.

MR. LIPINSKI: What about the six --

MR. KERR: Excuse me just a minute. Supposing that they analyzed and discovered that they needed to fix a wall which was going to take a year to fix. They cannot start until they fix the wall; right?

MR. CLARK: Dr. Kerr --

MR. DI IANNI: Right now, that would be the case. But right now, they would have to submit to us a request for relief; we would have to look at the wall in question and see how serious it is.

MR. KERR: My question is too hypothetical. I will withdraw it.

(Laughter.)

MR. LIPINSKI: Of the six walls you analzyed, have you reviewed it and agreed with the analysis?

MR. DI IANNI: No.

MR. LIPINSKI: So it is really the 18 walls.

MR. DI IANNI: Correct.

MR. ZUDANS: Just to make sure we understand. Whatever they find on these 18 walls, if you find any to modify construction, they would have to do it before starting?

MR. DI IANNI: That is correct.

MR. ZUDANS: If they analyze, use their own criteria, and find there is no need to do the modification, they can start? And if you find that they were not right, in your opinion, then the next refueling cycle they will have to fix it?

MR. DI IANNI: That is correct.

MR. ZUDANS: So they are going to start it without fixing it. That is kind of logical.

MR. LIPINSKI: Is the basic problem that you do not have criteria for them to look at to see if they are meeting them?

MR. DI IANNI: Their criteria has to be based on the requirements that were specified in Bulletin 80-11. We do specify requirements there.

MR. ZUDANS: Not in terms of stress limits, no.

MR. DI IANNI: I do not believe so.

MR. ZUDANS: You only specify that no safety-related equipment shall be damaged if the wall fails.

MR. DI IANNI: That is right.

MR. KERR: That seems pretty specific to me.

MR. ZUDANS: Good enough, yes.

MR. LIPINSKI: May I ask one more?

MR. MOELLER: Yes, Walt.

MR. LIPINSKI: At the last meeting I thought there was some doubt about how to do analysis on masonry walls and there was not an accepted masonry standard on that. Am I wrong?

MR. DI IANNI: I cannot answer that. I defer it to Casey Leu.

MR. LEU: That is right. There are available codes, but they are only applicable to the commercial type of building, not for nuclear plant use. So in that regard, SCP has developed an interim criterion based on the available information, and we intend to use that for the future evaluation of the walls.

MR. LIPINSKI: And that is acceptable to the Staff at this time?

MR. LEU: That is, as we indicate, based on the state of the art at the present time. In the future, with any available testing or other research available, the criteria will be improved.

MR. LIPINSKI: You are accepting that as it stands then as of now?

MR. LEU: Yes.

MR. ZUDANS: Could you repeat who developed the criterion?

MR. LEU: Our branch, structural engineering branch.

MR. ZUDANS: That is the branch criterion. And is this criteria only used by you in evaluating the Licensee response, or do you hand these criteria over to Licensee and say, "You shall work according to these"?

MR. LEU: We only use these criteria for internal use, for our own evaluation purpose.

MR. ZUDANS: Isn't that kind of the wrong thing to do, give them the criteria to begin with?

MR. LEU: Because in the beginning there was no such criteria.

MR. ZUDANS: But there is now.

MR. KERR: But that is not fair. Let them develop their own criteria. The Staff developed theirs.

MR. LIPINSKI: There are rocks and there are stones.

(Laughter.)

MR. ZUDANS: I work by logic, not by fairness principles.

What are typical fixes, if any, that you have seen?

MR. LEU: Pardon me, sir?

MR. ZUDANS: What are typical fixes for a wall that is shown not to be adequate?

MR. LEU: Are you talking about TMI-1?

MR. ZUDANS: In general. You have seen something that you have seen --

MR. MOELLER: Generically, what do you do to fix a masonry wall?

MR. ZUDANS: Throw it out and recast the concrete wall.

MR. NOVAK: Each problem is solved depending on the severity. Steel plates can be bolted against the wall. You can drill and support it a number of ways. What you do, you decide the failure mode, which was is the wall subject to failure, then you go back and strenghten it.

Now, a number of different things are done. They look for obviously the ways where construction modification ca be accomplished without excess labor. It is a very difficult job. You are doing a lot of chipping out of concrete, you are strengthening the wall. Basically, you are replacing the wall with steel or something of that nature.

MR. ZUDANS: It is a very difficult fix. You might reroute the piping, leave the wall where it is, and decide to go a different way. So you would look at the particular problem and choose a solution.

MR. DI IANNI: To go back to the criteria, we were looking at. I would assume the internal branch review is an in-house check of a design approach, the architect-engineer has a variety of ways he designed that wall and what loads he planned on and what criteria he decided was a sufficient criteria. It might be a lot easier just to review his criteria and see if they were acceptable, because he took a conservative approach.

And what we would use perhaps our criteria is perhaps where it is not clear what his criteria mean, you can use yours as a sounding board for developing questions and continuing the review. And sometimes, sure, you share that information with him. I think it is just a development tool at this time.

MR. ZUDANS: Well, at least they know now that you have criteria.

MR. MOELLER: I guess I had a question on this, too, that maybe Zenons can help me with. But presumably, in setting the criteria for these walls and in estimating the stresses that the walls may be subjected to in a seismic event, they are going to use whatever seismic criteria was in effect at the time the plant was constructed.

Now, has there been any new data on seismic activity in that area of the world, or the United States, since the plant was designed and built?

MR. NOVAK: I would think today our understanding is improved. I think, including the SEP program, we have more specific criteria.

MR. MOELLER: Was the SSE and so forth for this plant conservative on the basis of the knowledge we have today? In other words, where does it fit in? Have there been any newer plants, Beaver Valley or something, built in the same geographical area? And what were their seismic criteria?

MR. NOVAK: I do not have that firsthand information. I would actually go to seeif the seismic criteria for TMI-2 changed or was it the same as TMI-1.

MR. MOELLER: That would be another good question.

MR. NOVAK: Licensing could add information.

MR. MOELLER: Could you add, Mr. Clark, something and give us information that I am requesting? In other words were 1 and 2 designed to the same seismic criteria?

MR. CRONEBERGER: My name is Don Croneberger. The answer to that question is "Yes." They were identical.

MR. MOELLER: What were they?

MR. CRONEBERGER: The large earthquake was .2 G, and the small earthquake, now called "operational basis earthquake," was .06 G.

MR. ZUDANS: Don, since you are the wall expert there, I am sure, what do you do to decide that the wall will work? Do you disallow tensile stresses?

MR. CLARK: We do have a presentation by Mr. Croneberger on that subject. We would be glad to do it now or however you want to address them.

MR. MOELLER: Let us go on to the third one and then come back and hear the Licensee. That is fine. Thank you.

MR. DI IANNI: The bottom line on 80-11 is that the Licensee has to submit a report on the reanalysis of the remaining 12 walls. That is really the bottom line.

As far as the containment spray effectiveness, this deals with the illumination of the sodium thiosulfate as an unreliable iodine suppressor. This has to do with the containment spray system when used with sodium hydroxide in the containment spray solution.

In the event of a design basis accident, there is a certain amount of iodine that has to be suppressed. Earlier we thought the sodium thiosulfate would do the job. I guess we all got educated a little bit with time.

We found out that the sodium thiosulfate maintained 1 percent by weight as required or as stated in the FSAR, that this could not be done very easily with reasonable assurance. So what we did is we imposed -- we did not exactly impose the requirement, but we kind of let the other utilities know that we would prefer eliminating the sodium thiosulfate and using straight sodium hydroxide.

MR. MOELLER: You are saying that was a Staff decision?

MR. DI IANNI: That was a Staff decision.

MR. MOELLER: How many plants actually use the combination today?

MR. DI IANNI: None.

MR. MOELLER: Okay. I did not think I had heard of any.

MR. DI IANNI: They have all changed over.

MR. MOELLER: So TMI-1 would simply be doing what everyone else is doing?

MR. DI IANNI: That is right.

MR. CATTON: There was a letter from Read to Arnold on 1980 that talked about drawdown of sodium thiosulfate.

MR. DI IANNI: This is the same issue.

MR. MOELLER: So you are just going to eliminate the sodium thiosulfate and you will just simply use the sodium hydroxide?

MR. DI IANNI: This is right.

The basis or the position for the restart on this particular issue is that we have judged that this thing has gone on for several years, and we feel that this should be resolved. After all, it is done on all of our operating plants, the job is completed, and we do not see why this cannot be done prior to restart.

Out of the three, I would say the basis for restart, this is the weakest one. But this is a judgment call.

Now, as far as the status on this item, we are still awaiting the Licensee's response on our March 7, 1980, letter. We have not received a response on that.

That is all I have. Are there any questions?

(No response.)

MR. MOELLER: I have a question for the Licensee on this one. When the accident occurred at TMI-2 and the containment sprays cut on, was sodium thiosulfate and sodium hydroxide injected?

MR. WALLACE: My name is Ed Wallace.

There was no thiosulfate in Unit 2; it was eliminated before the accident. So there was hydroxide addition, but no thiosulfate.

MR. MOELLER: Okay. Thank you. That is helpful.

That completes the Staff's presentation.

I think we will take a ten-minute break.

(Brief recess.)

MR. MOELLER: The meeting will resume.

We are going to pick up with the Licensee's presentation on the three items which we have just finished, and I gather it will be Mr. Chisholm on the first item, Mr. Croneberger on the second, and Mr. Moore on the third.

MR. CLARK: Yes. Dick Chisholm.

MR. MOELLER: You will be covering the instrumentation.

(Slide.)

MR. CHISHOLM: Our response to 79-27 really involves looking at two incidents, one at Oconee and one at Crystal River, both of which involve in different ways failures of the power supply to the ICS/NNI system. What I would like to do is show the slide of the scond page of the handout and summarize what we have done. There is more detail in some of the other handouts, and I would b glad to talk about them if there are any questions.

Our response to this bulletin involved first performing a failure-modes-and-effects analysis, which was documented in a report and, I believe, submitted to the Staff.

We also committed to running a test. The object of this test was to substantiate the results of the analysis. Where we stand on that right now is the test procedure has been undergoing a rather long review. There have been a lot of changes to it. It is now in its final draft form, and we expect to be running that test sometime during the month of July.

The failure-modes-and-effects analysis brought out certain deficiencies in the system which could be caused by power supply failures. One of them was a -- some failure modes to various valves which failed in certain ways that could aggravate overcooling or depressurization of the plant. And those, the controls have been changed to correct those situations.

There was also, if you lost the ICS/NNI, you lost all of the display instrumentation or substantially all the display instrumentation in the control room. The conclusion was that we would not have adequate information for the operator to go to safe shutdown using the steam generators. He would have to go to bleed-and-feed.

To correct that, we installed two new instrument systems which are safety-grade. They are entirely independent of the ICS/NNI, and they provide enough information in the control room so that even if you lost all of the ICS/NNI, the operator would have adequate information to maintain the plant, bring the plant to safe shutdown using the steam generators.

MR. KERR: I am sorry, I should have been certain. Did you say that this is highly reliable safety-grade or something?

MR. CHISHOLM: Yes, they are. They are new systems right down from the transmitters to the readouts.

One of the issues that was invovlved was not only complete failure of the power supply but failure of individual power supplies which could have very complicated effects that might not be easily apparent as to what was going on.

We put in a power supply monitoring system which monitored each individual main power feed to the ICS/NNI, and that information will be available to the operator in the control room so that he will know where the failure has occurred.

There is a procedure now being implemented which will tell him on the basis of which part of the power supply has failed what he should expect to happen and what action he is supposed to take. As a result of the Oconee incident, which was failure of the feed to a bus which fed the ICS/NNI and a simultaneous failure of an automatic transfer switch, we put in a backup bus transfer which is operable from the control room. It is a manual transfer operable from the control room.

The operator will get an alarm when there is no voltage on the bus that feeds the ICS/NNI, and he can then transfer voltage from another source over to that bus.

So that is the summary of what we have done in response to Bulletin 79-27.

MR. MOELLER: Any questions on this?

MR. KERR: How did you know, when you were finished, how did you know whether you had enough improvements to satisfy you or the NRC?

MR. CHISHOLM: I think basically it was satisfying the findings and the recommendations in this failure-modes-and-effects analysis. We think we had looked at --

MR. KERR: Well, the failure-modes-and-effects analysis tell you what failures can occur and what the results will be, but it does not fix anything.

MR. CHISHOLM: No, it does not.

MR. KERR: How do you know when to stop fixing, that you have fixed every possible failure?

MR. CHISHOLM: No. There was some judgment involved on the consequences.

MR. KERR: THat is what I am trying to get at.

MR. CHISHOLM: I guess the criteria that was used was that we wanted to be able to, without the ICS/NNI, to allow the operator to safely shut down the plant using the steam generators. That was the basic criteria that was used.

MR. KERR: So not only can he use power supplies, but he can use the ICS and still shut down okay?

MR. CHISHOLM: He can lose the whole ICS/NNI system.

MR. KERR: And the reliability of the system that you provided which permits him to do that is not quantified but at least qualitatively it is the sort of reliability that one expects of safety-grade equipment?

MR. CHISHOLM: It is safety-grade equipment, and we think we have bought the best equipment that was available.

MR. MOELLER: Walt.

MR. LIPINSKI: In your modification of valve failure modes, you do not list the PORV. The PORV was part of the Crystal River event because it popped open. What have you done as part of your modification to review PORV?

MR. CHISHOLM: On our plant it does not go open.

MR. LIPINSKI: Yours is different than Crystal River?

MR. CHISHOLM: It is more like Oconee.

MR. LIPINSKI: You did not have the same failure modes as Crystal River 3 had?

MR. CHISHOLM: No.

MR. LIPINSKI: When you selected the instrument, you provided in the control room independent of the ICS nonnuclear instruments. I only see six on the list. Do I conclude that these are the only six instruments he needs, or do you have another list that you are not showing us and he supplemented that list with these six?

MR. CHISHOLM: These are the ones that we had to add to supplement what was already in the plant.

MR. LIPINSKI: So from this list I cannot judge what he has available to him in total?

MR. CHISHOLM: Not from this list alone.

MR. LIPINSKI: How does this list compare with the other request that is not resolved completely, I guess, in terms of the safety shutdown panel?

MR. CHISHOLM: I think it is substantially -- well, the list on the safe shutdown panel would be greater than this. This is a subset of what would be on your remote -- are you talking about the remote shutdown panel?

MR. LIPINSKI: Not the remote; the safety shutdown display in the control room where the operator is to have a concise set of information that he needs to determine the status of the plant. You are not familiar with that requirement?

MR. CHISHOLM: I am not familiar with that requirement.

MR. LIPINSKI: Is there anybody at B&W who can address that question; that is, the SPDS, the safety parameter display?

MR. MOELLER: You are asking if anyone from where?

MR. LIPINSKI: He has another vuegraph that has six items on the list, and I am wondering how this relates to the safety parameter display issue. Are these six items part of the safety parameter display and now you are making provisions tat the operator can see these? I do not know what the timetable is for resolution of that SPDS requirement.

MR. MOELLER: Is there anyone who can help us with that?

MR. SILVER: That is NUREG-0737 item I.D.2. And I have not checked this in detail. I do not believe there was an implementation schedule for actual installation of hardware.

MR. CHISHOLM: This was not meant to be part of that information.

MR. LIPINSKI: You have given some advanced thinking, and you have concluded that the operator needs this six indications in order for him to manipulate that plant. I assume when you get to the SPDS, we will see these same six items on that list?

MR. ZUDANS: At least.

MR. LIPINSKI: At least these items.

MR. CLARK: We will look, at this when we look at the SPDS, but we are not that far along on the SPDS at this point.

MR. MOELLER: Zenons.

MR. ZUDANS: I really do not have a question. I would just like a clarification from you. On the next slide -- I do not know if you plan to show it -- you say "pressurizer spray valves change from mid-open to mid-close and loss of signal." What is the implication of that? You do not need the spray to control pressure at that time because something else happens?

MR. CHISHOLM: It is not that you do not need it, but that if it failed open, it would contribute to depressurization of the plant.

MR. ZUDANS: Yes. But you may not be in the mode of depressurization; you may be in the mode of increasing pressure. In other words, you do not know what mode are you when the electrical portions fail and this happens.

MR. CHISHOLM: I think the mode we will be in is the plant will have tripped --

MR. ZUDANS: And the pressure will go down.

MR. CHISHOLM: Well, the analysis that was done showed that the pressurizer spray valves failing open would have an aggravating effect on the transient.

MR. ZUDANS: Could you think of a situation where it would be the othe way around?

MR. CHISHOLM: Well, ideally, you would like to maintain control of the pressurizer spray valves. But the decision that was made was that until such time as power could be restored, it was best to have it fail closed.

MR. ZUDANS: Okay.

MR. LIPINSKI: I have a question for the Staff. Looking at the six items on this list of the instruments still bothers me, because this is not a complete set. Has the Staff looked to see what the complete set is, these six plus whatever else was available, as to whether it represents an adequate set?

MR. NOVAK: This is Tom Novak again.

We did a review of the sensitivity of B&W reactors probably about a year ago. And as part of that review we looked at the instrumentation that we felt would assist the operator to read a variety of overcooling or undercooling transients. My recollection was that we identified a minimum of about 12 parameters that we thought would be a minimum set for quick implementation of plants, that being: look to see that you have more or less independent ways of obtaining values of these parameters. And we did not wait on the complete review of the SDS, so to speak.

So, in my mind, we looked at these -- I think the Licensees in meeting with us even added one or two that they said would be necessry things that we were not quite knowldgeable about, because you have to bring the plant down

-- I think something like the tank wall, the quench tank level was one we had mnissed. And they said makeup tank level was one that should be there because it helps the Licensee operator to follow the behavior of the plant.

But in my judgment, we came up with about 12 that we thought would satisfy the near-term requirements. I do not know if that is a complete answer, but that is the way we came out.

MR. LIPINSKI: But you have an idea of what the Licensee should have available. Now, the question of testing came up earlier. I presume you were going to kill the power to the other instrument supplies and verify that indeed these systems are still active in the control room and available to the operator? Or what tests do you plan?

MR. CHISHOLM: The tests that are being run next month will not be testing the plant as modified, necessarily. The tests will be done more to substantiate the failure-modes-and-effects analysis to verify that it was accurate.

We are going to disable power supplies one by one and in various combinations to note the results of these things and to see that the analysis that was done was correct. As the new systems are being put in, they will have their own operational tests to prove out the design.

MR. LIPINSKI: Will there ever a test done after the installation? Because you are talking about doing this piecemeal after the fact rather than before the fact.

MR. CHISHOLM: There will be individual checkout tests done for each of these modifications as they are put in to see that they operate properly.

MR. LIPINSKI: How about the alternate control room control, which is shown as your last line off in inverter E?

MR. CHISHOLM: Let me put that up there so everybody can see it.

(Slide.)

Is this the slide you are talking about?

MR. LIPINSKI: Yes. Now, when you say alternate control room control, does that indicate there is another path that allows you to execute control and that this is now an alternate and parallel path for control?

MR. CHISHOLM: Let me give you an example of what that means. The atmospheric dump valves were found to have failed open on a certain combination of power supply failures. That was changed so that they failed closed. Now we have put an alternate controller in there so that when the ICS/NNI is not available, the operator can operate them independently. That is what the alternate control is. It comes from a different power supply.

MR. LIPINSKI: Are those valves electrical or pneumatic, the final elements?

MR. CHISHOLM: Those are pneumatic.

MR. LIPINSKI: So that somewhere else they are interacting with pneumatic selenoid in this alternate control path to modulate the valve?

MR. CHISHOLM: They are modulating valves, and the modulating effect would be the same. What is changed is the signalling which comes from the ICS.

MR. LIPINSKI: That is what I am questioning, because this part here is electrical; you have got an interface with a pneumatic system, and it is a parallel path application.

MR. CHISHOLM: It is not a parallel path.

MR. LIPINSKI: It is an alternate path?

MR. CHISHOLM: Right. It is a switchover of the signal from the automatic signal which comes from the ICS to a manual signal which is operable by the operator in the control room.

MR. LIPINSKI: That requires a switchover?

MR. CHISHOLM: It is automatic. It is there, and he can use it when the other thing fails.

MR. LIPINSKI: So these diagrams are not complete, in the details of what is involved, because this does not show any switchover?

MR. CHISHOLM: It is an alternate control.

MR. MOELLER: Dr. Zudans.

MR. ZUDANS: On this list of instruments to be provided in a control room that are independent of ICS/NNI, is your subcooling meter independent of ICS/NNI?

MR. CHISHOLM: Yes. That list of meters was only the ones that are being added to replace instruments that we would presume to be unavailable if the ICS/NNI failed. There are other instruments in the control room.

MR. ZUDANS: Would it not be nice if you had a complete list and just jotted down the ones that are added so we would not have to ask these questions?

MR. CHISHOLM: I was trying to describe here the modifications we are making in response to this specific bulletin.

MR. ZUDANS: That is all.

MR. MOELLER: All right, that finishes that item. Let us move on then to the Licensee's report on the masonry walls by Mr. Cronaberger.

MR. MOELLER: And it is in your presentation, then, we will hear more details on the seismic considerations?

MR. CRONEBERGER: Yes. I will attempt to do that.

MR. MOELLER: Fine.

MR. CRONEBERGER: To try to get some understanding of the activities relative to this bulletin 80-11, basically the bull tin asked for two things to be done. One was to identify those masonry walls in the plant which were in proximity to safety-related equipment and then to re-evaluate the design adequacy of those walls to give some understanding as to the scope of application of masonry walls of TMI-1.

The application was substantially more limited than other plants, such as Trojan. Basically, the applications fell into only the categories that I have listed up here.

(Slide)

The first category of walls, which is really the dominant number of walls in the plant, are scattered throughout the auxiliary building, which is what I call knock-out panels which were installed to permit removal of components should major problems occur requiring replacement.

The second type of wall application, which was only one application, was construction of an elevator shaft in the reactor building, and the third was an application which was used for an air shaft in one of the other buildings external to containment.

The type of construction used was as shown for the elevator shaft and the air shaft, what is partially reinforced hollow block construction.

MR. MOELLER: What is the partial reinforcement? Could you explain that?

MR. CRONEBERGER: Typically, on hollow block construction one is installing within the bed from block to block some reinforcement, and you will also wind up having periodically through the hollows in the blocks some vertical steel going through.

When I call it partially reinforced, that is a typical type of construction.

MR. MOELLER: Thank you.

MR. CRONEBERGER: In the auxiliary building where we were installing these knock-out panels, we had to basically provide biological shielding in that area and that involved solid block construction. When I say multiple-Wythe construction, I am talking about the number of through thickness layer of block that is in the construction.

MR. LIPINSKI: How do you sum these to 18, which is the 18 you have reference to?

MR. CRONEBERGER: I have been trying to figure that out. I think in the original, the elevator shaft was construed to be 2. I am not sure, but I think that was the difference between 17 and 18.

(Slide)

This is an extract from one of the letters of submittal in our return. Internal work which continued since that time, shows the type of construction for what I call the knock-out panels.

This shows one example where there are simply four thickness layers of block, one of those layers keyed in to the adjacent concrete. What is shown here is the typical kind of dimensions of the walls that were used for knock-out panels, typically head-room heights to get into the compartment and depending on the size of the equipment that we needed to get out.

So that is the particular dimensions for the type of construction for those knock-out panels.

MR. LIPINSKI: What is the typical thickness you had for that Section AA? Are those eight inches time four?

MR. CRONEBERGER: The nominal thickness of the block is eight inches.

MR. LIPINSKI: So that would be a 32-inch thick wall?

MR. CRONEBERGER: That is correct.

MR. ETHERINGTON: What does that two by eight key mean?

MR. CRONEBERGER: The arrow should not be there. It just means the thickness back here (Indicating).

MR. ZUDANS: Don, what do those boundary conditions refer to? To analysis?

MR. CRONEBERGER: Yes.

As I said, this is one sheet out of the report, and for this particular wall, this is simply the boundary conditions for that particular panel.

MR. ZUDANS: How do you justify the fixed stage on the masonry wall?

MR. CRONEBERGER: Typically, the fixed edge was only assumed for the bottom joints.

MR. ZUDANS: Enough gravity to hold it on?

MR. CRONEBERGER: That is correct.

(Slide)

The conclusions of the investigation were that for all of the knock-out panels, the design using techniques that were a little bit better techniques as far as the seismic analysis was concerned than was employed in the commercial design showed that all of the multi-Wythe block walls were adequate.

There was only one problem that we did encounter in the field investigations of these walls. We did pull out some blocks to see if, in fact, there was contact, that is block width to block width, and we found that indeed in the cases that we investigated there was a gap which precluded the multi-Wythe acting as a unit.

One of the activities which will be underway will be to provide a collar joint which is to insure that, in fact, that gap is filled so that the wall widths act together.

MR. ZUDANS: That is talking about a gap that goes vertically in the wall between the four layers of the block?

MR. CRONEBERGER. That is correct.

MR. ZUDANS: How do you fill that?

MR. CRONEBERGER: By drilling a hole and grouting.

MR. ZUDANS: That will move the whole wall.

MR. MOELLER: What was your response?

MR. CRONEBERGER: Let me try this picture again.

(Slide)

When a block wall is built you really wind up not having -- when you build up these blocks, you really do not have an intimate contact. There is a nominal dimension between there.

When they pulled out some of the block, they found that in here they were not, indeed, in intimate contact. They went to close that space.

MR. MOELLER: So you said you would drill and grout?

MR. CRONEBERGER: We will drill in and grout up to a certain elevation to assure that they are acting as a unit.

MR. MOELLER: Mr. Zudans pointed out this might spread the blocks.

MR. CRONEBERGER: And one of the limits is that, in fact, one will not be able to grout 24 inches high at one time. One will have to grout a limited height, and then go in and grout again.

MR. ZUDANS: You go in and grout a limited height, but then you will grout the bottom one?

MR. ETHERINGTON: What is the principal problem: failure to support equipment, or damage to equipment by falling on it?

MR. CRONEBERGER: The major problem is falling on items, and not the load from any equipment. And, in fact, with certain limited exceptions, the main problem encountered was the presence of some field-run electrical conduit which were in close proximity to the walls. That was the typical type of problem with grout that we encountered.

MR. CATTON: Why not reroute the conduit?

MR. CRONEBERGER: That was another option, but this seemed to be easier.

MR. ZUDANS: Could not they be prestressed, because you have a concrete structure that surrounds this?

MR. CRONEBERGER: That could be done, but that is substantially more complicated.

MR. MOELLER: Could you help me on this? I am lost by your last statement because I thought the primary problem was the structural integrity of the walls because you have category one piping attached to the wall.

In other words, the wall was not a properly-designed unit to which you could attach the supports for this piping.

Are you simply saying that your problem is not that -- the problem is the walls may fall over something important?

MR. CRONEBERGER: It is a combination of the case.

MR. MOELLER: But you also did have some seismic supports hooked into these masonry walls?

MR. CRONEBERGER: Yes, although the original designs, since these are supposed to be knock-out panels did not have major things on these walls. It was just things that were field run.

MR. MOELLER: Okay.

(Slide)

MR. CRONEBERGER: The other type of thing we found was that in the air shaft the design appeared to be okay.

in the field investigation, it was noted that there was some cracking of the masonry. We will go back in there and repair the cracking as a solution.

The only area that we found any design deficiency was in the elevator shaft. In the elevator shaft, steps were being taken to provide some additional external reinforcement of a portion of that staff.

So the net result of all this is that we are proceeding with the modifications and our first priority is to reinforce or correct the construction to assure that wall failure does not jeopardize ability to achieve and maintain safe shutdown of the plant, and that is underway.

MR. ZUDANS: Is the air shaft underground?

MR. CRONEBERGER: No.

Basically, what it is is a shaft in one of the buildings to permit, as I recall, return air to another portion of an air handling system.

MR. ZUDANS: That is not the same intake air shaft that was faulty?

MR. CRONEBERGER: No.

A few miscellaneous comments. I did try to indicate that I am not aware, in that portion of Pennsylvania, any dramatic changes from a seismicity standpoint, as indicated on the TMI-2 basis.

The question was asked about criteria. Indeed, one of the problems in this type of construction is there is really is some criteria that was developed for particular nuclear applications.

There is an ACI Standard -- I think it is 531 -- which is applied for masonry construction for normal commercial application, but that cannot be applied as written, but it was the basis for extension of the criteria for these applications, when we are dealing with more extreme and less frequent kinds of loads that were applied for more frequent application.

MR. ZUDANS: Do you happen to know the Susquehanna G level?

MR. CRONEBERGER: No, I am not sure where that is.

MR. MOELLER: Does the staff? Can you give us the Susquehanna G level?

MR. ZUDANS: For SSE?

MR. MOELLER: Could someone call and find it out for us?

MR. STOLZ: Yes.

MR. MOELLER: All right. That would be helpful.

Are there any more questions for Mr. Croneberger?

(No response.)

MR. MOELLER: Thank you.

We will move on, then, for the licensee's presentation on the containment spray by Mr. Moore.

MR. ZUDANS: I would like to ask one more question.

MR. MOELLER: Go ahead.

MR. ZUDANS: When you did the analysis, did you assume that the wall would fail if it developed any significant tension?

MR. CRONEBERGER: There was criteria that allowed tension values different, if in fact it was a horizontal joint as contrasted to the vertical joint. I am not positive of what the basis for those numbers were, but it was typically on the order of 30 PSI; very low tension values.

MR. MOORE: My name is Jim Moore. I am going to give you a status report on the Reactor Building Spray System Modification.

As pointed out by the staff, the basic concern here was to convert the present reactor-building spray system from the existing combination of sodium thiosulfate, sodium hydroxate and boreated water to one that uses only sodium hydroxide and boreated water.

This modification is being implemented. We have performed a single failure analysis for the system and have done all the necessary evaluations to evaluate the capability of the system using only the hydroxide. The submittals in preparation will be submitted to the staff within the month.

MR. MOELLER: When did the similar change take place in TMI-2?

MR. MOORE: Prior to initial start-up of TMI-2.

MR. MOELLER: So it was changed before you ever operated?

MR. MOORE: Yes.

MR. MOELLER: What does this change involve?

MR. MOORE: To eliminate the sodium thiosulfate is simply a matter of draining the tank.

MR. ZUDANS: And the system remains the same and you do not have to adjust pipes and valves and what-not?

MR. MOORE: There are some minor differences in instrumentation. These are rather large tanks, 57 feet tall. In the analyses, one has to base the analysis on certain potential errors and the indicated level of these tanks.

We are improving the capability of the read-out on these tanks, decreasing the potential error level.

MR. ZUDANS: But you do not have to do anything on the meter-level reading?

MR. MOORE: That is correct.

MR. MOELLER: And there are no dangers in just simply valving off what used to be the sodium thiosulfate system as opposed to completely removing it?

MR. MOORE: We would prefer not to upset it.

There are some potential uses for further upgrading of the system in the future. We may want to use that.

MR. MOELLER: Will the tank be drained, or filled with water? What do you do with the thiosulfate?

MR. MOORE: Our intention is to drain the tank, block the valves off and lock it closed.

MR. MOELLER: How big is the tank?

MR. MOORE: All three tanks are relatively the same pipe based on the density of the fluids that are in it. They are roughly 50 feet high, in that proximity. The diameters vary. I do not recall the natural volumes.

The thiosulfate tank is a very slim tank because of the small quantity.

MR. LIPINSKI: TMI-2 had already made the mod. You had shut down for refuelling and were getting ready for a restart, but you had not made the decision not to drain the tank and valve off?

MR. MOORE: Well, the modification of unit two was, as I recall, made at our own volition. Is that correct?

MR. CLARK: Yes.

MR. ETHERINGTON: What has been your experience with the thiosulfate? Have you had any decomposition?

MR. MOORE: I can't speak to the actual operating experience there.

MR. WALLACE: With regards to the question about Unit 2, initially the incentive to changeover in Unit 2, I believe, was a result of staff questions during the FSAR review with regard to single-failure assumptions and the effect of single failures on the chemistry in the system with those failures, because you would get a certain percentage upsets in the thiosulfate, hydroxate or whatever, wherever you saw the failures.

So we evaluated those failures. Since the system is basically a gravity draindown system, the relative piping configurations between the banks had a predominate effect on the final chemistry in the spray headers. So that was the principal initiator of that changeover.

This activity, which started, I would have to guess, about in the same timeframe, possibly a little bit later, started as a question regarding single failures and the technical specification levels in those tanks. So we can live within the error bands of those instruments and still get the right drawdown between the tanks at extremes of the levels.

So that is sort of the genesis in Unit 2 and Unit 1.

MR. LIPINSKI: Yes, but now we are talking about the beneficial effect of the sodium thiosulfate. From what you have described, that didn't seem to be a question for

TMI-2 at the time.

MR. MOORE: To my knowledge, it hasn't been an issue on TMI Unit 1; it has been whether you could draw down and keep everything in the correct proportion to get the benefit that you wanted to. I am not aware of any detrimental effects of the thiosulfate itself. It is the inability to really control it.

MR. ZUDANS: Finally we learn why we are getting rid of it.

MR. MOELLER: Well, it is the metering, right, and the mixing.

MR. ZUDANS: What a good way of doing it. If the shoe does not fit your foot, cut your foot off.

MR. WALLACE: I think there another reason, too. There was some question about the thiosulfate performance and its effect on equipment if you got an inadvertent spray and the complexity of the metering that I think were all considerations. So it was not a simple question.

MR. KERR: Is it worse than sodium hydroxide on equipment?

MR. WALLACE: I am not sure I can adequately address that. I am under the impression that it adds additional complications in the clean-up, if you were to have an inadvertent spray, but I cannot really go much beyond that.

MR. MOELLER: Well, then, on Mr. Etherington's question, I had always heard that thiosulfate was unstable. It does not matter, but I would be curious as to how frequently you replaced it, or what you did, but if you are eliminating it, we can forget that.

Okay. Thank you.

Let's move on to the next item which is a listing, it says, of all improvements. I would rather say a listing of improvements that have been made since TMI-1 at the accident.

We want an overview here of changes of equipment, new staffing, written procedural changes with some back-up information on why the change was made and what it is expected to accomplish.

You are dividing that into four groups, then?

MR. CLARK: Yes.

On the equipment dates, Slear will make the presentation.

MR. MOELLER: Roughly how long, Mr. Slear, is your presentation scheduled?

MR. SLEAR: It really depends on how many questions you ask.

MR. CLARK: Without questions, I would think five or ten minutes.

MR. MOELLER: All right. Fine. Then we will cover equipment, Mr. Slear; staffing, Mr. Clark; procedures, Mr. Hukill.

MR. CLARK: We have made a substitution on procedures. Mike Ross will give the substitution on procedures.

MR. MOELLER: And Mr. Long on training.

It is item 5 on the agenda.

MR. CLARK: Mr. Chairman, while he is getting ready there, I guess I would like to make a general comment on the restart items and the bulletin items that we have covered. I do not have numbers on my agenda, but it is No. 4, ECCS outage, and the ones we have just covered.

MR. MOELLER: Yes.

MR. CLARK: What we are really doing in all of those cases is really giving you a status report. They are on the agenda because they are open items and therefore, you know, we do not have the definitive final answers in many cases as we would have if we were finished.

I think also in some cases we and the staff are together going through these things ahead of their going through them on some other plants, and that that attributes to their lack of some specifics in some cases and it is because of this status that we are trying to give you an intermediate point, rather than anything else.

MR. MOELLER: Thank you.

MR. SLEAR: My suggestion is that since most everyone who is interested has a copy of the hand-out, that instead of using overheads I would basically ask you to go through the hand-out page by page.

MR. MOELLER: Well, for the public, if they do not have the hand-outs, which they probably do not, it is helpful to put them up. MR. SLEAR: Okay. It is going to be more than ten minutes.

MR. MOELLER: Well, show them and refer to them as if they were not there.

(Laughter)

(Slide)

MR. SLEAR: I have arranged the handout basically in two parts. I have listed first the modifications that the NRC has required us to complete prior to restart; and the second part is a set of modifications that we, GPU, has committed internally to complete prior to restart. There may very well be some of those that subsequently the NRC has turned around and directed us to do prior to restart.

I have also tried to indicate for those that the NRC has required of us my knowledge of the source document as far as the requirements are concerned and the definition of what the criteria are.

As you look at the first page, I think people are undoubtedly familiar with the majority of these requirements. They came out of I&E Bulletin 79-05 and NUREG 0578. We are implementing those as indicated.

I think one thing worthy of pointing out on the first page is that our containment isolation, the NRC requirement is basically for diverse containment isolation. We chose instead of HPI in containment pressure to essentially isolate containment on reactor trip.

Containment pressure: We selected a number of process lines that could become contaminated and we would isolate those on highradiation on the process lines. In addition, we had a desire to keep cooling water surfaces to the reactor coolant pumps and chose line break detection as a diverse containment isolation signal for those particular cooling water lines.

As far as the other items, I think those are comparable to what others are being or have been required to do, and if there are no questions I would just as soon go to the second slide, but I can certainly entertain questions if you have some.

MR. MOELLER: We will have some. Mr. Lipinski?

MR. LIPINSKI: What is your tech spec on having the containment vent valves open, the purge valves?

MR. SLEAR: I don't know. Mike Ross, do you know?

MR. LIPINSKI: Because when you list containment pressure at 4 psi you are not going to develop 4 psi with your purge valves open, so that you've got some tech spec of 72 hours per year max for those valves to be open?

MR. SLEAR: As I recall, the requirement is, unless they are limited to 30 degrees open, they be open no more than 90 hours per year, and as I understand it, in effect we are limiting them to 30 degree open with the stops and sets on the limit switches.

MR. LIPINSKI: Right.

MR. SLEAR: And my understanding is of the regulatory basis that we no longer have the limitation on how many hours they can be open, once we have limited their travel.

MR. LIPINSKI: Once they are open, it is going to take a terrific flow to develop 4 psi when you say you are going to isolate on containment pressure.

MR. CATTON: That's a pretty big area with a 36-inch valve.

MR. SLEAR: They are 36-inch valves.

MR. CATTON: That is a pretty good area.

MR. LIPINSKI: It is going to take a terrific flow to develop 4 psi in containment when they are open.

MR. SLEAR: Those lines go shut on a high radiation signal.

MR. LIPINSKI: But when you give me a list saying containment pressure 4 psi and you have those vent valves open, tell me what the flow rate is to get the 4 psi.

MR. SLEAR: I do not know the answer to that.

MR. WALLACE: Excuse me, Mr. Lipinski. I want to make sure that you understand that is not the only signal to those valves. There are other signals.

MR. LIPINSKI: I understand that, but I am looking at a list that says containment pressure, 4 psi and if you have vent valves open in that containment, tell me how much flow goes through the vent valve to develop 4 psi in containment.

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

MR. CATTON: That question is kind of critical. It may take a large break LOCA to get the 4 psi.

MR. SLEAR: It may, and we may, within our company, know the answer. But I personally do not know whether or not a large break LOCA with a valve 30 degrees open would get you four pounds of pressure in the building.

MR. MOELLER: Walt, what do you suggest on that?

MR. LIPINSKI: Well, I have always seen this listed and it is never qualified. If those vent valves areopen, this is not a parameter that isolates containment.

MR. MOELLER: And that can be depended on 100 percent of the time.

MR. LIPINSKI: That is what I just found out.

MR. SLEAR: It is my understanding the reason you have diverse parameters is partly because of that concern, partly because of reliability.

MR. LIPINSKI: If you are going to have the vent valve open then you have to qualify the 4 psig as being how many million cubic feet per second on those valves to develop the 4 psig.

MR. CLARK: Excuse me, but I would like to be sure that you understand that with the purge valves open you still have diverse isolation on reactor trip for high radiation.

MR. MOELLER: We know that.

MR. KERR: Mr. Clark, I think the point is, if we never get 4 psig on that sensor, there is not very much point as listing it as a trip, and we are trying to find out if there are circumstances under which you could get it.

MR. CLARK: If the purge valves are closed, obviously you can get the 4 psig.

MR. KERR: But we are told you have no requirement for their being closed, so we cannot depend on their being closed, I guess.

MR. WALLACE: If I could try?

MR. KERR: Sure.

MR. WALLACE: For the circumstances we have for containment isolation, give~ a reactor coolant system rupture with the valves open, there are three possibilities to close those valves. Accepting your premise that pressure will not build up rapidly enough for that initiator, that is closed --

MR. KERR: That is not my premise. What we are trying to find out is whether it will or not. We do not know.

MR. CLARK: If the valves are open, it will not.

MR. LIPINSKI: Let me qualify where that 4 psi. came from. The Staff looked at pressure variations within containment, and on the average they came out 3 psi., and then they arbitrarily added 1 psi. to that value and came out with 4 psi.

Now if you are going to operate with the vent valves open, you are not going to develop the 3 psi. background pressure; you are going to be running close to atmospheric.

MR. MOELLER: Okay. On here you list a hydrogen contr , install hydrogen recombiner. You did not have hydrogen recombiners previously?

MR. SLEAR: That is correct. We had recombiners on Unit 2, but we did not have the recombiner installed on Unit 1. We have not installed it.

MR. MOELLER: Okay. And on the shielding design review, you have relocated the stack monitor. What did that entail?

MR. SLEAR: Basically the stack monitor was in a location where it was subject to radiation from fluid lines that could become contaminated, and as such affect its readings. Therefore we took the stack monitor out of its previous location, built a new room beside the stack away from any sources of post-accident radiation, since the background radiation could not affect its operation.

MR. MOELLER: Okay. Other questions for this page?

MR. ZUDANS: Yes. I am puzzled that purge valves are allowed to be open under any, let's say, 70 or 80 hours a day. Where is this new permissiveness, 30 degree open and 36-inch valve? It is almost open anyway.

MR. MOELLER: Are they saying it can be open continuously?

MR. SLEAR: That is what the speaker says.

MR. CATTON: 100 percent of the time at 30 degrees.

MR. ZUDANS: That is what he says, and that is what the whole issue is about.

MR. SLEAR: Ed, you may want to correct me, but it is my understanding that once it is limited to 30 degrees open --

MR. WALLACE: That is correct.

MR. ZUDANS: What does the NRC Staff say about that? That does not seem right, because an air valve at 30 degree open is essentially open.

MR. MOELLER: You are wanting a response from the Staff on this?

MR. ZUDANS: Yes. Whether they allow it and what is the rationale again.

MR. NOVAK: Tom Novak again.

The containment purge is a generic issue. We have had a lot of activity over the last two years. There were some interim positions on positioning of valves. The approach we are following now is to minimize purging. Just minimizing it as low as practicable for what I would call "consistent with the good operation of the plant," as well. So it is not the case that they can operate without regard to how much time out of any reactor cycle they are purging. There have been cases where plants have operated under a continuous purge. Those are the exceptions. And as we get to these plants, they are going to have to operate in a different manner.

So it is true that it was a mixed bag for a number of years. The approach now is to limit the position of the valves so that you have assurance of closed under LOCA loads and to then reduce the amount of purging. Purging and venting should not be used synonymously. Purging is normally used for very small lines. Venting is a large line, and we have to be careful of that kind of nomenclature.

MR. ZUDANS: But now we are talking about a 36-inch valve and 30 degrees open. It is essentially open.

MR. MOELLER: These are not smaller lines; these are the big lines.

MR. ZUDANS: And now if I read your correctly, you say that NRC does not allow the vent to be open all the time.

MR. NOVAK: We are going in the direction of reducing the amount of permitted purging and venting.

MR. ZUDANS: Are they allowed to be open 100 percent of the time?

MR. NOVAK: In some plant technical specifications, yes, that was the case. And it was analyzed such that in the event of an accident, the release that occurred while that valve was closing was considered in the off-site dose calculations. So it was done with knowledge, obviously, but there is a better way to operate the plant now.

MR. ZUDANS: Can these valves be closed at the full flow?

MR. NOVAK: That is why we put the limits on the position of the valves, to ensure that the closing can be accomplished with the forces available from the valve motors, I would guess.

MR. SLEAR: We have done calculations to confirm, based on model tests and extrapolations, that if they are limited 30 degrees open they will go closed.

MR. CATTON: Then you do know the flow rates, but you just do not have them here?

MR. SLEAR: I am sure we have them in the company. I just do not have them here.

MR. CATTON: What is your reaction to 30 degree open?

MR. NOVAK: I am sure we are aware of it. We can speak to it at the full committee meeting.

MR. ETHERINGTON: Containment pressure is only one of three isolation signals. Does each of the others isolate all of the lines independently? Any one of the other three will isolate all lines?

MR. SLEAR: Yes. High radiation would isolate the line that it is sensing, and I think there is one containment purge line -- is that correct -- coming out of containment?

MR. WALLACE: Yes.

MR. SLEAR: So high radiation will sense that line and close that valve and reactor trip will also close that valve.

MR. ETHERINGTON: Line-break detection?

MR. SLEAR: Line-break detection will not. Line-break detection is only on two cooling water systems that supply the reactor coolant pumps. Where those are closed systems unless those systems are broken, you will theoretically not be getting contaminatio external to containment. We want to keep those systems functioning so the pumps are available to us.

MR. ZUDANS: That is the seal coolant?

MR. ETHERINGTON: What about reactor trip?

MR. SLEAR: It will.

MR. ETHERINGTON: It will isolate all lines.

MR. SLEAR: All the purge valves. Each containment isolation valve has a diverse signal. That diverse signal can be a combination of reactor trip and four pounds reactor trip and 30 pounds. I am not sure about the line-break detection. 30 pounds in line-break detection, I think it is, then the high radiation in process lines is on top of those and provides a third signal for selected lines but not necessarily all lines.

MR. ETHERINGTON: Anything like the --

MR. SLEAR: But these containment purge valves do have three triggers.

MR. MOELLER: But I think you were just saying to us that two of the events must occur simultaneously to get the isolation. Is that what you are saying?

MR. SLEAR: No, no, no, I am not.

MR. MOELLER: Any one?

MR. SLEAR: Any one. Reactor trips, these valves are shut. Reactor trip, and these valves are shut.

MR. ETHERINGTON: Reactor trip does not shut all of the --

MR. SLEAR: Reactor trip shuts these purge valves. Reactor trip does not shut all the isolation valves.

MR. ETHERINGTON: I was trying to find out whether the containment pressure trip is an essential trip, and I am beginning to feel that it is because none of the others seem to do exactly the same thing. Is that right?

MR. WALLACE: Mr. Etherington, containment pressure is essential as one of the diverse signals for other lines, for other lines but not necessarily essential for the purge lines because of the reactor trip and process radiation monitors which will also close those valves.

MR. CLARK: So as we see it, if you have high radiation, it trips the purge valves even if they were open. Once tripped, pressure will build up and make the 4 psi. a meaningful signal for the other four lines.

MR. MOELLER: And high radiation is high radiation in the line, not just within containment?

MR. WALLACE: In the line, that is correct, sir.

MR. LIPINSKI: I am confused on that last point. The radiation will trip these valves and then the containment has to go to 4 psi. before other valves trip. Why does not radiation do that directly?

MR. CLARK: The pressure has to go to 4 psi. In order for that diverse signal to trip the other lines, in many cases radiation signal would also trip the other lines.

MR. SLEAR: I guess my comment would be when we sense radiation, we sense it in selected process lines. We look at that particular containment penetration and answer the question is it contaminated above some preset limit? If the answer is "Yes," we shut that valve based on a radiation signal.

MR. LIPINSKI: Why would pressure in itself be a requirement to isolate the other lines?

MR. SLEAR: Pressure is an indication of a high energy line break inside containment.

MR. LIPINSKI: Okay. But if I have got activity first, why would I not be isolating certain lines on activity before pressure goes up instead of isolating the containment building of the pressure and then doing further isolation?

MR. SLEAR: Do not forget the reactor trip. If the reactor has tripped, if you have a transient that has tripped for the reactor, you have also sent the signal to close these valves and other containment isolation valves.

MR. LIPINSKI: Somehow this is not clear without knowing specifically what the other lines are and what the conditions are for their closures in terms of how the sequence proceeeds.

MR. WALLACE: If I could maybe direct Mr. Lipinski to the right place -- I do not have the table with me today -- there is a table in the restart report that covers all the containment isolation lines and all the old and new signals.

And what you will see is we have prioritized the lines on the basis of the functions of the lines and our perception of the importance of those those lines for various events. The least important lines -- and I will go to another example -- some drain line would isolate one of the earliest signals, reactor trip being the earliest signal that would precede radiation or anything else. The more important the line for continued operation -- and I would include reactor coolant pump services in that condition-- would isolate only under the most extreme conditions of 30 pounds in the building, or rupture of those lines which would interrupt their containment integrity since they are otherwise closed systems.

So I think a review of that table might give you a better feel for the kind of system we install.

MR. ZUDANS: And, of course, pumps would be shut down when that happened?

MR. WALLACE: That is correct. We retain the services so we have the capability under inadequate core cooling conditions to restart and maintain seal integrity.

MR. LIPINSKI: Thank you.

MR. ZUDANS: I do not quite know whether you are allowed to keep your purge valves 30 degrees open indefinitely or, as he says, you are attempting to reduce the period of time they can keep it. Now which one is right?

MR. NOVAK: We are in a transition period here. There was a period of time when tech spec allowed 90 hours over the year.

MR. ZUDANS: I remember that.

MR. NOVAK: Now I am saying we are looking at these individually to go down to what I will call a minimum value system with acceptable plant operation.

MR. ZUDANS: But he is correct in what he is stating as of now?

MR. NOVAK: We will be getting to this.

MR. ZUDANS: But he is not going to be able to enjoy that luxury; is that correct?

MR. NOVAK: I think that is correct. We do not know exactly on what time frame, but we are in the process of looking at this now on all operating reactor plants.

MR. KERR: There must be some reason these purge valves are open occasionally. And one, I thought, was in order to allow entry to containment to do inspections. And that is not a negligible safety consideration. I think, before we close these valves unequivocally, let us look at the system effect.

MR. ZUDANS: Well, I just want to find out if they work together or each one assumes their own rules. I do not really care.

MR. MOELLER: Well, in the past there have been examples where they reduced purging to cut down on the airborne radioactive material being released. Then that cuts down on the frequency that inspections can be made. And there have even been examples, hopefully now correcting where lack of purging called the radiation instruments within containment to be offscale. So if a further increase in radioactive meaterial had occurred, it would not have been detected.

MR. ZUDANS: I felt that the reduction in purging time was mainly associated with the desire to be able to isolate containment. No?

MR. MOELLER: Well, can we go to the second page?

MR. SLEAR: Yes, sir. I guess on the second page I will certainly address any questions you have.

(Slide.)

Containment water level, we have in fact installed a control-grade wide range. We are going to have this by 1/1/82 and have a second one with qualified indicators in by 1/1/82.

MR. MOELLER: And what assurance -- we will be covering that tomorrow -- but what assurance do we have that your pumps, sump pumps in containment, will not be out of operation or their float valves nonworking and so forth?

MR. SLEAR: I guess I am not sure what the question is.

MR. MOELLER: I think the Indian Point plant recently had a problem of flooding of containment. Have you studied that problem?

MR. SLEAR: Yes, I am aware of that problem. I guess what I am calling narrow, we already have an indicator of level in the sump, the small sump, which I will call a narrow range, and we are replacing it with new indicators when we go to the "safety-grade" system which will be redundant. In this case, the zero to 90 inches is from the containment floor itself. So you would get indication of the water level both in the small pump and if they overflowed.

MR. MOELLER: Are these in duplicate?

MR. SLEAR: They will be in duplicate when we install the safety-grade installation. They currently are not. Zero to 90 inches covers a different range, if you will, than the narrow range that was installed since the plant was operational.

MR. MOELLER: Is this iodine particulate sampling in the building's purge lines; is that what you are saying?

MR. SLEAR: That is correct. That is from the vent from the station.

Are there any other questions?

MR. ZUDANS: Where does your pressurizer spray water come from? From reactor coolant pump?

MR. SLEAR: Yes. And it puts basically the spray valve --

MR. ZUDANS: You do not have a redundant spray?

MR. SLEAR: Mike, do we have the ability to spray with systems outside? I am not aware of it.

MR. ROSS: Well, on the high-pressure system, we do not have a redundant spray, but we have the ability to spray when we are on low-pressure cooling or decay heat removal. So we do have two sprays: one a high pressure; one a low pressure.

MR. SLEAR: Does that answer your question?

MR. ZUDANS: Yes.

MR. MOELLER: Several of the items on this page we will be covering tomorrow in greater depth. So it is good to see them listed here. Let us go on to the third page then.

(Slide.)

Fire protection.

MR. SLEAR: Once again, these are all -- I am not sure you have covered them separately as part of the TMI-1 restart, but we are implementing the requirements that the NRC has laid on us in CFR 50 Appendix R.

MR. MOELLER: The Staff has reviewed the fire protection changes, and thereare no problems here; is that correct?

MR. DI IANNI: Their submittal is still under review. We have not completed the review yet.

MR. MOELLER: What is the schedule for the completion of that review? I do not recall it having been listed as unresolved or outstanding item.

MR. DI IANNI: It is not an outstanding item for restart.

MR. MOELLER: You can complete this after restart?

MR. DI IANNI: That is correct.

MR. WALLACE: Mr. Chairman --

MR. DI IANNI: In other words, they have to meet the schedule in Appendix R. There is a sche .e specified in Appendix R.

MR. MOELLER: For operating plants?

MR. DI IANNI: For operating plants, yes.

MR. MOELLER: What is that schedule, roughly?

MR. DI IANNI: I do not know.

MR. NOVAK: It is a staggered schedule, Dr. Moeller. A number of pieces of equipment, for example, are required by the end of this year. I recall a December date. We have had a number of requests for exemptions to certain parts of that rule, for example, dedicated shutdown systems or what they refer to in fire protection as an alternate.

So we are treating Three Mile Island as any other operating reactor, and it is just a question of priority.

MR. MOELLER: Any other questions on this page?

MR. KEYSERLING: I have a question under the control room design review where it says "Show normal range on meters." I know that was one recommendation coming out of the review. There were also some questions about meters failing in mid-range. Has anything been done in this area in terms of actually changing the meters or changing their failure mode?

MR. SLEAR: I am personally not aware of any changes.

Dick, do you know of any changes that have been made, or Gary? The question has to do with the failure mode of meters: Have we made any changes associated with the concern that I guess the -10+10 volt signal feeding them if they fail to zero, do they fail midscale?

MR. KEYSERLING: Yes.

MR. SLEAR: I am aware of that situation.

MR. BROUGHTON: My name Gary Broughton. I am from GPU. Pending the results of the test that Mr. Chisholm talked about earlier, the test will deenergize certain power supplies to test which instruments do fail. We do plan to mark meters which have a particular failure point that is important to the operator, and that would be done before restart.

MR. MOELLER: But this is simply again a marking. You are not getting to the fundamental problem. Am I correct?

MR. BROUGHTON: In the short term, what we would be doing is marking the meters to indicate their failure point. There is no plan in the near point to change out the meter circuits; they are a different failure point.

MR. KEYSERLING: What if the failure point happens to be in a normal operating range, how would you know that you have a failure instead of normal conditions?

MR. BROUGHTON: That would be the purpose of the marking on the meter, to indicate that the faliure was not at that normal point. Plus another output of this test program is to provide that type of information so that the operators could be trained on what they would expect to see pending different failures of instruments.

MR. KEYSERLING: I am not sure that they would always be able to distinguish normal conditions from failures.

MR. KERR: The sign would say, "If the meter reads normally, it is broke."

(Laughter.)

MR. MOELLER: Let us do have comments from the Staff.

MR. NOVAK: Again, let me try to help. What the idea of this test is to accommplish is to identify for a different power supply what are meters that can be affected by low power supply and then to identify where that meter would read given it were to fail.

Now the logic in this interim fix is to first identify what power supply, so to speak, has failed. Then the operator knows from his training which instruments he can rely on. He knows that certain instruments would be affected by an NNI bus A failure, and he knows that that instrument is to fail at a certain range. He now knows through his procedures what other backup instruments can give him what information he would have read off that instrument.

MR. CATTON: If it fails in a normal operating range, how will he know it has failed?

MR. NOVAK: He first knows he has a bus failure. If he has a black bux failure, all black-marked instruments tagged black are not to be relied on.

MR. CATTON: It is a separate indication?

MR. CLARK: Yes. I think Mr. Chisholm covered the fact that we have put in indication of failed power supply. So if a power supply fails, an operator will get an indication that that power supply has failed and he then knows what instruments are suspect.

MR. CATTON: I certainly hope this power display system is displayed properly.

MR. CLARK: It is.

MR. MOELLER: Is this under review by the Staff, or are you happy with what we are hearing in this?

MR. NOVAK: This is part of the 79-27 Bulletin review, and until we have seen the Licensee's response exactly, I would just have to hold the review open.

MR. KEYSERLING: Are there any long-range plans to overcome this situation in terms of new standards for instrumentation and how they would behave under power failures? Because it seems at best that this is only an interim and perhaps doubtful solution.

MR. NOVAK: I think the long-erm solution is the dedicated panel, which would be independent of any NNI failure. The system is built -- in fact, unless you decide to tear out your control room and start all over and rectify these kind of things, you are going to lose a certain amount of instruments if you fail a bus.

The idea is to have enough redundancy so that you are not missing any important piece of information. The idea of a dedicated panel independent of any of these bus failures, that is the panel that the operator is trained to go to to get the confirmatory information to accomplish safe shutdown.

MR. ZUDANS: I perceive the problem as something more profound than that. I think the idea of failing an instrument for whatever reason in the operating range is a wrong one, anyway.

MR. MOELLER: Fundamentally, it is wrong.

MR. ZUDANS: Yes. If the instrument fails for either power supply or whatever, it should not fail in the operating range, because that makes no sense at all. You cannot solve it by having indications of buses or whatever. In the long range, that should not be allowed.

MR. NOVAK: I really don't have the detailed information. We got into this discussion by saying minus 10 to plus 10 and they fail to zero, by definition you put me in the operating range.

MR. ZUDANS: Just forget about TMI. Just in general.

MR. NOVAK: We don't know, and that's why we are looking at this information.

MR. ZUDANS: You know, your gasoline indicator, fuel indicator, fails at an empty tank, so you worry.

(Laughter.)

MR. NOVAK: I've had a failed gas fuel tank since the day I bought my car.

(Laughter.)

MR. MOELLER: Okay. Walt, and then let's go to the next page.

MR. LIPINSKI: Where in TMI-1 is the drain tank pressure temperature indicated? Is it on the face of the control panel?

MR. SLEAR: Mike Ross, I suspect you're best prepared to answer that.

MR. ROSS: The RC drain tank pressure and temperature are indicated in the control room on one of the back panels. But the back panel is readily available to the operator.

MR. LIPINSKI: Hold it. This is TMI-2 we are describing, or TMI-1?

MR. ROSS: TMI-1 I'm describing. It's a back panel. It's is in the control room itself.

MR. LIPINSKI: He can see it from the main console?

MR. ROSS: He can see the main indication from the console. He may have to take a step back to the computer to see it.

MR. LIPINSKI: Now is it recorded, or just indicated just that when it blows it goes to zero?

MR. ROSS: As far as level is reported; as far as pressure it's just indicated. As far a temperature, it's just indicated. I might also add that these are alarmed computers, both these parameters.

MR. LIPINSKI: Yes, but so is TMI-2, except when they blew they went to zero. Pressure and temperature.

MR. CATTON: Then went back to normal.

MR. LIPINSKI: They went back to normal. Then the fallback indication was containment pressure. containment and pressure.

MR. ROSS: But any perturbatio.. you would have, you would see a spike on your level recorder and it would be readily apparent that something had happened in that drain t nk.

MR. LIPINSKI: Except I'm going back to TMI-2. These were going up and I think somebody noted it in the first 15 minutes, and when it blew it went back to zero, and it was not a piece of information that was being followed after the first 15 minutes.

MR. CATTON: As a matter of fact, they thought everything was fine since it went back to normal.

MR. LIPINSKI: That's right.

MR. CATTON: Why don't you trend the information? Is that a costly thing to do?

MR. ROSS: We do trend some of the information, as I pointed out. We trend the level indication in the tank. Should you have a relief valve actuation or anything going into that tank, that level would show a trend and continue to show a trend. So it's strictly not just looking at temperature or pressure.

MR. LIPINSKI: If I blow the disc, the level is going to flash and the liquid is going to go out through the disc. That level will go back to zero. You'll see that on your trend recorder. You will have built up and then gone back to zero in the tank.

MR. ROSS: The probability level indicator would indicate full. That would indicate --

MR. LIPINSKI: If that rupture disc goes and I have a heated liquid over 212?

MR. ROSS: We have a DP instrumentation with a dry lake in that particular tark itself.

MR. CATTON: So once it blows like that, it ceases to be operable.

MR. ROSS: I wouldn't say ceases to be operable, but it's a good chance it indicates --

MR. CATTON: Indicating full when it's not full, by my definition that ceases to be operable.

MR. ROSS: The RC drain tank -- let me just clarify. The RC drain tank is not the only parameter we're loo' ng at to determine whether or not a code safety valve or a PORV valve is open as it was in the past. We now have flow indicators on the console telling us it's open. In addition to a flow indicator on the PORV, we have an accelerometer. So we have two redundant indications on the

PORV valve now, in addition to the much talked-about light indicator.

So what you have is a myriad of indicators that you can draw indication from. You have a flow meter telling you the safety valve is open. He'll have the temperature indication of an increase that will stay up in that tank and say, gee, you have a high temperature. You have a level increase that will do something funny at worst case. And you have a pressure indication and an alarm on the computer.

So you have more than one indication to draw a conclusion from.

MR. CATTON: I thought you had a concern about confusing the operator with too much information?

MR. ROSS: We do, but we also like to have enough information to draw concrete conclusions. He will know the valve is open, he'll know something's happened in the tank to bring the temperature up, he'll have increase in sump level. It's like anything in the plant. There are more than one indication to draw conclusions from.

MR. MOELLER: Any further questions?

MR. KEYSERLING: The last item on the page it says "annunciator, tone alarm adjustment." Could you just clarify what that means?

MR. SLEAR: Yes. My understanding of this is that there are several different annunciators in the control room, and the intent of this modification is to, number one, be able to adjust their volume so that the decibel level is appropriate for where the operator is and the sound background level in the control room. So it's going to be adjustable. And I assume the human engineers will decide annunciator X has got to read db Y at this location and that will be set up as part of the testing.

MR. KEYSERLING: But once it has been adjusted it will be fixed? In other words, the operators won't be able to readjust these downward?

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

MR. KEYSERLING: Well, that could be fairly -- it's not uncommon for people to turn down annoying things, even if these annoying things happen to be alarms. And I would strongly suggest that if these things are made adjustable that they not be made adjustable to the operators.

MR. SLEAR: Gary Broughton stood up. He may know the details on it.

MR. BROUGHTON: Yes, that is the intention. The alarm sound level will be set with the test procedure before the plant startup, and then those settings would be prese d.

MR. KEYSERLING: Thank you.

MR. MOELLER: Let's go to the next page.

(Slide.)

(Pause.)

MR. MOELLER: All right, if there are no questions on this, why don't we move on.

(Slide.)

We are seeing?

MR. SLEAR: It's the ICS again.

MR. MOELLER: Right, some items we've already seen. We will be talking about separation of TMI-2 and 1 tomorrow.

What is the --

MR. SLEAR: With regard to physical modifications, we have in fact installed a separate TMI-2 RCS sampling facility and removed the TMI-2 facility from the TMI-1 area. We are in the process of doing that. The fuel handling building modifications, they were aimed at divorcing the ventilation system in the auxiliary building from the fuel handling area. So it includes both a damper that goes shut on the high radiation in the fuel handling area, and also a barrier for some lower doors that previously would have enabled the auxiliary building to communicate freely with the fuel handling area.

MR. MOELLER: What is the last one, the concrete coating?

MR. SLEAR: We are recoating areas in the auxiliary building and in the containment itself, recoating with paint, if you will, areas that were worn, areas that were chipping. The thrust is, or why is to improve our ability to control contamination really on a day to day basis when we're operating the plant. And if you have an accident, it would make it easier to clean it up.

MR. MOELLER: Any questions on this page?

(No response.)

MR. MOELLER: Let's go on to the next.

(Slide.)

MR. MOELLER: We have talked about the control room. We will be talking about details later on the agenda.

The decay heat pumps; should we ask anything here? Does anyone want to ask about that?

MR. SLEAR: If I can elaborate on it, the perception is that with an accident and the radiation levels we experienced at Unit 2 and those required to be addressed by NRC, we won't get back into the decay heat pump pits for many months, if not years, due to the high radiation level. And if you put that system in service, you want to be able to monitor the pumps, i.e., vibration monitors. They do use oil over periods of time. You want to be able to monitor the oil levels and re-oil them. And in fact if they become air-bound you want to vent them.

MR. MOELLER: You're doing all of that remotely?

MR. SLEAR: Yes.

MR. MOELLER: Okay. Questions or comments?

(No response.)

MR. MOELLER: Okay, let's go to the last page.

(Slide.)

What is that first item, or can you elaborate?

MR. SLEAR: The engineered safeguards actuation system essentially activates at 1600 pounds and decreasing to initiate high pressure injection. We had a situation-- well, previously the design, if in fact the operator recovered pressure and met his criteria for terminating high pressure injection and in fact turned off the high pressure injection pumps the system did not automatically rearm, such that if he repressurized, the PORV stuck open again, he went through 1600 pounds a second time. If the operator is not paying attention and doesn't manually re-initiate HPI, the IE/SSA system, the system doesn't rearm itself. We just basically made it an automatic reset such that when we've recovered to above 1600 pounds and the operator manually terminates it, the system is primed to fire again. If something else goes wrong and you drop below the set point, it requires an action.

MR. MOELLER: And can you elaborate on the last item? We've been talking about containment isolation.

MR. SLEAR: The ASCO solenoid valves?

MR. MOELLER: Yes.

MR. SLEAR: Yes. There was I believe a bulletin or a circular that basically said that ASCO alerted us as a Nation I guess that they have solenoid valves with limited life inside containments, and we took off to evaluate all our ASCO solenoid valves. Our ASCO solenoid valves are outside containment.

In this case we identified and reported in an LER the fact that these 11 ASCO solenoid valves were designed to operate with a maximum differential pressure of 70 pounds, and our instrument air can maintain 90 pounds, so the valves were really designed with the wrong differential pressure. So we've replaced them with the right valves.

MR. CATTON: Aren't the PORV's the refurbished valves? Isn't that the same manufacturer?

MR. SLEAR: That is the same manufacturer, that's correct. We also -- as a matter of fact, I forgot to list it -- but we sent the safety valves back also, and we have now sent the safety valves back and had them refurbished and have had them tested.

MR. CATTON: So you are taking the PORV out of the system to refurbish it. It wasn't done in place?

MR. SLEAR: What we did, we refurbished the spare PORV and put it on. We have spare safety valves and we have spare PORV's.

MR. CATTON: So you're happy with that Dresser valve?

MR. SLEAR: For the time being, we're happy with the Dresser valve. I know of no reason we wouldn't be.

MR. ZUDANS: What is the manual control from the control room? Didn't you already have that?

MR. SLEAR: No. And in fact some of the inadequate core cooling procedures now require and direct the operator to use the valve. He could have done that, he had to leave the control room and be in communication with someone somewhere else. We have concluded that it is better -- At Unit 2 we had that, as I recall. At Unit 1 we did not have that switch and we now have it.

MR. MOELLER: Okay. Any further questions on this first topic of the changes that have been made?

(No response.)

MR. MOELLER: Thank you, Mr. Slear.

MR. ZUDANS: I wanted to ask a question on the previous page, which went so fast.

MR. MOELLER: All right.

MR. ZUDANS: On the reactor coolant pumps on the previous page, can you explain what that means?

MR. SLEAR: Yes. On Unit 2, as I am sure you will all recall, the pumps were off and we wanted to get them back on. Everybody was worried about when do we turn them on, and are they going to start. And as you looked at the circuits, there was a concern raised early in the game: Gee, did we put these surge suppression capacitors in Unit 2? It turns out we didn't in Unit 2, but in Unit 1 they were in there. The concern is over starting turns, the damage to the motors under many, many starts.

The surge compression capacitors turn out to be the limiting integrated dose radiation item when you look at the reactor coolant pumps. I think we were gaining like a factor of 10 or 100 on the ability of the next limiting item on the pump. And in fact, the circuits, just the cabling, on the analysis of the capacitance of the cabling going to the pumps it turns out we really don't need those surge capacitors. So we just removed them.

It was really, as we were looking at Unit 2 we remembered they were in Unit 1 and they might be limiting, and after the accident we concluded in Unit 1, since we don't need them, why not take them out.

MR. ZUDANS: Did you start the pumps up?

MR. SLEAR: Yes, sir. And it is not a problem.

MR. MOELLER: Well, thank you, Mr. Slear.

Mr. Clark, looking at the clock and thinking in terms of the comment on the report prepared by the majority staff of the Committee on Interior and Insular Affairs, you are going to have people arriving to do that?

MR. CLARK: Mr. Dieckamp was scheduled out of La Guardia at 2:10. The plane was delayed until 2:45. So I expect that they will be here imminently. They are the people who are prepared and I do not think we have people here who are really prepared and the proper people to do that.

MR. MOELLER: Well, we hesitated to call on Mr. Stello until they arrived, so that they could hear his presentation.

Mr. Stello, would 5:15 or something like that be okay to start with you? It's not --

MR. STELLO: We are at the pleasure of the Subcommittee. Whatever it desires, we will be happy to do.

MR. MOELLER: Well, all right. Let's go ahead quickly with the -- let me make a suggestion, Mr. Clark, as you come up. You are going to talk on staffing changes, and yet we do have an item, item 6, management and organization. Were you going to give that presentation also? I mean, later when it's scheduled? Could you delay staffing and do it at that time?

MR. CLARK: We can take them in any order you wish.

MR. MOELLER: I think maybe I would suggest we combine the presentation you are about to make, delay it and combine it with item 6 on management and organization. Then training, the last of the four items, the Subcommittee heard a detailed review of your training program at the last Subcommittee meeting, so I don't think we need to hear that again.

So what I am suggesting is we hear procedures and then let that wrap this up, and then we'll take a break and then we will move onto the next item.

Mr. Catton?

MR. CATTON: Last time we discussed mixing of hydrogen, and I understand there is a report from Lehigh where they supposedly took their hydrogen collection to the top of the dome to rest. We discussed hydrogen mixing in the top of the containment last time, and I understand there's a report available, work done by Lehigh or something?

MR. MOELLER: Right. Where should we cover that?

MR. CATTON: I would just like to get a hold of the report, and I could bring it up tomorrow.

MR. MOELLER: Is that report from Lehigh Univeristy on the hydrogen, hydrogen mixing within containment, is that available? Mr. Catton would like to see it.

MR. WALLACE: I think we provided that after the last meeting, sir.

MR. MOELLER: Didn't we already provide it?

MR. CATTON: I may have it. If I do, I've lost it. Maybe I should get another one.

MR. MOELLER: All right, provide him with another one. Let's go on to procedures and Mr. Ross. And we'll take a break when Mr. Ross is finished.

MR. ROSS: Gentlemen, I will address the agenda item on procedures and improvements we've made in procedures. Generally, after looking at our procedures, we wanted to increase their technical content, yet make it eaier to understand for the operator. We wanted to increase their pictorial appearance to the operator so he could easily read it.

We also wanted to change our review chains so that we got the proper people with the proper expertise in reviewing them, thus increasing the two items I just talked about. In addition, we wanted to make sure that our operators knew what the management policies were on procedur-- and the various items that revolved around procedures. So those were our three undertakings on procedures.

The changes we made to procedures included incorporating into them stressing the heat transfer aspect of maintaining adequate core cooling, incorporation of NRC bulletin items, lessons learned task force recommendations, philosophy of using multiple plant parameters to judge system conditions -- in other words, don't just rely on one single indicator -- including as a follow-up action the rechecking of key parameters using available alternate indications, denoting the use of newly installed systems designed to assist in combating any accidents -- in-core thermocouples would be a good example of that; providing firm instructions for continuing high pressure injection, and providing definitive instruction on bypassing the engineering safeguard signals, including in the procedures definitive operator guidance where necessary to accomplish core cooling through either the PORV or the code safety valves in order to prevent core damage.

MR. CATTON: What's the difference between firm instructions and definitive instructions?

MR. ROSS: We wanted to make sure they were firm but also tell them exactly what they should be, not just a firm "do this," but "do this in this manner." Including independent verification -- Did I answer your question, sir?

MR. CATTON: I'm confused. Would you answer that again?

MR. KERR: Do you want a firm, definitive definition?

(Laughter.)

MR. CATTON: I give up.

MR. MOELLER: Go ahead, Mr. Ross, and repeat your answer. And we will see if we can provide --

MR. ROSS: I was saying, we give the operators firm instruction to continue high pressure injection. Definitive instructions mean we tell him exactly what to look at, in addition to having instructions to do that.

MR. CATTON: So "firm" is a level beyond-- "definitive" is the level beyond "firm"?

MR. ROSS: "Definitive" tells you exactly how to do it, in my way of thinking, not being an English major.

MR. CLARK: "Firm" implies you don't use judgment, you absolutely do it. And "definitive" implies detail or specificity.

MR. ROSS: I think that was our thrust.

MR. KERR: I'll be glad to give you a short seminar on the difference some time. They are different.

MR. CATTON: Good, I'd appreciate that.

(Laughter.)

MR. ROSS: Some of the other items we wanted to include in our procedures, and have been required to include: independent verification of system lineups and components to ensure that we have emergency feedwater and the ECCS system is available prior to doing any maintenance on that system.

We also changed the procedures to include valve lineups and independent alignments after maintenance or testing, to assure the system is placed back into service properly.

We upgraded the procedures to reflect newly installed change modifications. We also incorporate a firm guidance to initiate the emergency plan when the applicable E plan initiating event is reached.

We made an effort to make procedure words and plant equipment labels agree throughout all procedures.

To increase the pictorial view of our procedures, we blocked caution notes. That is supposed to visually aid the operator in noting the importance of these items.

In order that the operator more fully understood what the purpose of an emergency procedure was, we added an objectives section to each emergency procedure.

To ensure our procedures do not become so cumbersome to use that the operator lost faith in them, but still give sufficient guidance to the operator, where required, we've added appendices to some of the procedures giving step by step alternate actions to be taken if during the course of a procedure the required action did not take place as expected.

A good example of that would be if the emergency feedwater didn't start, you would go to the appendices and that would tell you exactly step by step how to restore the emergency feedwater system.

Many of our changes came about not only due to NRC bulletins, but due to our management study of the Unit 2 accident and the Human Engineering Team did a walkthrough of our procedures. We for some time been doing a human engineering walkthrough of procedures on the mockup at TMI.

Some additional emergency procedure changes resulted from actual simulator checkout of plant procedures with our TMI crews during their normal training selection. The crews while there not only checked out the procedures, but they also checked out the crew concept of training that we're advocating at TMI that we briefly talked about. Basically that concept says that everybody in the control room has a specific duty and a specific function. They have a specific place to be and they have a specific function that will be accomplished in that area.

We've trained STAs, shift foremen, shift supervisors, and control room operators in that concept. We've used that concept during emergency drills at TMI and the big emergency drill of June 2nd. It worked very well for us and it really improved communications.

MR. LIPINSKI: Mr. Chairman, before you continue, I like the fact that you have inserted these alternate actions. And generally most of these emergency procedures have an automatic section, and the operators verify that it took place. Does every procedure that has automatic action have an alternate action for the operator if it does not happen automatically?

MR. ROSS: I think the answer to that is definitely no, not every procedure would have a detailed guidance for an alternate action for every single step that happens on a trip. The major items would in fact have alternate actions.

MR. LIPINSKI: You mean if I flipped to an emergency procedure and it says automatically so and so is going to happen, verify it, that you won't give me guidance if it doesn't happen? I'm going to be left up to my own devices to how I'm going to proceed?

MR. ROSS: No, I wouldn't say it in quite those words, sir. What I would say is the procedures would get you out of that problem in some part. For instance -- let me find one that isn't in there.

The turbine bypass valves automatically open to control 10-10 pressure. We probably won't give you an alternate action for that because there's not much else that can be done other than try to take manual control of the bypass valve. So we won't tie you up with saying, take manual operation of that particular valve. But we would in fact give you definitive guidance if you failed to get an emergency feedwater system to start. We would put you in the procedure and give you an item.

MR. LIPINSKI: Take high pressure injection for an example. If high pressure injection was to come on automatically and I observed that it didn't, that system can fail in two ways. One, the sensors that pick the signal up and were to inject it, were to cause the automatic action, all failed, because there would be more than one; or the signals were picked up but they didn't get through the breakers that were supposed to close to stark the pumps.

Now if I execute a manual action and I go through the same breakers, I may not be able to close those breakers remotely if that's where the failure has occurred. Have you gone into that depth of detail to see where the problem may arise and what guidance you're going to give the operator?

MR. ROSS: We haven't gone into details where we're going to analyze the signals per se. We feel that would really complicate it.

Let's take the example you gave, high pressure injection wouldn't initiate. We would have procedures to manually initiate.

MR. LIPINSKI: Yes, that's right. They switch on the panel and that's where the failure has occurred, it's downstream from the switching action, so the automatic system couldn't propagate through and the manual action cannot propagate through. What's my next step?

MR. ROSS: You start the redundant emergency system. You verify you have the other systems fully functional, because you know that in fact all ECCS systems are in fact redundant.

MR. LIPINSKI: I'm giving you multiple failure.

MR. ROSS: I understand. Let's just go on. Let's say it progressed to where he only got one of the systems. When he got into the inadequate core cooling section he would have additional guidance on what to do with the core. You wouldn't want the procedure to be so detailed that we start talking about putting a jumper in the breaker or something like that at this point in the procedure.

MR. LIPINSKI: I'm asking for the appendix, though, because you said you had an appendix. I wouldn't expect to necessarily see these failures to be in that procedure such that the procedure becomes 100 pages long. But if something didn't happen, that you allowed me to jump to some other section that I could refer to.

MR. ROSS: I think in many cases we do that. Emergency feedwater is one I gave. Inadequate core cooling is another example. We wouldn't give you guidance in manually initiating, but putting into a procedure how to jumper out a breaker for an item so remote to happen, I don't think you've done the operator a justice. You've burdened him with a pile of paper is what you've done.

MR. LIPINSKI: Yes, except when he's in that control room and things are happening quickly and he doesn't have an opportunity to digest, assimilate and plan a course of action. You in your office can take your time and think something through and recommend before it happens, and it's a lot easier to do than when you're under pressure.

MR. ROSS: I agree with that, naturally. And the point I was trying to make is that we have done that on many occasions. In the case of high pressure we have, but we haven't gone down to where we put a jumper in because the fourth item in the line possibly could fail. We haven't analyzed it in such detail that we've looked at triple and quadruple failure.

MR. LIPINSKI: That's right, and they have happened.

MR. ROSS: The only comeback I would have to that is that if it ould happen we are adequately staffed now to handle that. The concept of training, the inadequate core cooling procedures we're designed to handle that. When we get to a point, when we have met something that is not happening properly, we have on site technical advice right away from the shift technical advisor.

MR. CLARK: I think there are a large number of contingencies for which you could write procedures or alternate procedures and appendices. What we've done is provide a good number of those where we felt it could be helpful to the operator. That's been done in conjunction with the operators in terms of where they felt they could use guidance as opposed to being able to rely on the rest of their training.

Mr. Ross is the operations manager, not the designer. And we have given a fair bit of weight to the opinion of him and his people as to what truly would help them in an emergency.

MR. LIPINSKI: I think you have hit on a key point, because this is going to come up in our later discussion as to the role the procedures play and the rule training plays. Because there was a paper written by one of the ACRS staff, not consultants but fellows, and his conclusion was contrary to what you are stating now. And I agree with you in terms of where training fits in. Procedures are only part of the picture.

MR. ROSS: Very defintely. That's been our whole management approach. It's a twofold approach: the procedures have to be good and the training has to be better.

MR. ZUDANS: Your procedures consist of hard copies stored, conveniently accessible to the operator?

MR. ROSS: That's correct, sir. They're hard copies like this. We've arranged them so they're a little bit more accessible to the operator by having a pullout book. It's like a parts book. He goes 12026 and he's on the console right in front of him.

MR. ZUDANS: Have you ever considered putting a certain set of the procedures on the computer in a recallable form, or in fact even going a step further and in your computer system picking out the proper procedure and telling the operators: Here, you may either follow this or that or that, for these and these reasons, and then flash it on the screen for him. Or is that going too far?

MR. ROSS: Gary Broughton, do you have anything to add to that?

MR. BROUGHTON: The answer to your question is that is something we're looking at. We don't think that we're yet prepared to implement computer-assisted procedures yet, although I think the last time we talked to the Subcommittee we gave an indication of the direction we're going and the type of things we're studying.

MR. ZUDANS: Yes. You do have a new computer?

MR. BROUGHTON: The computer is capable of doing the work.

MR. ZUDANS: It's just a matter of getting the right software?

MR. BROUGHTON: That's correct, and making sure we have the format that is useful to the operator. We're doing a lot more thinking about how we want the operator to interface with the computer, as opposed to the procedures that he's using now.

MR. ZUDANS: I like those things, and there's a very simple reason for it: The computer can react to anything so much faster than a human being can. For example, if you flash the procedure, or even if it didn't flash the procedure -- you said to the computer, I'm going to proceed with this procedure. It would monitor what you do. If you did the wrong thing, it will come back saying: fellow, you're just not following the procedure or something of that nature.

MR. LIPINSKI: Mr. Chairman, at my last visit to the Zion simulator the procedures that were in the back of the simulator room had a logic diagram laid out in computer format that effectively guided the operator in terms of what the procedure was to look up, based on the condition of various key plant variables, namely, is pressure greater than, less than; he goes to a branch that says, is this condition here or there; he goes to a branch and it says, look up procedure so and so.

Effectively they had the thing laid out in the format that you would see somebody who's designing computer software in terms of his logic diagram -- somebody had done some advanced thinking as to how the various parameters in the plant allow you to do your diagnosis as to what procedure applies in the particular set of conditions.

MR. ROSS: We've done some looking at that. In fact, we have some work in progress. I'll just ask Gary Broughton to very briefly describe our work in progress. We have not ignored that.

MR. BROUGHTON: The type of work you've just de[illegible]ibed is something we're looking at in conjunction with an abnormal operating guide program, which is a B&W program to develop improved operating procedures. The improvements that are being looked at are both in terms of technical content and in terms of presentation of that information to the operator under the conditions that would exist under the transients.

Logic diagrams are part of that. We're also looking at using the computer to present information that's directly related to the procedure and to provide the operator some guidance as to which parts of the procedure he ought to be addressing based on plant conditions that he has determined.

MR. ZUDANS: Thank you.

MR. ROSS: In fact, we have recently gone as far a to check some of that out with experienced people on the simulator, just looking specifically at that concept.

MR. MOELLER: Why don't you go ahead and wrap up your presentation?

MR. ROSS: Thank you.

In addition to the actual procedure upgrades, we have changed our way of reviewing and approving procedures. We hope that these changes will in fact improve the quality of the review and help the people involved in the review to focus on safety items.

Under the previous method of procedure review and approval, basically anybody could submit a change. We're not trying to discourage that, but then the changes will all end up in the Plant Operations Review Committee, where they have to sort out the changes and look at the merit of a large amount of changes. Basically no one person has control of any particular procedure. Under our new basic new method of doing business -- I'm sorry, sir.

MR. CATTON: On your PORC, is that what you call it?

MR. ROSS: Plant operations review committee.

MR. CATTON: Do you have anybody that's a member of that committee who is also associated with the training program? Or is there a disconnect?

MR. ROSS: When you say associated with the training program?

MR. CATTON: You look at procedures within PORC. You address other types of safety issues within PORC. Your operator is probably the key man with respect to safety and your operator is trained by a group that you have that is separate. Do you have anybody that is associated with that training arm as a member of POR~?

MR. ROSS: Nobody who reports to training is in fact a member of PORC at this time.

MR. CATTON: It seems to me that it might close \ circle for you if you had a member of the training program also on PORC.

MR. ROSS: I think we have close that circle another way, without tieing them up in an area that could possibly be construed as being outside of their realm of training.

MR. CATTON: I think it would be a lot better if you had somebody as part of your training program directly involved with the PORC activities, because they he could see how well it's going.

MR. CLARK: I think we need to point out that at the last meeti~g we identified that we are moving to a safety review process which does not have PORC as it is constituted today. We discussed that in some fair detail at the last meeting. The idea of having the training involved in looking at the procedures and having a feedback loop as to how effective the training is, I think we are covering those.

MR. CATTON: But not directly. It's indirect.

MR. CLARK: It's direct, but it's not as part of a committee that is going to go out of existence.

MR. CATTON: What committee is going out of business?

MR. CLARK: PORC. They'll be involved in the safety review process and there will be a feedback in terms of checking the effectiveness of the training and revised procedures. I think those were the two elements you mentioned?

MR. CATTON: Yes, thank you.

MR. MOELLER: Go ahead.

MR. ROSS: The procedure review chain has in fact been changed. Now the way we are aligned is that every procedure now has a procedure owner and he is responsible for the content of that procedure. The purpose of that is to make the continuity of changes and to make sure everything is all-inclusive. Also, every procedure has assigned a responsible office. For instance, operating emergency procedures, emergency procedures fall under my office. Radiological control procedures would fall under the Radiological Manager's Office. So they have a responsible office.

The hope here would be that the cognizant people would in fact do the detailed review; also, that PORC wouldn't be inundated with changes from various groups that reflected improperly on another group. We feel this has been a good improvement, and also in regulating the workload of our senior management people so they can in fact focus on procedures related to their particular area.

We also changed the way of doing business such that non-safety related procedures -- for instance the ventilation system in a non-safety related building -- does not need the site manager's approval for that procedure to be distributed. That would be the operations manager. If it's non-safety-related there's no reason to tie anybody up with that item, and it gives everybody else a chance to focus.

So we're hoping that the procedure review, we've seen some increase in the technical content and the completeness of our changes by doing this. We are hoping this will help us.

To go along with the technical increase in procedures and display increase in procedures and the review process changes, we have instituted a new operating and administrative procedure that is designed to get management's desires and requirements on plant operation down to the operating level. The new procedure is called the conduct of operations and the items that are specifically covered in that procedure are items such as control room formality, control room access, control room distractions, eating, trainee supervision, shift supervisor responsibility, working hours, requirements on component labeling, procedural compliance, housekeeping and cleanliness, personnel work attire and attention.

The purpose of that procedure is to assure that the working level operator knows what the requirements of our management are. We're hoping also that this will get our policies down to them and ensure that in fact they are followed.

MR. MOELLER: Thank you. Any more questions for Mr. Ross?

MR. ZUDANS: I just want to make it absolutely clear. Certain procedures are already assisted by computers; those were the abnormal operating procedures, is that what you said? Or you plan to use the procedures for that?

MR. BROUGHTON: Yes. Currently there are no procedures that are computer-assisted. We are working on ways to computer-assist these abnormal transient operating guidelines, but we have not yet implemented any scheme of computer assistance.

MR. ZUDANS: Nothing implemented or planned for abnormal and not for emergency?

MR. BROUGHTON: That's correct. There is nothing implemented, but our plans are to work on those first and we have a program under way that hopefully will be able to implement compute assistance for those procedures.

MR. MOELLER: Any other questions or comments?

(No response.)

MR. MOELLER: There being none, then I will declare a ten-minute recess and we will resume at 5:30 with the review of the House Committee report.

(Recess.)

MR. MOELLER: The meeting will resume.

In March of this year the majority staff of the Committee on Interior and Insular Affairs of the U.S. House of Representatives issued a report entitled "Reporting of Information Concerning the Accident at Three Mile Island." And then, on June 4, Edward Abbott, a senior fellow with the ACRS, prepared and there was distributed a report by him on the report by the House Committee.

Because of the significance of these reports to the review of the Three Mile Island restart application, we have asked and we have with us this afternoon several people who will offer comments on it. We will begin with Victor Stello, Director of the Office of Inspection and Enforcement.

Vic?

MR. STELLO: Well, thank you, Mr. Chairman.

Reviewing why we are here. I had received a copy of Mr. Abbott's report and in reviewing it decided that it might be appropriate to come before the Subcommittee and very quickly and, hopefully, efficiently review a whole host of studies and reports that have been written on the accident that cover a variety of topics.

The majority staff report parallel to a report that we had issued was particularly interested in the question that remained with us for quite a bit of time dealing with the flow of information that occurred during the accidents and the lessons we had learned from it and what kind of emphasis and needs for rectifying problems identified in that study we felt were needed.

Mr. Abbott's report looked at the staff report and did not -- he may not have been aware of some of the other things we had done and review those for the Committee very quickly.

I have asked Mr. Moseley to go through, if you will, a thumbnail sketch that starts with what we consider to be the major topics of interest as a result of these two reports and also to remind the Subcommittee of the many other reports that have been written and to focus on a number of conclusions that I think are important, including the conclusion of the majority staff report, which we will address specifically.

Norm, with that let me ask you to begin.

(Slide.)

MR. MOSELEY: As Vic has said, I intend to talk briefly about these four major topics. And in this way we hope to provide to you important information related to what is addressed in the Abbott report. We feel that you should have this information in your consideration of this report.

Each of you were provided a copy of these slides during the break.

MR. MOELLER: Do all of the consultants and subcommittee members have these? Dr. Kerr needs a set.

MR. MOSELEY: John?

MR. KERR: I've got it.

MR. MOELLER: He's got it. Okay.

MR. MOSELEY: On this slide we show each of the reports which address conclusions about the basic or underlying causes of the TMI accident. Each of these reports leads to a conclusion that the causes were many and had bases and roots that fit back to all segments of the industry including the regulators.

(Slide.)

MR. CATTON: The Frampton report -- I'm familiar with all of them but the Frampton report.

MR. MOSELEY: The Frampton report was a supplement to the Rogovin report where it addressed specifically the transfer of information.

(Slide.)

On this slide I have shown the underlying cause statement which came from the first investigation report that was issued on the accident -- the NUREG-0600. This list came from the foreward of 0600 and clearly shows the broad number of the underlying causes. I could have gotten an even longer list had I summarized from other reports.

But even in this brief list operator performance is only a part of one of the six numbered, broad causes from the foreward. In view of the extensive record of evidence of widespread causes of the TMI accident we believe that the statement on page 12 of the Abbott report --

(Slide.)

MR. MOSELEY: And I have that here. We believe that this statement is misleading. As it says, it is based on the premise that we viewed the seriousness of the accident to be based on operator error. The NRC action plan is not so narrowly based. It is based on the widely-held view that the problems were many and came from diverse sources.

(Slide.)

MR. MOSELEY: The next major area I want to talk about is that of information flow or reporting. Each of the reports are shown on --

MR. CATTON: Do you disagree with the conclusion drawn, aside from the statements about the action plan, but the seriousness of the accident was a result of operator error when, in fact, it was a result of faulty procedures?

MR. MOSELEY: I am saying there were many, many other causes that had an effect, and to say that our action plan is based on the presumption that operator error is the only cause is not true.

MR. CATTON: As I recall NUREG-0600 made a very strong point that it was operator error.

MR. MOSELEY: There was some discussion about the operators, had they taken certain actions they could have lessened the severity, but this list that I just showed you comes from 0600, which states that there is a broad spectrum of problems that have their lists in different places.

MR. CATTON: Well, go ahead. We disagree, but go ahead.

MR. STELLO: Let me amplify. We have discussed, if you may recall, this particular point with the Committee in the past at great length, and it is unfortunate that someone can, which I guess it is easy to do, take a particular sentence out of the foreward and say that's what we have said, and in some instances not give equal weight to the other statements that are in that foreward.

The list of the underlying causes that Mr. Moseley just showed you are taken directly from NUREG-0600. They ought to have at least some weight. That sentence has caused me a great deal of frustration in dealing with it following issuance of that report. And I think it got a great deal more attention than I think was needed.

The thought that I had in my mind was a very simple thought, that with the equipment that was there, the plant that existed, could the accident have been made less severe? Did you really need to have other things in order to have either prevented or made it less severe? And I think the answer is no.

Now why did the accident occur? What was the principal point. I would probably point to the inadequate analyses that were done from which procedures were derived rather than the procedures themselves. The analyses is the beginning of all procedures and they clearly were inadequate.

MR. CATTON: I wouldn't disagree with that.

MR. STELLO: Part of the problem is trying to make a simple statement of what it is that is or is not the principal issue. There are a lot of issues. Taking one out and trying to make it the central theme loses and detracts from a lot of other issues, even and including equipment. Clearly the Task Action Plan, which the Committee has gone through and we will not bother to repeat, the many, many equipment modifications that are made ought to suggest that there was not a preoccupation with operators and their inadequacies, although there clearly are problems there too.

Rather, I think that the central theme of the Kemeny report, which I think says there was inadequate attention to the man-machine interface I think is a true statement. This Committee and NRC has not paid the time and attention to that subject that it deserves. But I hate to use only one issue and say that is the only issue.

The conclusion that Norm put up that's in the Abbott report I disagree with strongly. It detracts from what I think we really learned from TMI.

MR. LIPINSKI: Mr. Chairman, may I supplement his comments?

MR. MOELLER: Yes.

MR. LIPINSKI: Abbott's conclusion is that it was the result of faulty procedures because there was another procedure in effect at the time, namely 2202-1.5 pressurizer system failure.

After the accident we did quiz the operator as to why they did not implement this procedure, because the automatic manual action says close block valve. And all of the symptoms that are outlined in terms of this procedure did apply at the time, with the exception that they already had the high tail temperatures and they ignored the fact that that was a condition and that therefore they should implement this procedure. It was a decision on the part of the operators that they wanted to ignore these symptoms.

Let me read the symptoms: Relief valve discharge line temperature exceeding the normal 130 degrees Fahrenheit; alarms on computer at 200 degrees Fahrenheit.

Number two, RC drain tank pressure above normal on the control room rad waste disposal control panel and temperature above normal on the local rad waste disposal control panel.

Three, RC system makeup flow above normal for the letdown flow and RC pump seal in-leakage conditions.

Four, boric acid concentration continually increasing in the pressurizer.

Immediate actions: Automatic, none; manual, one: Close the electromatic relief isolation valve, RCV-2.

But they did not implement this procedure.

MR. MICHAELS: Mr. Chairman, I would like to comment on that for just a moment.

MR. MOELLER: All right. Karl Michaels.

MR. MICHAELS: I agree with you except that the indicating light, of course, said the PORV was really closed.

MR. LIPINSKI: There is another procedure that I could read that goes beyond this one, because then -- this was the leaking pilot operated valve -- and then the other one was that there was the inoperative relief valve and it says: For a failed open, the manual action is [illegible] ose the electromatic. And there they had the light on the console and they are assuming that the thing had closed.

MR. MICHAELS: Now if you read the same procedure a little further you will find that if a code relief valve is stuck open you will find the same set of symptoms and you will, of course, believe that the code relief is the problem because the indicating light says the power-operated relief valve is already closed.

So why didn't you just flip over to the code relief valve and use that procedure? And that procedure is rather explicit, because there's no need to isolate that valve. So it said instead, control the level to 220 inches, which is precisely the sort of thing that they attempted to do, which of course got them into difficulty.

The procedure is clearly wrong for the code relief valve.

MR. LIPINSKI: But not for the PORV.

MR. MICHAELS: For the PORV, the procedure is correct, but the indications aren't correct, because they had a "closed" light. So I think they should have gone to the code relief valve and then he would have gotten into the identical trouble he got into.

MR. MOELLER: I think perhaps too for the record we ought to restate Mr. Stello's statement and that would be to state again what part of the Abbott report, which statements in it, trouble you the most. I didn't get that in what Mr. Lipinski was just saying.

MR. STELLO: Norm, put the slide back up.

MR. MOELLER: Yes, put the slide back up. I think you were citing the further conclusion, am I correct? The slide here?

MR. MOSELEY: That's correct.

MR. STELLO: This was the statement that I strongly disagreed with.

MR. MOELLER: Yes, let's be sure everyone is together on what you are saying.

MR. STELLO: We are going to cover other aspects. We are thus far. I want to make it clear that I think the record also makes clear that this has not been what the NRC has done.

MR. MOELLER: Fine, I wanted to clarify that in case there was any misconception. Go ahead, Mr. Moseley.

(Slide.)

MR. MOSELEY: On this slide we have a list of reports which discuss the flow of information reporting. Each of these reports lead to a conclusion that information which should have been reported or passed on was not. For our purposes today we are only talking about failure to pass on information to the state or to the NRC, who have responsibilities for possible off-site action.

(Slide.)

MR. MOSELEY: Now on this slide I have shown enforcement action which was taken by NRC following the investigation into information flow. The results of this investigation are documented in NUREG-0760. In this enforcement action we specifically stated the licensee's responsibility to obtain, evaluate, and immediately communicate important information on-site and to off-site officials.

We stated that on the day of the accident there was a clear failure of Met Ed to do this. There were two specific citations. One was the failure to obtain and evaluate specific information and the other was for failure to report specific information to the NRC and/or the State of Pennsylvania.

(Slide.)

MR. MOSELEY: On this slide I have quoted verbatim the majority staff report of the House Committee on Interior and Insular Affairs. I won't read it to you, but we believe that the actions taken when we issued NUREG-0600, these actions, which were summarized in the preceding slide are consistently with the conclusions stated on this slide.

Our belief on this has been stated.

MR. STELLO: Excuse me, Norm. I believe you used the wrong number. You don't mean 0600.

MR. MOSELEY: I did use the wrong number. Excuse me.

Our belief is that our actions are consistent with this. It was stated in a letter to Congressman Udall dated February 13, 1981, and signed by Chairman Ahearne. I have some copies of this for the Committee, but I don't have a slide. But I will read you quickly the approrriate sentences.

"We have also reviewed the revised version of the conclusions stated on page 247 of your staff report." Skipping a little bit, "Our reading of the revised conclusion is they are consistent with the enforcement action taken in our notice of violation sent to Metropolitan Edison on January 27."

In the Abbott report, in its summary, the statement there may lead to a conclusion that the NRC takes another view. You should understand that we believe that the total actions that have been taken are consistent with this conclusion.

MR. STELLO: Norm, it might be useful to point out in the Abbott report the reference back to NUREG-0600, and it was my understanding that the copy of 0600 was not made available to Mr. Abbott, is that correct?

MR. FRALEY: I'm sorry, is that correct? 0760?

MR. STELLO: You had a copy?

MR. FRALEY: Yes.

MR. STELLO: I took that to mean that it was not considered in his review. I guess I don't know whether that's true or not, and perhaps we could ask him if it was or was not, because I was unable to determine it. Could you respond to that question, please?

Use the microphone if you can to be sure they can hear.

MR. ABBOTT: My name is Ed Abbott, Senior Fellow of the Advisory Committee on Reactor Safeguards. I did not include comparison between your report and the Udall report in my report.

MR. STELLO: By our report do you mean 0760? You did use NUREG-0760?

MR. ABBOTT: I did look at NUREG-0760.

MR. STELLO: That did not consider and was specifically accepted on the flow of information at the direction of the Commission because it was pending before the Rogovin group and it was not until after the Rogovin group finished and several exchanges of correspondence with Frampton that we began our study that led to the report NUREG-0760, which is this positive NRC document on the flow of information following that.

MR. MOSELEY: I have already talked about two of the areas addressed in the Abbott report and there are several others about which I spoke briefly. The first one, I believe, is quite important. It's relating to the relationship of the license limit to core cooling.

The technical specifications do cover normal operation or expected operation. They are implemented through the operating procedures, as we know. In accident situations emergency procedures are to describe the actions to be taken. In some cases these emergency procedures do direct operators to take actions which are contrary to technical specifications.

In accident situations that are not covered by the emergency procedures they are expected to take independent action to return the plant to a safe condition. A rule change is being drafted now to clarify this issue for one and all.

MR. STELLO: Let me again remind the Subcommittee --

MR. KERR: Excuse me. I'm not sure what issue it was that was already clear that is being clarified?

MR. STELLO: I'll cover it, Norm.

We discussed, along with the accident, a number of evolutions for where there were conditions set forth in the tech specs that one could ask were they consistent or inconsistent with the actions you wanted to take. Did the tech specs prevent you from doing what was right? And although we made it very, very clear that what we had to do was to do what was right for safety, notwithstanding whatever was in the tech specs, there became a question and a concern ought we not to clarify that given an accident the tech specs don't apply. And the consensus agreement was that we needed a statement that says if you have an accident you don't open up the tech specs and try to follow the tech specs. They clearly are not intended to apply to that kind of an environment.

MR. KERR: So there could have been some ambiguity before you made the statement?

MR. STELLO: There could have been some ambiguity there. It is now ambiguity in light of your question.

MR. KERR: You are clearing up an ambiguity which apparently you felt existed and hence you make a statement to clear it up.

MR. STELLO: There is no question that ambiguity existed.

MR. MATHIS: In your mind.

MR. STELLO: Even in the minds of the operators at TMI. Let me see, there was one particular incident that I do recall. We were reaching a decision about letting the plant go water solid in the pressurizer to do some particular test to measure the response of the level instruments, and the operators relieving the high pressure pumps in their automatic mode and, as was explained a little while ago, the particular design of that system is such that as you go through the pressure swing you get a reset of the ECC actuation, so you could have wound up in a position where if you left them in the automatic, went solid and weren't careful you could have actuated ECC and the pumps would have come on full with the solid system.

That clearly was undesirable. They were leaving them in that position because the tech specs required them at the conditions they were in to have ECC. They met the conditions. And what we did, as I recall, we issued an oral amendment at the pla to say if that's a problem forget it. Take them and put them in the pull off position. You don't want them on. That's the kind of conflict I'm talking about, where there is a need.

The unfortunate thing is why it takes so long. But working for the NRC as long as I have, it just takes a long time to get anything done.

MR. MOSELEY: And the reason we bring it up at this point, my reading at least of the Abbott report tended to say that that confusion or misunderstanding could persist and that is why we bring it up today.

Now relating to the second item on operating procedures being correct, of course all of us agree with that. However, we should note that a good procedure or a correct procedure can only be prepared if there is knowledge and understanding of the transient and its behavior.

Of course this knowledge and understanding won't exist unless the appropriate analyses have been made.

Now referring to item three on this slide, on passing on or reporting of information, as I have already covered earlier we came to similar conclusions and so stated in the enforcement actions which were taken after the

NUREG-0760 investigation.

So in summary, we believe that the various investigations into the TMI accident have shown that the determining causes were many, were varied, and that they were derived from deficiencies in all sectors of the industry. We believe there were deficiencies in the information flow of the day of the accident, particularly to agencies with off-site responsibility. We believe our collective actions taken are consistent with the conclusions stated in the report by the majority staff of the House Committee on Interior and Insular Affairs.

We also believe that an important relationship exists between tech specs and procedures. Tech specs should never be allowed to interfere with placing the plant in a safe condition.

Thank you, sir.

MR. MOELLER: Thank you. Do we have questions for either Mr. Moseley or Mr. Stello?

(No response.)

MR. MOELLER: I think in summary, if I can paraphrase what we've heard, you did show the section 6, the conclusions of the House report and you said you have taken steps to implement the -- or you said, in essence, that NUREG-0760 was consistent with the conclusions of this report, and indeed the various recommendations that you have made will bring about corrections of the problems noted. Am I putting words in your mouth?

MR. KERR: Yes, I think you are. I didn't hear him say that.

MR. MOELLER: Okay, let's --

MR. STELLO: Could I just agree with what you said? Would that be simpler if I just agreed and say yes? Yes.

MR. MOELLER: Yes. Fine.

MR. STELLO: Yes.

MR. MOSELEY: Excuse me, Vic. I think there is an important point to clarify here. There are some differences between NUREG-0760 and the conclusions stated. What we are saying is the actions that were taken at that time met this conclusion.

MR. MOELLER: Okay. In terms of the action plan and the criticisms in the Abbott report relative to that, let me ask a couple of questions.

Has the NRC specifically taken steps to assure that all utilities in the future will provide full and complete information on a timely basis if an accident does occur?

MR. STELLO: Yes.

MR. MOELLER: Roughly how have you done this?

MR. STELLO: Well, there are a variety of things we've done. It would be helpful to have the Committee's support in putting it in the oven, which is one of the things we would like to do that would enhance that capability. I'm sorry, I couldn't pass the opportunity up to solicit the Committee's help in that regard.

MR. MOELLER: Well, on that item will the NDL reduce the responsibility of a utility to provide timely and accurate information to the NRC?

MR. STELLO: Not at all.

MR. MOELLER: Not at all?

MR. STELLO: It does not in any way interfere with that responsibility, but it assures our ability to get significant and important information regarding accident scenarios directly. Whether or not that will come to pass, I did not mean for that to be the key issue.

We are now in the process of reviewing all emergency plans for all of the operating plants consistent with the new regulation that went into effect on April 1 of this year. One of the central issues and themes is to look at emergency procedures regarding how the flow of information will occur among the various state, local, and federal officials. To that end, before we finally write off on the total emergency preparedness at a facility, we require an exercise that shows that these channels and lines of communication that assures that the information is going to flow are in fact in existence, and that the people are aware and they do understand what it is that their jobs are and how that information is to be processed through the system to assure that it does get to the appropriate places.

Let me emphasize, however, the most appropriate, the most important, the most significant place for that information is with the operating crew that is dealing with the accident. With respect to that issue there have been a large number of things that have been done inside of the control room, including putting in a safety parameter display system to assist the Navy operators as well.

I don't want to go through my long list and detract in any way to say that the fact remains emphatically that the licensee must do what is correct.

MR. MOELLER: Well, in the House report it had the three conclusions which you have again shown on the slide. The first one is that the TMI managers did not communicate information in their position that they understood to be related to the severity of the situation.

Did your investigation confirm this?

MR. STELLO: Yes, it did, and the enforcement action that Norm referenced by specific citation is an example of that kind of information.

MR. MOELLER: Well, then, I think that one of the basic differences between your studies and those of the

House Committees, the basic difference would be that their report implies that there was a willful withholding of information and I think your reports would imply that it was due to confusion. Is that a fair assessment as far as you know?

MR. STELLO: If I read the conclusion itself I don't believe it is necessary to reach the conclusion of willfulness, and I have had a large number of conversations with the principal author of that report and it is my view that it is his view. What the words say, I think, are obvious to each of us and each of us may have a somewhat different view.

My reading of the words show consistency. I have struggled with this withholding, of intentional dissembling and lying to the point where I think I have memorized the definition of every word and synonym and derivation thereto. But I don't, at least in my reading of it, feel compelled to come to that conclusion. I guess each individual who reads it will have to come to his or her own conclusion.

MR. MOELLER: Well, thank you. That's a very clear and straightforward answer.

Mr. Zudans?

MR. ZUDANS: I am not quite satisfied with putting aside the procedure. As I read the procedure I would be a very poor operator if I did not implement those steps anyway, even if there was an alternate procedure with the same symptoms. There is a set of symptoms that says you can do this, a simple thing, by closing the block valve.

There is another set of procedures that is simple and direct to close the safeties. I would still implement both, so I don't think that is adequate explanation.

MR. STELLO: I don't mean to steal the thunder from Carl Michaels, but if I might just comment, the point I had been trying to make is that one ought not to look for a simple answer and be able to go into the accident say if only one had done such and such. There are a whole host of things that one can postulate, including something as simple as if you hadn't turned the ECC off you would never have had an accident of any consequence.

There are a lot of what-ifs that sound so simple, like they are the answer. But clearly the procedures were deficient as well. But the reason they were deficienct is the most fundamental thing. You need to write good procedures as a good analysis of the transient and that clearly was not available.

MR. ZUDANS: That I don't agree with. That was correct, but what I kind of don't like is the argument by Carl said yes, indeed, the procedures were wrong. The code is much different than that. That procedure is not wrong, because all you have to do is open a valve.

MR. KERR: Would you agree, however, Mr. Zudans, that hindsight is very much better than foresight?

MR. ZUDANS: Well, of course, that's correct.

MR. LIPINSKI: I don't think that is the issue. The statement is the procedures were faulty, okay?

MR. KERR: Walt, we have been through this argument over and over and over. Do you want to continue it?

MR. LIPINSKI: I disagree with the conclusion that the procedure was faulty.

MR. KERR: I think that's clear from what you said.

MR. MICHAELS: There is no doubt that the procedure for this stuck-open relief valve is correct. You close the block valve. That terminates the event. The procedure is correct. However, the procedure did not act on the symptoms he had because he already had an indication his block valve was closed.

So he goes on to found another.

MR. LIPINSKI: No, his block valve was not closed.

MR. MICHAELS: The PORV was closed.

MR. LIPINSKI: That's what the procedure calls for.

MR. MICHAELS: Only if it's open.

MR. LIPINSKI: It had opened, and it reclosed. The light said it was closed. The temperatures were up. Next the drain tank pressure and temperature was up.

MR. MICHAELS: Right.

MR. LIPINSKI: All right, that was another symptom he didn't have prior to that.

MR. MICHAELS: He couldn't have had, right.

MR. MOELLER: I think we need to move on.

MR. MICHAELS: Yes, I think there is -- well, at any rate, if there is any question about it -

MR. ZUDANS: Mr. Chairman, the point is no such strong statements are valid, anyway, in this connection.

MR. MICHAELS: I think the important point to note, which is what Vic was trying to make, is if this had been, say, a broken off nozzle on the PORV upstream of the block valve, or if this had been a broken off safety valve, the procedure, for instance, for the broken off safety would have been quite incorrect. It would have meant a loss of coolant accident for which you would have gone to a different set of procedure, but you wouldn't have had the same set of symptoms.

The problem is simply the analysis for the LOCA at the top of pressurizer had not been --

MR. MOELLER: Okay, we're going to move on. The next person that we want to call upon to make a statement is Mr. Robert Arnold of the Licensee.

MR. ARNOLD: Mr. Chairman, my name is Robert C. Arnold. I am the Senior Vice President of Metropolitan

Edison Company, the licensee for the Three Mile Isla~d Unit 1. I am also heai of the GPU Nuclear Group, which the license recognizes, the operating organization for Three Mile Island Unit 1.

I have to confess to, I guess, some uncertainty as to exactly what would be the specific question that I may be responding to at this time, but I understand at the moment that the request is that we would respond to the conclusions of the majority Committee report of the House Committee.

MR. MOELLER: Yes, if you would respond to those that would be good.

MR. ARNOLD: And what I would like to do, if I may, is read a statement which was directed, I think, to the same issue, but that issue was described in Mr. Abbott's memorandum and report to the Subcommittee. I have given copies for distribution to the Committee members and their consultants, and I think that the NRC has a few also.

As I go through I will come to one point where I will have a correction where a line of type was omitted in the draft and the typing.

This issue is one that has been very important to the company and GPU has concluded that the aggregation of plant information, the synthesis of that information into an assessment of the safety status of the plant and its potential for hazarding the local populus, and the communication of that quality of information to the company management, state authorities, and the NRC was inadequate during the first few days of the accident.

GPU does not believe that the communications failure was a result of a conscious effort to mislead. Tens of thousands of pages of testimony, interviews, and depositions exist relating to the accident. The conclusions drawn from this record must give adequate recognition to the state of knowledge prior to the accident, the stress of the situation, the extended time period of the record, the degree of inseparability of original knowledge from acquired knowledge, the influence of the interviewer, the background and interest of the diverse participants, and many other factors.

The Three Mile Island accident is probably unique in terms of the number of in-depth public investigations. These investigations were conducted by competent individuals who had no allegiance to the company or the technology and who sought only to extract the full learnings from the accident.

We would urge that Mr. Abbott as well as anyone else reviewing the report of the staff by the House Committee on Interior and Insular Affairs on the reporting of information concerning the accident at Three Mile Island would take into account the conclusions resulting from those very extensive investigations, specifically the report of the President's Commission on the Accident at Three Mile Island and the Need for Change: the Legacy of TMI, October 1979, states, "we do not find that there was a systematic attempt at a coverup by the sources of information.

Second, the second study report entitled "Three Mile Island: A Report to the Commission and the Public, Volume I, Nuclear Regulatory Commission Special Inquiry Group", generally termed the Rogovin report, of January 1980, on page 156, "While both the public information performance of Met Ed and the NRC can be faulted in many instances we found no evidence that officials from either the utility or the regulatory agency willfully provided false information to the press or public."

On page 159: "In sum, we concluded that the evidence failed to establish that Met Ed management or other personnel willfully withheld information from the NRC."

Report number three is contained in the memorandum to Chairman Ahearne from Mitchell Rogovin and George T. Frampton, Jr. The subject are questions submitted by Congressman Udall, March 4, 1980. On page two of that memorandum he states, "The evidence failed to establish that Met Ed management or other personnel willfully withheld information from the NRC. There is no question that plant information conveyed from the control room to offsite organizations throughout the day was incomplete and in some instances delayed and often colored by individual interpretations of planned steps. Indeed, information conveyed by Met Ed, NRC and the control room to their own management and off-site information was in many cases incomplete and even inaccurate.

"However, based on the evidence we could not conclude that the causes of this breakdown in informaton flow went beyond confusion, poor communications, and a failure by those in the control room, including NRC and B&W employees to comprehend or interpret the available information, a failing shared to some extent by offsite organizations as well."

The fourth reference is to "Nuclear Accident and Recovery at Three Mile Island", a specal investigation, Subcommittee on Nuclear Regulation for the Senate Committee on Environment and Public Workd dated July 1980, which on page 13 states, "The evidence reviewed by the special investigation does not confirm any intentional concealment of information by the utility on the first day of the accident."

Fifth is an "Investgation into Information Flow at Three Mile Island, NUREG-0760, January 1981, previously referenced by Mr. Moseley. And on page 11 contains, among its other conclusions item number 5: "Information was not intentionally withheld from the state on the day of the accident," and Conclusion number 5: "Information was not intentionally withheld from the NRC on the day of the accident."

Members of GPU's senior staff have spent many hours discussing the conclusions of the various reports. We agree that there are many human behavioral factors that can contribute to or impede effective communications. We do believe that these kinds of influence should bej given specific recogition.

GPU has (a) issued to all shift supervisors, and posted for the benefit of all nuclear personnel, a policy statement emphasizing the importance of candor and timeliness in all communications, and, (b) and I will go a little slower so you can write in this additional, has structured emergency communcations formats so as to better assure that meaningful information critical to the best assessment of any emergency situation is communicated and that such communications are thereby less vulnerable to inadvertent omissions due to the stress of the moment or the specific focus of the reporting or the receiving party.

Since the TMI-2 accident the company has undertaken a complete reevaluation of its response capabilities during an emergency situation regulating in the development of an entirely new emergency plan. The plan, the basic document which directs and governs the company's response to an emergency, is the end result of a process involving the company, the NRC, the Federal Emergency Management Agency, Pennsylvania state agencies and others.

The company submitted Revision 3 of our new emergency plan in January 1981. Throughout this one and a half year process, the company has met, and coordinated its emergency plan with the Commonwealth of Pennsylvania, including PEMA, Bureau of Radiological Protection, and the Pennsylvania Deartment of Transportation, and the five counties of Dauphin, York, Lancaster, Cumberland and Lebanon. This coordinated planning process began with agreement on organization and communications concepts, including such matters as which offsite agencies would be notified of an emergency situation at TMI, when and by what means that notification would take place, and what information would be transmitted.

Additional meetings continued throughout the detailed planning stage. Items discussed at these meeting -- for example, initial and continuing notification procedures, early warning systems, evacuation time studies, and the specific role of BRP -- assure that in the event of an emergency at TMI the proper interface between onsite and offsite response personnel will occur.

MR. MOELLER: Do we have any questions for Mr.

the basic document which directs and governs the company's response to an emergency, is the end result of a process involving the company, the NRC, the Federal Emergency Management Agency, Pennsylvania state agencies and others.

The company submitted Revision 3 of our new emergency plan in January 1981. Throughout this one and a half year process, the company has met, and coordinated its emergency plan with the Commonwealth of Pennsylvania, including PEMA, Bureau of Radiological Protection, and the Pennsylvania Deartment of Transportation, and the five counties of Dauphin, York, Lancaster, Cumberland and Lebanon. This coordinated planning process began with agreement on organization and communications concepts, including such matters as which offsite agencies would be notified of an emergency situation at TMI, when and by what means that notification would take place, and what information would be transmitted.

Additional meetings continued throughout the detailed planning stage. Items discussed at these meeting -- for example, initial and continuing notification procedures, early warning systems, evacuation time studies, and the specific role of BRP -- assure that in the event of an emergency at TMI the proper interface between onsite and offsite response personnel will occur.

MR. MOELLER: Do we have any questions for Mr.

Arnold?

(No response.)

MR. MOELLER: Let me wrap up today's Subcommittee meeting by reviewing with you very briefly, once again, the conclusions of the House Committee report and ask you if you believe that the record indicates that in reporting to state and federal officials on the day of the TMI accident GPU officials did not communicate information in their possession that they believed to be related to the severity of the situation.

MR. ARNOLD: Mr. Chairman, I think the important element in that phrase -- statement -- is one that states that they understood related to the severity of the situation. I think that now we see where information which they had within the total staffing at the plant clearly related to the severity that we now understood existed, but it was not understood by them in the context which it is understood today.

So that while I think that they did have information which they understood was pertinent to the condition of the plant, their failure to properly synthesize all of that information into an adequate assessment of plant conditions led them to misjudge the importance of that information to the assessment.

And with that sort of qualification of the situation, I would agree that they had information that was pertinent to the severity of the situation that they did not convey. But that severity was not understood in the way it was today, and I do not believe that their failure to pass it on was in any way an attempt to not disclose the severity which they understood existed.

MR. MOELLER: Thank you.

As second item. As far as you know, did the lack of such information prevent state and federal officials from accurately assessing the condition of the plant?

MR. ARNOLD: I don't think there's any question that during the first two days after the initiati[illegible] of the accident that the incompleteness of information to offsite organizations made it almost impossible for them to adequately assess the condition of the plant.

MR. MOELLER: Thank you.

And, lastly, do you agree with the final statement of the report that the record indicates that TMI managers resented state and officials misleading statements -- i.e., statements that were inaccurate and incomplete -- that conveyed the impression that the accident was substantially less severe and the situation more under control than what the managers themselves believed and what in fact was the case?

MR. ARNOLD: I think, again, the critical element of that statement is that with regard to what the managers themselves believed. And my judgment is the information that was provided to the state and federal authorities by the management of the company was done in a way that attempted to convey their understanding of the situation.

MR. MOELLER: Thank you.

Yes, Mr. Catton?

MR. CATTON: Is the Met Ed's $4 billion suit a result of the belief that the NRC is somewhat at fault in the incident? Maybe I don't understand what the $4 billion lawsuit is all about.

MR. ARNOLD: Maybe I don't understand your question. It seems to me one files suit when they believe there is some degree of responsibility.

MR. KERR: Mr. Chairman, I would say that since this is a matter under litigation we should not press the applicant to discuss it.

MR. MOELLER: Thank you, Mr. Arnold. We will recess today and convene promptly tomorrow at 8:30.

(Whereupon, at 6:22 o'clock p.m., the Subcommittee recessed, to reconvene at 8:30 o'clock a.m., Friday, June 26, 1981.)

* * *

NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

____

in the matter of: ACRS/Subcommittee on Three Mile Island Nuclear Station Unit 1

Date of Proceeding: June 25, 1981

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.

Jane W. Beach

Official Reporter (Typed)

Jane W. Beach

Official Reporter (Signature)

POOR ORIGINAL

SUMMARY AND STATUS OF RESTART REVIEW

REQUIREMENT SOURCE	APPLICABILITY	REVIEW REFERENCE	NO. OF OPEN ITEMS
8/9/79 ORDER S.T. ITEMS 1-3,8 L.T. ITEMS 1-4	ALL PLANTS NUREG-0694/0737 54 ITEMS	NUREG-0680, DATED 6/80 SUPP. 1, DTD. 11/80 SUPP. 2, DTD. 3/81 SUPP. 3, DTD. 4/81	1
		NUREG-0746, DATED 12/80 SUPP. 1, DTD. 5/81	1
8/9/79 ORDER S.T. ITEMS 4-7	UNIQUE TO TMI-1		
3/6/80 ORDER 3/23/81 ORDER (MODIFY 8/9/79 ORDER)			
NUREG-0737/0694	ALL PLANTS 28 ITEMS	SERs ENCLOSED WITH 4/22/81 LETTERS TO MET ED	6
		NUREG-0752 DATED 12/80 SUPP. 1, DTD. 4/81	0
NON-TMI-2 RELATED	ALL PLANTS AND UNIQUE TO TMI-1	INDIVIDUAL SERs	3

STATUS OF RESTART HEARING

DESIGN AND ANALYSIS

RECORD CLOSED, PROPOSED FINDINGS FILED, EXCEPT UCS-12 (E.Q.)

HEARING ON UCS-12 JUNE 29, 1981

SEPARATION OF UNITS 1 AND 2

RECORD CLOSED, PROPOSED FINDINGS FILED

MANAGEMENT

RECORD CLOSED, PROPOSED FINDINGS FILED

EMERGENCY PREPAREDNESS

HEARING RESUMES JUNE 30, 1981, EXPECTED TO BE CONCLUDED BY JULY 9, 1981.

CONTENTIONS & BOARD QUESTIONS

DESIGN & ANALYSIS	CONTENTION	FORMAL BOARD QUESTION
NATURAL & FORCED CIRCULATION	2	3
ADDITIONAL LOCA ANALYSIS	2	1
*EFW RELIABILITY	0	3
SAFETY SYSTEMS BYPASS & OVERRIDE	2	0
*SAFETY CLASSIFICATION	3	1
VALVES & VALVE TESTING	2	1
CONNECTION OF PZR HEATER TO DIESEL	1	-
ICS	1	-
CONTAINMENT ISOLATION	1	-
FILTERS	2	-
COMPUTER	2	-
SAFETY SYSTEMS STATUS PANEL	2	-
INSTRUMENT RANGES	2	-
*DETECTION OF INADEQUATE CORE COOLING	3	-
CONTROL ROOM DESIGN	2	-
CLASS 9	4	-
STAFF POSITION ON 0694, 0660	-	2
HOW IDENTIFY REQUIREMENTS	-	1
IREP ON TMI-1	-	1
APPLICATION OF NUREG-0667	-	1
SEPARATION OF UNIT 1 & 2	3	1
MANAGEMENT	5	1
EMERGENCY PLANNING		
ONSITE	36	-
OFFSITE	107	-

* BOARD EMPHASIS

POOR ORIGINAL

OPEN ITEMS

TMI-RELATED ITEM	DESCRIPTION
II.F.2	NEW INSTRUMENTATION FOR DETECTION OF INADEQUATE CORE COOLING
II.K.3.1	AUTO PORV ISOLATION-DESIGN
II.K.3.2	REPORT ON PORV FAILURES
II.K.3.7	EVALUATION OF PORV OPENING PROBABILITY
II.K.3.17	ECCS SYSTEM OUTAGES
III.A.2	EMERGENCY PREPAREDNESS
III.D.3.4	CONTROL ROOM HABITABILITY (REVIEW ONLY, NO MODIFICATIONS REQUIRED BEFORE RESTART)

NON-TMI RELATED ITEM	
IEB 79-27	LOSS OF NON CLASS IE INSTRUMENTATION AND CONTROL POWER SYSTEM BUS DURING OPERATION (INCLUDES NNI/ICS FAILURE ANALYSIS)
IEB 80-11	MASONRY WALLS
NRC LETTER DATED 3/7/80	CONTAINMENT SPRAY EFFECTIVENESS

OPEN ITEMS

II.K.3.2 REPORT ON PORV FAILURES

- LICENSEE SUBMITTAL 4/6/81 (REQUIRED 1/1/81)
- STAFF REVIEW IDENTIFIED FURTHER PROBABILITY ANALYSES REQUIRED
- SAFETY SIGNIFICANCE FOR RESTART - DETERMINE IF AUTO PORV ISOLATION NECESSARY. SEE II.K.3.1

II.K.3.1 AUTO PORV ISOLATION

- LICENSEE SUBMITTAL 4/6/81 STATED NONE REQUIRED BASED ON II.K.3.2
- IF II.K.3.2 SHOWS NEED, DESIGN REQUIRED PRIOR TO RESTART (7/1/81 PER NUREG-0737) INSTALLATION 6 MONTHS AFTER 1ST RELOAD AFTER APPROVAL
- SAFETY SIGNIFICANCE FOR RESTART - ASSURANCE OF ADEQUATE LONG-TERM IMPLEMENTATION

12 ✓ II.K.3.7/II.K.2.14 PORV/SV LIFT FREQUENCY & PROBABILITY

- LICENSEE RESPONSE 4/6/81 - PORV WILL ACTUATE IN <5% OF OVERPRESSURE TRANSIENTS
- STAFF REVIEW CONCURS IN METHOD, BUT REQUESTED ADDITIONAL STATISTICAL INFORMATION
- SAFETY SIGNIFICANCE FOR RESTART - ASSURE MINIMAL CHALLENGES TO PORV

OPEN ITEMS

II.K.3.17 ECCS SYSTEM OUTAGES

- NO RESPONSE FROM LICENSEE - REQUIRED 1/1/81 (STAFF WILL ACCEPT PRIOR TO RESTART)
- SAFETY SIGNIFICANCE FOR RESTART - IDENTIFY ANY CHANGES REQUIRED TO IMPROVE AVAILABILITY OF ECCS.

III.D.3.4 CONTROL ROOM HABITABILITY

- NO RESPONSE FROM LICENSEE (REVIEW REQUIRED 1/1/81)
- SAFETY SIGNIFICANCE FOR RESTART - IDENTIFY MODIFICATIONS REQUIRED TO IMPROVE HABITABILITY (NO REQUIREMENT YET FOR IMPLEMENTATION)

II.F.2 - INSTRUMENTATION FOR DETECTION OF INADEQUATE CORE COOLING (ICC)

TMI RESTART MODIFICATIONS TO EXISTING INSTRUMENTATION

* 52 CORE EXIT THERMOCOUPLES- PRIMARY DISPLAY
  - CABLING EXTENDED OUTSIDE CONTAINMENT TO PLANT COMPUTER (0-2300F READOUT)
* EXTENDED RANGE OF REACTOR OUTLET RTDs (2 IN EACH HOT LEG) TO 120F-920F AND ROUTE TO COMPUTER AND TO SATURATION METER
* PROVIDE REDUNDANT SATURATION METERS (REDUNDANT TEMPERATURE/PRESSURE INPUTS TO REDUNDANT CALCULATORS)
* COMPUTE SATURATION MARGIN ON PLANT COMPUTER FOR LOGGING, TRENDING, AND ALARM
* PROVIDE BACKUP T/C DISPLAY
  - MINIMUM OF 16 T/Cs (4 PER CORE QUADRANT) MUST BE OPERATIONAL FOR POWER LEVELS > 5%

STAFF POSITION - ICC INSTRUMENTATION FOR RESTART

* EXISTING INSTRUMENTATION WITH COMMITMENT TO UPGRADE PER NUREG-0737 IS ACCEPTABLE FOR RESTART
* EVIDENCE OF REASONABLE PROGRESS ON ADDITIONAL INSTRUMENTATION (REACTOR WATER LEVEL) IS REQUIRED

Criteria to Show Evidence of Reasonable Progress on Additional Instrumentation (Reactor Water Level)

1. Selection of a level measurement system concept or an equivalent system for development

2. Definition of the development program and scheduel for development and procurement of the selected system

3. Evidence of a tangible commitment to performance or participation in the appropriate test programs to execute the defined development program

4. Justification for the concept selected if it results in significant schedule delays

5. Contingency plans and schedule for procurement of an alternative concept

6. Appropriate analyses to incorporate the water level status information into the guidelines for operator actions with respect to ICC

BASIS FOR WATER LEVEL MONITORING POSITION

* MUST DETECT APPROACH TO ICC
  - SATURATION METERS ARE AMBIGUOUS
  - CORE EXIT THERMOCOUPLES DO NOT SHOW SUPERHEAT UNTIL ICC IS IMMINENT
  - KNOWLEDGE OF COOLANT INVENTORY IS NEEDED TO MONITOR CONTINUING APPROACH TO ICC AND EFFECTIVENESS OF RECOVERY ACTIONS
* PROVIDE INDICATION OF A VOID AT VENT LOCATIONS FOR EVALUATION OF VENTING NEED
* PROVIDE EVIDENCE THAT THE CORE IS COVERED DURING RECOVERY FROM A TMI-2 TYPE FLOW BLOCKAGE CONDITION
* PROVIDE COORDINATING INFORMATION TO ASSIST THE OPERATOR IN:
  - RESTORATION OF WATER SOLID PRIMARY SYSTEM AND NORMAL LEVEL IN PRESSURIZER
  - TERMINATION OF HPI
* PROVIDE DIAGNOSTIC INFORMATION TO ASSIST IN THE EVALUATION OF ANOMALOUS EVENTS

+3

EMERGENCY PREPAREDNESS - TMI-1

- O RESTART ORDER REQUIRED UPGRADED EMERGENCY PREPAREDNESS PRIOR TO RESTART TO INCLUDE:
  - O UPGRADING EMERGENCY PLANS TO SATISFY REGULATORY GUIDE 1.101 WITH EMPHASIS ON ACTION LEVEL CRITERIA;
  - O ESTABLISHING AN EMERGENCY OPERATIONS CENTER, AN ALTERNATE LOCATION FOR SUCH CENTER AND COMMUNICATIONS TO THE PLANT;
  - O UPGRADING OFFSITE MONITORING CAPABILITY, INCLUDING ADDITIONAL TLDS;
  - O ASSESSING THE RELATIONSHIP OF STATE/LOCAL PLANS TO LICENSEE PLANS TO ASSURE CAPABILITY TO TAKE EMERGENCY ACTIONS;
  - O CONDUCTING A TEST EXERCISE OF LICENSEE'S PLAN
- O NEW EMERGENCY PLANNING RULES AND CRITERIA OF NUREG-0654 IMPOSED MORE RIGOROUS REQUIREMENTS

THREE MILE ISLAND - EMERGENCY PREPAREDNESS
STATUS REPORT

- O <u>NRC STAFF SER SUPPLEMENT FILED MAY 29, 1981 ON ONSITE EMERGENCY PREPAREDNESS</u>
    - O 1 OPEN ITEM - TIME TO STAFF EOF
    - O IN COMPLIANCE WITH NUREG-0654
- O <u>HEALTH PHYSICS/EMERGENCY PREPAREDNESS INSPECTION</u>
    - O CONDUCTED WEEK OF MAY 4 - 26 OF 30 ITEMS CLOSED.

      I&E WILL TRACK REMAINING TO COMPLETION
- O <u>JOINT EXERCISE - CONDUCTED JUNE 2, 1981</u>
    - O ONSITE - NO SIGNIFICANT DEFICIENCIES
    - O OFFSITE - FEMA REPORTS CONTAINS RECOMMENDATIONS IN SEVEN AREAS. HOWEVER, STATE AND FOUR COUNTIES PERFORMANCE REPORTED ACCEPTABLE
    - O YORK COUNTY - DID NOT PARTICIPATE IN JOINT EXERCISE
- O OVERALL - LICENSEE EXCEEDS REQUIREMENTS OF SHORT-TERM ITEMS OF AUGUST 9, 1979 ORDER

SUMMARY OF TMI-1 EXERCISE SCENARIO

The exercise scenario was initiated at 5:15 a.m. on June 2, 1981 at TMI-1 which, for purposes of the exercise, was simulated to have been at 100% power for eight days. Initial indications of a developing abnormal condition were provided by simulating increased radiation levels and an alarm on radiation monitor RMA-5, the condenser off-gas monitor, an indication of a possible steam generator tube leak. The RMA-5 radiation levels exceeded the Emergency Action Level (EAL) for an Unusual Event. This condition was allowed to worsen until the operators determined the reactor coolant system leak rate, which was computed to exceed technical specification limits and required plant shutdown. The condenser off-gas monitor continued to increase to the point of exceeding the Alert EAL. Due to simulated power grid limitations, the plant was ramped down in power at a rate of 2%/minute.

While actions were being taken to assess the events and initiate a controlled plant shutdown and cooldown, a faulty waste gas compressor seal was simulated, requiring a demonstration of emergency corrective actions to isolate the compressor.

The control room operators were subsequently given indications of an increased steam generator leak rate and activity levels, increased condenser off-gas monitor readings, and increasing primary letdown monitor (RM-LI) readings. These indicators were designed to trigger the declaration of a Site Emergency. During a site accountability operation, two persons were simulated to be missing, requiring search and rescue operations. During a subsequent evacuation of non-essential personnel, five individuals were simulated to be contaminated, and required monitoring and decontamination at Crawford Station.

To evaluate the Licensee's ability to handle an individual who became contaminated and injured, an auxiliary operator who was dispatched to investigate an increasing bearing temperature was simulated to slip after breaking a pressure sensing line, breaking his leg and becoming unconscious. This required a response by offsite medical and transportation support.

There was a simulated fire in the circulating water pump house. This fire was fought by the onsite fire brigade as well as offsite fire companies. The fire caused the loss of circulating water flow, loss of condenser vacuum, and the need to steam to the atmosphere to continue plant cooldown. During this process, major fuel damage was simulated to occur with offsite dose rates which would trigger declaration of a General Emergency and protective action recommendations.

In summary, this was a comprehensive and detailed scenario, escalating from an Unusual Event to the General Emergency category. The scenario called for very little simulation - information on plant parameters and conditions was provided to participants only after those actions which would be required under actual accident conditions to obtain or produce such information had been taken by the exercise participants. This satisfied the NRC scenario objective for the emergency exercise.

POTASSIUM IODIDE

PORC APPROVED PROCEDURE

- EXPOSURE ≥10 RAD THYROID DOSE
- ADMINISTERED BY SITE MEDICAL PERSONNEL
- VOLUNTARY USE BY EMERGENCY WORKERS

FOLLOW-UP BIOASSAY MONITORING FOR EXPOSED PERSONNEL

ONSITE STOCKAGE OF 1000 DOSES-KI TABLETS

r/n Rnnnn

TRANSFER OF RESPONSIBILITY

I. SHIFT SUPERVISOR - EMERGENCY DIRECTOR

EMERGENCY DIRECTORS LOG

EMERGENCY PLAN IMPLEMENTING PROCEDURES

EMERGENCY/ABNORMAL PROCEDURES

II. EMERGENCY DIRECTOR - EMERGENCY SUPPORT DIRECTOR

EMERGENCY PLAN IMPLEMENTING PROCEDURE

ASSUMES RESPONSIBILITY FOR CORPORATE MANAGEMENT OF EMERGENCY RESPONSE -

- CORPORATE SPOKESMAN TO OFFSITE AGENCIES
- RECOMMENDS PROTECTIVE ACTIONS
- RELIEVES EMERGENCY DIRECTOR OF RESPONSIBILITIES NOT RELATED TO PLANT OPERATION.

III. RADIOLOGICAL ASSESSMENT COORDINATOR - ENVIRONMENTAL ASSESSMENT COMMAND CENTER

EMERGENCY PLAN IMPLEMENTING PROCEDURE

UPON DIRECTION OF THE EMERGENCY DIRECTOR

RAC - DIRECTS IN-PLANT AND ONSITE MONITORING
EACC - DIRECTS OFFSITE MONITORING AND DOSE PROJECTIONS

1981 ANNUAL RADIATION EMERGENCY EXERCISE SCENARIO

THREE MILE ISLAND

UNIT I

JUNE 2, 1981

EXERCISE EVENTS

DECLARATION OF EMERGENCY

NOTIFICATION OF OFFSITE AGENCIES

EMERGENCY ANNOUNCEMENTS

ACTIVATION OF ONSITE ORGANIZATION

ACTIVATION OF OFFSITE ORGANIZATION

FULL ACCOUNTABILITY

RCS POST ACCIDENT SAMPLE

SEARCH AND RESCUE

*EVACUATION OF PERSONNEL

MONITORING AT ASSEMBLY AREA

*CONTAMINATED PERSONS ARE DECONTAMINATED

EMERGENCY MEDICAL ASSISTANCE TO CONTAMINATED-INJURED PERSON

OFFSITE MEDICAL RESPONSE

RESPONSE TO FIRE AT CWP HOUSE

STATE POLICE HELICOPTER NOTIFICATION AND TRAFFIC CONTROL

MAJOR SCENARIO EVENTS

T (MIN)

T (MIN)		
30	1.	PRIMARY TO SECONDARY LEAK INDICATED BY INCREASING COUNTRATE ON CONDENSER OFFGAS MONITOR.
140	2.	STEAM LINE RADIATION MEASUREMENTS INDICATE LEAK IN BOTH STEAM GENERATORS.
170	3.	WASTE GAS COMPRESSOR SEAL FAILURE ALLOWS BUILDUP OF AIRBORNE RADIOACTIVITY IN AUXILIARY BUILDING.
220	4.	STEAM GENERATOR TUBE RUPTURE INDICATED BY STEP CHANGES IN COUNTRATE ON THE OFFGAS MONITOR AND MAKE-UP FLOW RATE.
320	5.	AUXILIARY OPERATOR IS INJURED AND CONTAMINATED WHILE INVESTIGATING MAKE-UP PUMP PROBLEM. OFFSITE MEDICAL ASSISTANCE.
380	6.	FIRE IN CIRCULATING WATER PUMP HOUSE. OFFSITE FIRE ASSISTANCE.
390	7.	FIRE CAUSES LOSS OF ALL CIRCULATING WATER PUMPS AND CONDENSER VACUUM REQUIRING STEAMING TO ATMOSPHERE TO CONTINUE COOLDOWN. MAJOR FUEL FAILURE OCCURS.
425	8.	OFFSITE POWER IS LOST. "B" DIESEL GENERATOR PICKS UP VITAL LOADS.
UNTIL TERMINATION	9.	REACTOR COOLANT SYSTEM IS ON NATURAL CIRCULATION REMOVING DECAY HEAT BY STEAMING TO ATMOSPHERE.

NRC Staff Response to GPU Submittal

II.K.2.14/II.K.3.7 (PORV Opening Probabilty)

- Concurred with general technique
- Requested additional details on methods used

II.K.3.2 (Safety Effect of PORV Isolation System)

Requested additional information:

1) Probability of stuck open safety valve resulting from operation with PORV block valve closed.

2) Probability of stuck open safety valve resulting from depressurization events.

3) PORV opening probability due to ICS failure which terminates all feedwater flow.

4) Safety valve failure rate based on operating experience.

GPU Response

- Work initiated at B&W to develop additional information
- Expect to submit requested information by September 1, 1981

T. 7 Keaten

POWER OPERATED RELIEF VALVE ISSUES

II.K.2.14/II.K.3.7

PERFORM AN ANALYSIS TO ASSURE THAT THE FREQUENCY OF PORV OPENINGS IS LESS THAN 5% OF THE TOTAL NUMBER OF OVERPRESSURE TRANSIENTS. USE REVISED SETPOINTS AND TRIPS.

II.K.3.1

PROVIDE A SYSTEM TO AUTOMATICALLY CAUSE THE PORV BLOCK VALVE TO CLOSE WHEN RCS PRESSURE DECAYS AFTER PORV HAS OPENED. FAILURE OF THIS SYSTEM SHOULD NOT AGGRAVATE PLANT TRANSIENTS AND ACCIDENTS (IMPLEMENTATION DEFERRED UNTIL COMPLETION OF II.K.3.2).

II.K.3.2

PERFORM AN ANALYSIS OF IMPROVEMENTS WHICH DECREASE PROBABILITY OF SBLOCA DUE TO STUCK OPEN PORV. EVALUATE SAFETY VALVE FAILURE RATES BASED ON OPERATING EXPERIENCE IN PLANTS DESIGNED BY THE NSSS VENDOR.

II.K.2.14/II.K.3.7 PORV OPENING PROBABILITY

- Analytical Estimate

  Defined random variables:

  High pressure trip setpoint

  Pressure Overshoot

  PORV Opening Pressure

  Performed Monte Carlo analysis of PORV opening probability

  Result = 3.9×10^{-6} / RX - YR

- Estimate from Operating Experience

  - 148 PORV Actuations (Prior to TMI-2 Accident)
  - 42 PORV Actuations (Post TMI-2) would have occurred with old PORV setpoint
  - With new setpoint, 3 PORV actuations expected out of 190 old setpoint actuations
  - Result = 1.6% PORV opening probability for overpressure transients

- Conclusions

  - Two methods give significantly different answers
  - Both answers meet 5% criteria

II.K.3.2 SBLOCA PROBABILITY

PORV Opening Probability

Estimated analytically based on five initiators

- Overpressure transient
- Transient with delayed EFW
- Operator action
- Instrumentation/Control faults
- Overcooling event and delayed HPI throttling

Result = 2.3×10^{-2} / Rx - yr.

PORV Failing Open Probability

Estimated based on experience and analysis

Based on five mechanical failures in > 250 openings

Net failure rate = 2.1×10^{-2}/ demand

Total PORV SBLOCA Probability = 4.7×10^{-4}/Rx - yr.

Total SBLOCA Probability = 1×10^{-3}/ Rx - yr.

Pressurizer Safety Valve Failure Rate

3 cases where valves lifted on B&W plants

No case of failure to close

CONTROL ROOM HABITABILITY

REQUIREMENTS: (NUREG-0737, ITEM III.D.3.4)

1. EVALUATE CONTROL ROOM HABITABILITY FOR:
   - HAZARDOUS CHEMICAL RELEASE (R.G. 1.78),
   - ACCIDENT CHLORINE RELEASE (R.G. 1.95)
   - DBA RADIATION SOURCE TERM (SRP-15.6.5)
2. IDENTIFY POSSIBLE NEED FOR CONTROL ROOM MODIFICATIONS OR PROVIDE ASSURANCE OF CONTROL ROOM HABITABILITY PER GDC-19.
3. SUBMIT INFORMATION PER NUREG-0737, ITEM III. D.3.4, ATTACHMENT 1.

PROBLEM:

THE TMI-1 CONTROL BUILDING VENTILATION SYSTEM IS INADEQUATE TO MONITOR AND CONTROL A TOXIC GAS OR RADIOACTIVE GASEOUS RELEASE AS REQUIRED BY NUREG-0737, ITEM III.D.3.4.

CAUSE OF PROBLEM:	CORRECTIVE ACTION:
(1) CONTROL ROOM ISOLATION IS NOT SINGLE FAILURE PROOF	(1) MODIFY OR REPLACE DAMPERS
(2) NO QUICK-RESPONSE DETECTORS AND ALARMS FOR CHLORINE AND OTHER TOXIC GASES	(2) INSTALL REDUNDANT SAFETY-GRADE DETECTION AND ALARM SYSTEMS

LICENSING STATUS:

ACCIDENT ANALYSIS RESULTS AND IDENTIFICATION OF REQUIRED MODIFICATIONS FOR RADGAS AND CHLORINE WILL BE SUBMITTED TO NRC WITHIN A MONTH. ANALYSES ARE CONTINUING FOR OTHER TOXIC GASES.

SCHEDULE:

MODIFICATIONS WILL BE IMPLEMENTED BY JANUARY 1,1983

-a

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

HANDOUT FOR THE ACRS SUBCOMMITTEE MEETING ON TMI-1

JUNE 25, 1981 Agenda Item No. 5

Non TMI Related Items Requiring Resolution Prior to TMI-1 Restart

I. I&E Bulletin 79-27

Requirement

The following are commitment items imposed by Commission Orders to the B&W licensees as a result of the Crystal River No. 3 event of February 26, 1980 and the items are related to issues in I&E Bulletin 7927.

The licensee will be required to implement all four items prior to restart.

1. Actions which will allow the operator to cope with various combinations of loss of instrumentation and control functions. This includes changes in (A) equipment and control systems to give clear indications of functions which are lost or unreliable; (B) procedures and training to assure positive and safe manual response by the operator in the event that competent instruments are unavailable.

2. Determination of the effects of various combinations of loss of instrumentation and control functions by design review analysis and verification by test.

3. Correction of electrical deficiencies which may allow the power operated relief valve and pressurizer spray valve to open on non-nuclear instrumentation power failures, such as, the event which occurred at Crystal River, Unit 3 on February 26, 1980.

4. Submit to the NRC a written response to I&E Bulletin 79-27.

Position for Restart

These items were imposed as a condition for continued operation on all operating B&W plants by Commission Orders issued on April 14-22, 1980.

Status

The staff has not issued a Commission Order imposing the 4 items on TMI-1 because of the Commission's shutdown order. However, the licensee was made aware of these items being imposed on other B&W plants. Presently the licensee is partially responsive to this issue.

T10 Dilanni

III. Contain..nt Spray Effectiveness

Requirement

The staff has determined that the use of sodium thiosulfate is an unreliable I_2 suppressor when used with sodium hydroxide as a containment spray solution in the event of a design basis accident. The staff has requested that all operating plants delete sodium thiosulfate as a solution in the containment spray system. In addition, a determination on the iodine removal effectiveness of the containment spray using sodium hydroxide should be evaluated using the method described in NUREG-CR0009.

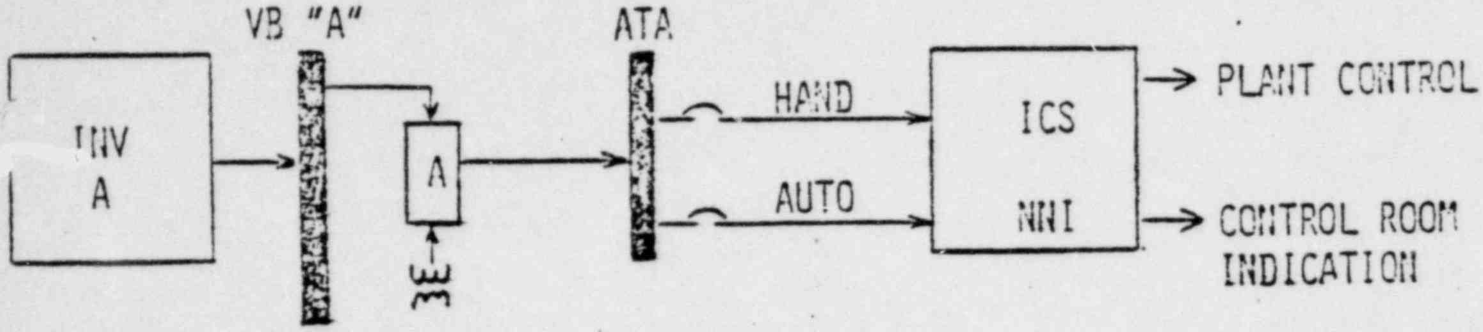
Position for Restart

This problem has been existing for several years and the staff has judged that it should be resolved prior to restart. This issue has been resolved for all other operating plants.

Status

The staff is waiting on the licensee's response to our letter dated March 7, 1980.

ICS/NNI POWER - BEFORE



o Loss of Power to ATA or HAND or AUTO to ICS/NNI

- Inadequate Control Room Indication for Hot Shutdown
- Inadequate Control System Operation for Hot Shutdown
- CORE COOLING BY PRIMARY FEED AND BLEED

TII Chisholm

ICS/NNI IMPROVEMENTS

- FAILURE MODES & EFFECTS ANALYSIS
- EQUIPMENT TEST
- MODIFICATION OF VALVE FAILURE MODES
- CONTROL ROOM DISPLAY INSTRUMENTS INDEPENDENT OF ICS/NNI
- POWER SUPPLY MONITORING
- ADDITIONAL BUS TRANSFER

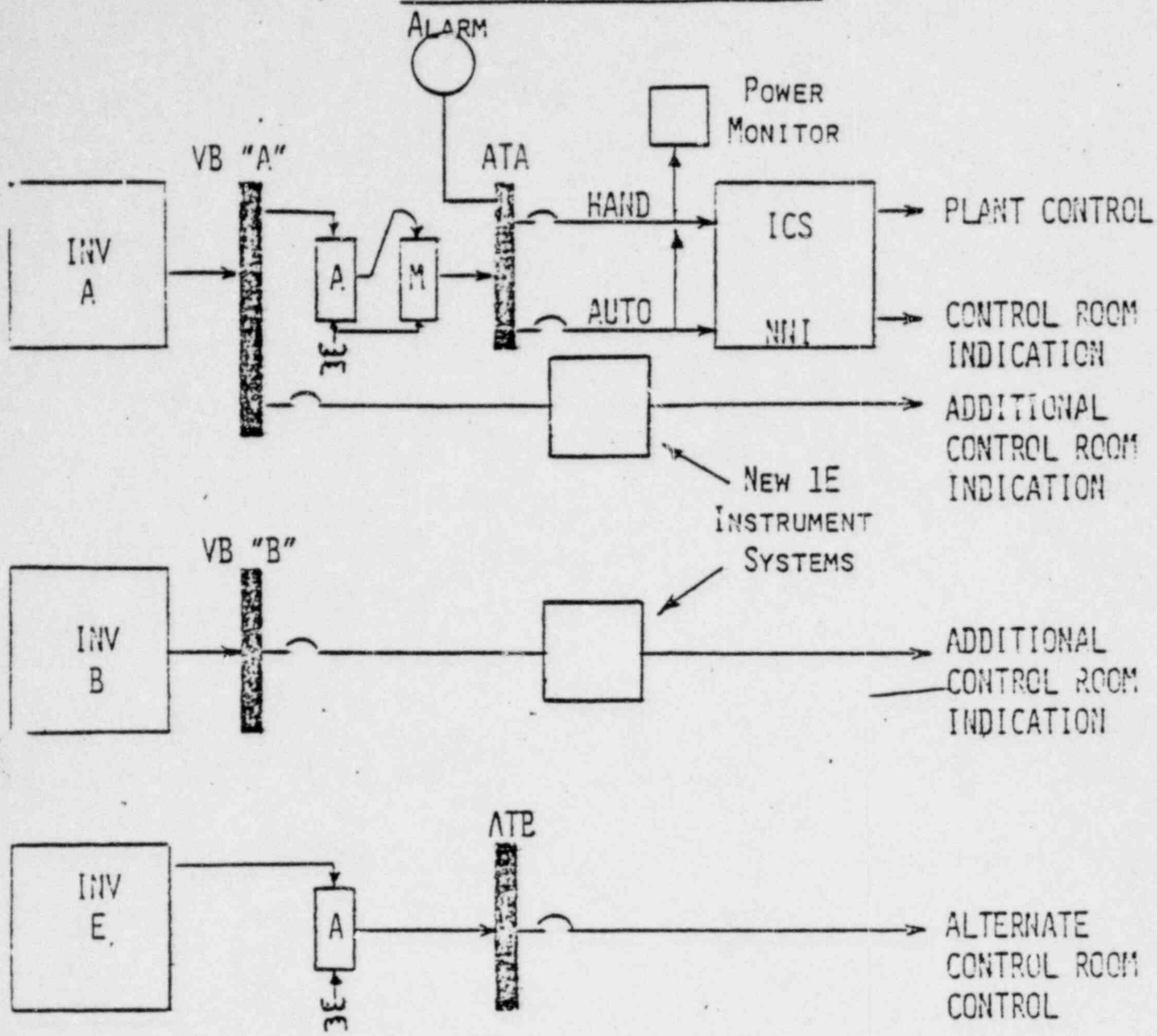
MODIFICATION OF VALVE FAILURE MODES

- ATMOSPHERIC DUMP VALVES
  - CHANGED FROM FAIL MID-OPEN TO FAIL CLOSED ON LOSS OF SIGNAL
  - PROVIDED ALTERNATE MANUAL CONTROL INDEPENDENT OF ICS.
- PRESSURIZER SPRAY VALVES
  - CHANGED FROM FAIL MID-OPEN TO FAIL CLOSED ON LOSS OF SIGNAL
- TURBINE BY-PASS VALVES
  - CHANGED FROM FAIL MID-OPEN TO FAIL CLOSED ON LOSS OF SIGNAL

INSTRUMENTS TO BE PROVIDED IN THE CONTROL ROOM INDEPENDENT OF ICS/NNI. (REQ'D FOR HOT SHUT-DOWN)

- OTSG PRESSURE (A & B)
- PRESSURIZER LEVEL
- MAKE-UP TANK LEVEL
- RCS PRESSURE
- RCS COLD LEG TEMP. (A & B)
- RCS HOT LEG TEMP. (A & B)

ICS/NNI POWER - AT RESTART



o LOSS OF POWER TO ATA OR HAND OR AUTO TO ICS/NNI

- ADEQUATE CONTROL ROOM INDICATION FOR HOT SHUTDOWN
- ADEQUATE CONTROL FOR HOT SHUTDOWN
- CORE COOLING VIA STEAM GENERATORS

o LOSS OF POWER TO VB "A", VB "B" OR ATB

- NO EFFECT ON NORMAL CONTROL OR INDICATION

POOR ORIGINAL

NRC I&E BULLETIN 80-11 (MASONRY WALLS)

SCOPE OF APPLICATION

AUXILIARY BUILDING - 15 WALLS USED AS "KNOCKOUT" PANELS

ELEVATOR SHAFT IN REACTOR BUILDING

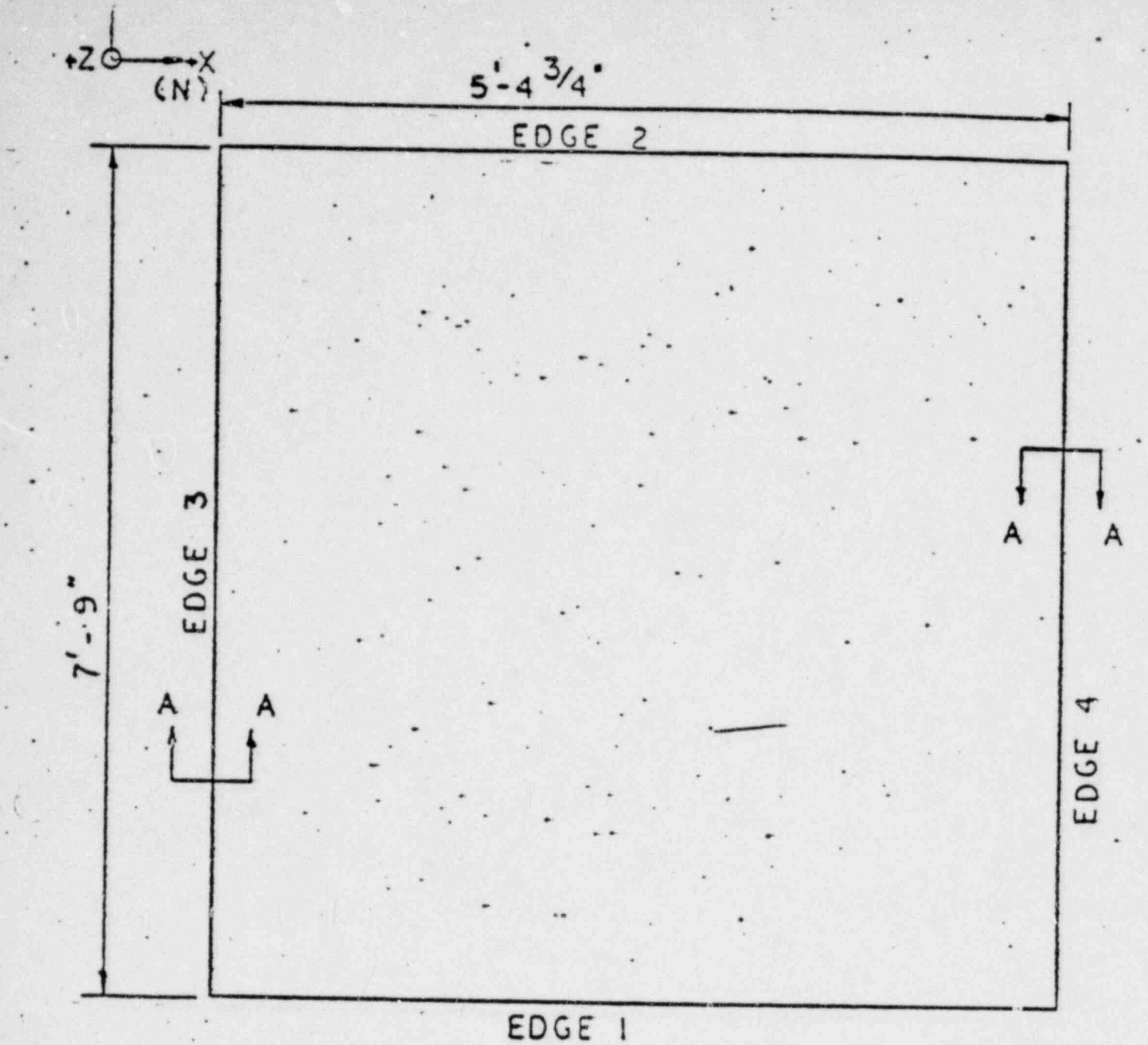
AIR SHAFT IN INTERMEDIATE/TURBINE BUILDING

TYPE OF CONSTRUCTION

ELEVATOR AND AIR SHAFTS PARTIALLY REINFORCED HOLLOW BLOCK CONSTRUCTION

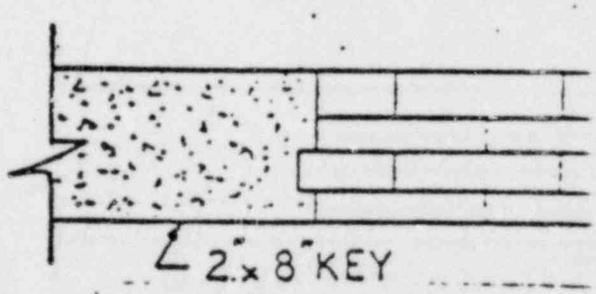
AUXILIARY BUILDING - MULTI WYTHE UNREINFORCED SOLID BLOCK CONSTRUCTION

T12 Cranebarger



BOUNDARY CONDITIONS

EDGE 1 = FIXED
EDGE 2 = FREE
EDGE 3 = FREE
EDGE 4 = SIMPLY SUPPORTED



SECTION A-A

POOR ORIGINAL

CONCLUSIONS

1. FOR MULTI WYTHE CONSTRUCTION, PROVIDE COLLAR JOINTS (I.E., ASSURE GAP BETWEEN BLOCK WIDTHS IS FILLED).

2. REPAIR VISIBLE CRACKING IN AIR SHAFT.

3. REINFORCE PORTIONS OF ELEVATOR SHAFT.

ANTICIPATED SCHEDULE

FIRST PRIORITY - TO REINFORCE OR CORRECT CONSTRUCTION TO ASSURE WALL FAILURE DOES NOT JEOPARDIZE ABILITY TO ACHIEVE AND MAINTAIN SAFE SHUTDOWN.

TMI-1 MODIFICATIONS - GPUNC REQUIRED

INTEGRATED CONTROL SYSTEM	• Control Power Supply for Atmosphere Dump Valves on ICS Power Failure • Loss of Power Indication • Valves Fail Shut on Loss of Power Przr Spray Condenser Dump Atmospheric Dump • Przr Heaters Low Level Cutout Override • Indication of Critical Plant Parameters Independent of ICS/NNI RCS Pressure RCS Temperature OTSG Pressure MUT Level Przr Level
AUXILIARY FEEDWATER	• Backup Air Compressors to Supply Selected Valves Flow Control Atmospheric Steam Dump AFW Pump Recirculation Turbine Steam Pressure Control • OTSG Level Indication Independent of ICS • Manual Flow Control Independent of ICS • Flow Control Valves Fail Open on Loss of Air • EFW Turbine Pump Relief Valves Spring Replacement
TMI-2 SEPARATION	• Separate TMI-2 RCS Sampling Facility • Fuel Handling Building Barrier and Isolation Dampers
PRESSURIZER HEATERS	• Move Circuit Breakers for Two Groups Outside Containment
CONCRETE COATING	• Recoat in Selected Areas of Auxiliary Building and Containment

T13

CONTROL ROOM DESIGN REVIEW	• Relabeling/Demarcation • Relocation of Instruments and Controls • ESAS Status Panel Reformat • Relocation of Alarm Windows
INSTRUMENTATION	• Raise OTSG Level Transmitters • Raise Pressurizer Level Transmitters • Butt Splicing/Heat Shrink Tubing/Conax Connectors Inside Containment
DECAY HEAT PUMPS	• Vibration Monitors • Remote Oiling • Remote Venting
VALVE POSITION INDICATION	• MS Safeties Position Indication • Nameplates for Valves with Demand Indication
855 COMPUTER	• Higher Speed Printer (40 LPM)
MOD COMP IV COMPUTER	• High Speed Alarm Printer (79 LPM) • High Speed Utility Printer (300 LPM) • Color CRT's in Control Room (1 alarm/2 utility)
REACTOR COOLANT PUMPS	• Remove Surge Suppression Capacitor to Improve Reliability in Radiation Field
CABLE TRAYS	• Replace Approximately 200 Connection Assemblies
CONTAINMENT COOLING	• Additional Industrial Cooler • Ind. Cooler Chemical Addition System • Modify Containment Cooling Fan Motors

ENGINEERED SAFEGUARDS ACTUATION SYSTEM	• Provide Automatic Reset • Modify Clark Relays
EMERGENCY PLANNING	• Real Time Gamma Radiation Monitors at 10 Locations • New Radio Communications Channel for Environmental Monitoring Teams
IE BUS LOADING	• Automatically Trip Loads on ESAS
PORV	• Added Manual Control from Control Room • Replace Installed PORV with Refurbished Valve
CONTAINMENT INTEGRITY	• Replace Containment Isolation Valve (RB-V7) • Added System for Leak Checking Decay Heat and Core Flood Check Valves • Replace Purge Valve Seats • Modify Makeup System Crane Check Valve Internals
ALARA	• Install Makeup Valve Room Shield Wall • Relocate Waste Evaporator Feed Pump
DIESEL GENERATOR	• Replace Air Intake Duct Elbows
CONTAINMENT ISOLATION	• Replace 11 ASCO Solenoid Valves

TMI-1 MODIFICATIONS - NRC REQUIRED

IEB 79-05A (4/5/79)

- CONTAINMENT ISOLATION
  - Line Break Detection
  - Reactor Trip
  - Containment Pressure (4 psig or 30 psig)
  - High Radiation in Process Lines
- PORV SETPOINT
  - Raised to 2450 psig
- RX TRIP SETPOINT
  - Lowered to 2300 psig

IEB 79-05B (4/23/79)

- ANTICIPATORY REACTOR TRIP
  - Loss of Both MFWP
  - Turbine Trip

NUREG-0578 (9/13/79)

- PRESSURIZER HEATERS EMERGENCY POWER
  - 252KW Manually Transferred to Diesel
- PORV AND SAFETY VALVE POSITION INDICATION
  - Flow Meters Downstream of PORV and SV
  - Accelerometers on PORV
  - Tail Pipe Temp. Detectors
- INADEQUATE CORE COOLING
  - Incore Thermocouples (2300°)
  - RCS Saturation Margin Monitc
  - Wide Range Th (120°F-920°F)
- H_2 CONTROL
  - Install H_2 Recombiner
- SHIELDING DESIGN REVIEW
  - Relocate Stack Monitor
  - Shield MCC 1A/1B
- POST ACCIDENT SAMPLING
  - Shield/Reroute RCS Sample Lines
- RCS HIGH POINT VENTS
  - Pressurizer Degas Line
- OSC/TSC

(cont.)

T13

Requirement	Modification	Details
NUREG-0578 (continued)	CONTAINMENT WATER LEVEL	• Control Grade Wide Range (0-90")
	IODINE/PARTICULATE SAMPLING	
	NOBLE GAS MONITORS	• Rx Building Purge • Condenser Off-Gas • Main Steam
	AUXILIARY FEEDWATER AUTOMATIC INITIATION	• MFP Auto Start on Loss of 4 RCP or 2 MFP • Operability on Loss of All AC (Backup Air Bottles) • Condensate Storage Tank 20 Min. Alarm • Control Room Annunciation for All Auto Starts
	AUXILIARY FEEDWATER FLOW INDICATION	• 2 Sonic Flow Detectors/OTSG
IEB 79-27 (11/30/79)	ICS/NNI POWER	• Manual Bus Transfer from Control Room • Loss of Power Alarm
10 CFR 73.55	SECURITY SYSTEMS	• Positive Access Control System • Subdivided Vital Areas Into 3 Zones • Power Supply (Diesel/UPS) • Motion Detection System

Requirement	Modification	Items
10 CFR 50 App. R	FIRE PROTECTION	• Halon Fire Suppression for Computer • Fire Door Upgrade • Hose Reels Containment Auxiliary Bldg. Control Bldg. • Fire Detection Containment Intermediate Bldg. Auxiliary Bldg. • Sprinkler System Auxiliary Bldg. • Deluge System Auxiliary Bldg. • Emergency Lighting • Fire Dampers
IEB 79-02 IEB 79-14	PIPING SYSTEM SUPPORTS	• Modify Approximately 400 Supports • Add 65 New Supports
NUREG-0737 (10/31/80)	CONTROL ROOM DESIGN REVIEW	• Guard Rails to Minimize J-Handle Inadvertent Actuation • Color Code Alarms for Prioritization • Show Normal Range on Meters • Annunciator Alarm Volume/Tone Adjustment

	LOCA ANALYSIS	• HPI Cross Connects • HPI Cavitating Venturis
	DEGRADED GRID	• Replace Limitorque Gears on BSV-1A/1B • Added Solid State Under-voltage Relays to Trip 4160V Buses at 3550-3560V
IEB 79-18	RADIATION EVACUATION ALARMS	• Additional Alarms/Lights in High Noise Areas
	RADWASTE	• Temporary Solidification System • Radwaste Staging Facility
	CONTAINMENT PURGE VALVES	• Limit Opening to 30°
	TELEPHONE EQUIPMENT	• Vital Bus Feed
	INPLANT COMMUNICATIONS	• Additional Sound Power Phones and Page Station
	CONTAINMENT SPRAY pH CONTROL	• Deletion of Sodium Thiosulfate • BWST/NaOH Tank Differential Pressure Indication
	EMERGENCY PLANNING	• Early Warning Sirens

REQUIREMENT

NUREG - 0737 SECTION II.F.2

"LICENSEES SHALL PROVIDE A DESCRIPTION OF ANY ADDITIONAL INSTRUMENTATION OR CONTROLS (PRIMARY OR BACKUP) PROPOSED FOR THE PLANT TO SUPPLEMENT EXISTING INSTRUMENTATION (INCLUDING PRIMARY COOLANT SATURATION MONITORS) IN ORDER TO PROVIDE AN UNAMBIGUOUS, EASY-TO-INTERPRET INDICATION OF INADEQUATE CORE COOLING (ICC)."

"THE EVALUATION IS TO INCLUDE REACTOR-WATER-LEVEL INDICATION."

GPUN APPROACH TO
EVALUATION OF WATER LEVEL MEASUREMENT

- DEFINE USE AND DEVELOP CRITERIA
  - PARTICIPATED IN B&W OWNER'S GROUP EVALUATION
  - IN-HOUSE EVALUATION VS OPERATOR GUIDELINES
  - CONSIDERING USES OTHER THAN OPERATOR ACTION
- EVALUATE POTENTIAL DETECTORS
  - PARTICIPATED IN B&W OWNER'S GROUP EVALUATION
  - IN-HOUSE EVALUATIONS
  - SPONSORING STUDY BY CONSULTANT OF POSSIBLE METHODS
  - COOPERATING IN UNIVERSITY PROPOSAL RE NEUTRON DETECTORS
  - WILL REVIEW EPRI EVALUATION (DUE OCTOBER 1981)
- SELECT APPROPRIATE ACTION
  - INSTALL AVAILABLE DETECTOR(S)
  - SUPPORT FURTHER DEVELOPMENT
  - DEFINE ALTERNATE APPROACH

GPUN Definition of Inadequate Core Cooling

"Inadequate core cooling means those conditions under which the limits of 10 CFR 50.46 are exceeded."

HUMAN FACTORS CRITERIA FOR INSTRUMENTATION

- PROVIDE ONLY INSTRUMENTS THAT OPERATORS WILL USE TO PERFORM THEIR JOB.
- DISTINGUISH BETWEEN NEEDS OF OPERATORS, SENIOR OPERATORS, SHIFT TECHNICAL ADVISORS, AND OTHERS.
- AVOID AMBIGUOUS INDICATIONS.
- PROVIDE SPECIFIC TRAINING AND PROCEDURES FOR EACH INSTRUMENT USED BY OPERATORS.

OPERATOR ACTIONS RELATEL .O WATER LEVEL MEASUREMENT

OPERATOR ACTION	INFORMATION NOW AVAILABLE	VALUE OF WATER LEVEL SIGNAL
LOCA RESPONSE		
- Verify adequate HPI flow	ESAS status panel, HPI flow meters	Not useful
- Throttle HPI flow	T_{SAT} Margin, Pzr Level, LPI Flow	Operator actions unchanged*
- Detect approach to inadequate core cooling	In-Core T/C's	Probably not useful
OVERCOOLING RESPONSE		
- Initiate/verify HPI Flow	ESAS status panel, HPI flow meters	Not useful
- Throttle HPI flow	T_{SAT} Margin, Pzr Level	Operator actions unchanged*
HEAD BUBBLE RESPONSE		
- Determine bubble exists	Pzr level, PV tests	Undefined
- Repressurize/Slow Cooldown	Under evaluation	Undefined
RCS VENTING(Post-Accident)		
- Open Vents	Under evaluation	Undefined
- Close Vents	Under evaluation	Undefined

* Might be used as confirmatory information

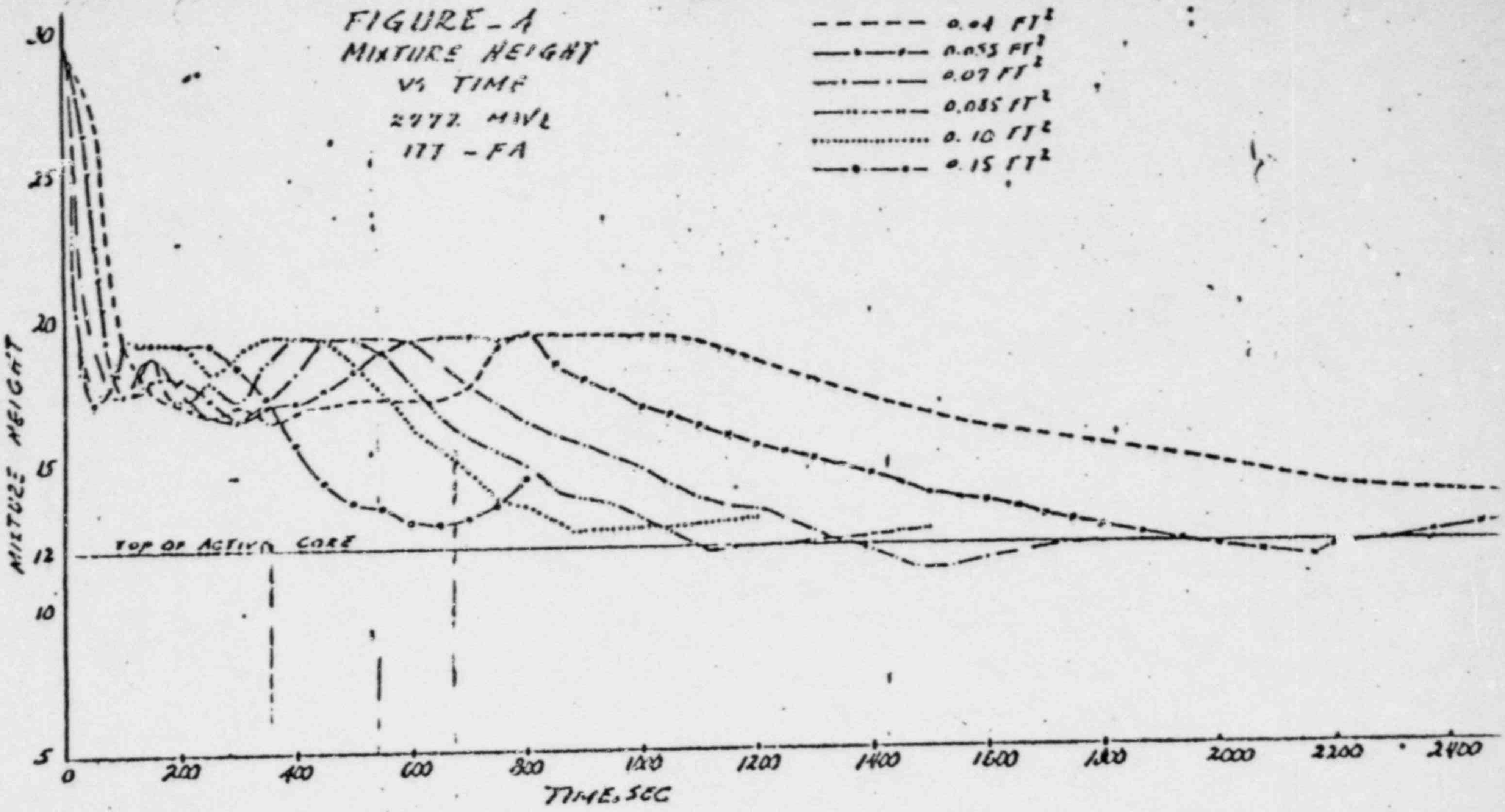


FIGURE-1
MIXTURE HEIGHT
VS TIME
2772 MWt
177 - FA
0.04 FT²
0.055 FT²
0.07 FT²
0.085 FT²
0.10 FT²
0.15 FT²
TOP OF ACTIVE CORE
MIXTURE HEIGHT
TIME, SEC
5
10
12
15
20
25
30
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400

OTHER POSSIBLE USES OF WATER LEVEL MEASUREMENT

USE	COMMENTS
• CONFIRM NEED FOR WATER INJECTION	• USEFULNESS DEPENDS ON SPECIFIC DESIGN - ALL DESIGNS NOT RELIABLE FOR ALL SCENARIOS.
• DISTINGUISH BETWEEN LOCA AND OVERCOOLING	• NOT USEFUL
• AID IN POST-TRANSIENT EVALUATIONS	• USEFULNESS DEPENDS ON SPECIFIC DESIGN AND ACCIDENT SCENARIO.

LEADING CANDIDATES FOR LEVEL MEASUREMENT

METHOD	DEVELOPER	COMMENTS
VESSEL ΔP	WESTINGHOUSE EG&G GE	DIRECT LEVEL MEASUREMENT UNDER QUIESENT CONDITIONS. INDICATES "EQUIVALENT" LEVEL FOR 2 PHASE, LOW FLOW CONDITIONS. DIFFICULT TO INTERPRET WITH FORCED FLOW.
HOT-LEG ΔP	B&W	SIMILAR IN PRINCIPLE TO VESSEL ΔP. GOOD "ANTICIPATION" BUT NOT FULL RANGE.
HEATED T/C's	CE ORNL (EG&G)	INDICATES LEVEL AT DISCRETE INTERVALS. RESPONSE VS QUALITY OF FLUID MUST BE KNOWN. REQUIRES APPROPRIATE PENETRATIONS IN REACTOR HEAD.
NEUTRON DETECTORS	EPRI (PREVIOUSLY) PSU (POTENTIALLY)	NON-INTRUSIVE DETECTORS. TESTS INDICATE SENSITIVITY GOOD WITH WATER LEVEL WITHIN 8 FEET OF TOP OF CORE.
CORE EXIT T/C's	?	MAY BE ABLE TO CORRELATE TO WATER LEVEL IF BELOW TOP OF CORE.

COMPARISON TO NRC CRITERIA

NUREG 0737 CRITERIA	VESSEL ΔP	HOT-LEG ΔP	HEATED T/C's	NEUTRON DETECTORS	CORE EXIT T/C's
1. Unambiguous:					
a) Pumped void fraction	No(?)	No(?)	?	Yes	Yes
b) Stagnant Boil-Off	Yes	Yes	Yes	Yes	Yes
c) No erroneous ICC	?	?	Yes	?	Yes
2. Advance Warning	Yes	Yes	Yes	Yes	Yes*
3. Full Range	No	No	No	No	**
4. Qualifications					
a) Environment	?	?	Yes	Yes	?
b) Single Failure	Yes	Yes	Yes	Yes	Yes
c) 1E Power	Yes	Yes	Yes	Yes	Yes
d) Available before accident	Yes	Yes	Yes	Yes	Yes
e) Q/A	Yes	Yes	Yes	Yes	?
f) Continuous indication	?	Yes	Yes	Yes	Yes
g) Recording	?	Yes	Yes	Yes	Yes
h) Isolation	Yes	Yes	Yes	Yes	Yes
i) Operation Checks	?	?	?	?	Yes

* By GPU definition of inadequate core cooling.

** Full range of temperatures, not full range of water level.

CURRENT GPUN CONCLUSIONS
RE WATER LEVEL MEASUREMENT

- Not Required Prior to TMI Restart
  - No need as input to safety systems.
  - Required operator actions are based on existing instruments.
- Criteria for Detector not yet clear
  - Probably not for use by control panel operators.
  - Might be helpful as confirmatory or later diagnostic information.
  - Might help guide longer term actions (e.g., venting).
  - Additional evaluation is needed.
- No "Ideal" Detector has been Identified
  - Forced flow vs low flow/stagnant pool is a problem.
  - Existing systems not shown to meet NRC criteria.
  - New approaches should be considered.
- Premature Installation is Inappropriate
  - May add unnecessary complexity
  - Could be misleading unless use is carefully defined.
- GPUN should continue to pursue criteria and detectors

The Unit I plant procedures are being revised so that they provide the operator with an easy to read, well defined document he can rely on during normal and emergency conditions. The changes being incorporated include:

A. Stressing the heat transfer aspect of maintaining adequate core cooling

B. Incorporation of NRC bulletin guidance

C. The lessons learned task forces recommendation on operator performance

D. The philosphy of using multiple plant parameters to judge system conditions

E. Including as followup action the rechecking of key parameters using available alternative indications

F. Denoting the use of newly installed systems designed to assist in combating any accident

G. Providing firm instructions on continuing high pressure injection and providing definitive instruction on bypassing engineered safeguard signals.

H. Including in the procedures definitive operator guidance where necessary to accomplish core cooling through either the PORV or code safety valves in order to prevent core damage. The instructions clearly specify these actions are permissible and required, even though <u>during</u> normal plant operation the plant procedures and Tech Specs prohibit operating with indications of a solid pressurizer.

I. Including independent verification of system lineups and components to ensure alternate emergency feedwater and alternate engineered safeguard systems are functional prior to allowing maintenance or testing on any portion of these systems. Including procedure requirements for

TIH Rwch

independent system alignment after maintenance or testing to ensure system readiness.

J. Upgrading the procedures to reflect the newly installed change modifications.

K. Incorporating firm guidance to initiate the emergency plan when the applicable E-plan triggering level is reached.

L. Making procedure words and plant equipment labels agree.

Caution notes are being enclosed in blocks to visually aid the operator in noting the importance of these items.

In order that the operator more fully understands the purpose and intent of the emergency procedures an objective section is being incorporated into each procedure.

To ensure our procedures do not become cumbersome to use, but still give sufficient guidance to the operator, when required, appendixes have been added to some procedures giving step by step alternate actions to be taken if during the course of the procedure a required action does not take place as expected.

An example of these would be attachments giving step by step action to place the emergency feedwater system in service should components in the system fail to function.

Many of the above changes came about due to our management study of the Unit II accident and the human engineering teams walk through of our procedures. Some additional emergency procedure changes resulted from actual simulator checkout of the plant procedures using actual TMI operations crews.

These crews not only checked out the procedures and made changes but also verified the procedures and the crew concept of training were compatible.

TMI-I Procedure Review and Approval

Previous Method

Under the previous method of procedure review and approval there was a lack of continuity in changes. (No one person controlled the changes to any specific procedure.)

The technical/safety review group, PORC, was flooded with changes - many of which were minor and insignificant; this situation obstructed the PORC's ability to focus on safety significant changes and finally the Unit Superintendent in having to approve all procedures, whether safety related or not, was greatly extended. Due to the numerous changes, including non-safety related changes, the Unit Superintendent could not devote as much time as he would have liked to the review and approval of changes. Also, due to the large number of changes it was difficult to focus on the safety related items.

New Method:

Under the new method of procedure review and approval, the system has been substantially restructured. The concepts of Procedure Owners and Responsible Offices have been established. A Procedure Owner is that person assigned responsibility for a specific TMI-Unit 1 Procedure. The Procedure Owner will be responsible for ensuring that his procedure is maintained accurate and up-to-date. The Procedure Owner will be responsible for reviewing all changes to his procedure, thus insuring continuity. A Responsible Office is that department or group (such as Operations Department, Maintenance Department, Rad Con Department, etc.) which is assigned responsibility for specific groups of TMI-Unit 1 Procedures. The Responsible Offices will insure that their procedures mesh and fit smoothly within not only their department but also with interfacing departments as well. Additionally, the approval requirements have been revamped (within the

POOR ORIGINAL

constraints of the current TMI-I T.S.) to place approval authority with the most cognizant management representative. This more specific approval authority will provide a more realistic work load and should enhance the quality/depth of review. (i.e.: the approval authority should be able to devote more attention to the review and approval of changes and thus be able to focus better on those changes which may be safety significant.) A pending TSCR would allow the review function of the PORC to be separated. The initial revi f changes for technical accuracy and safety significance will be satisfied by the Responsible Offices' Department Head review and concurrence and by a Technical Function review and concurrence (for specific key procedures). Specific assignment of the PORC's review requirements should enhance not only the quality of the procedures but also the level of confidence that items of safety significance are not overlooked. Additionally, the IOSRG is responsible to independently evaluate the technical adequacy and clarity of procedures important to the safe operation of the unit on a periodic basis.

New Administrative Procedure addition to ensure dissemination of management operations policies

A new administrative procedure titled "Conduct of Operations" has been written. This procedure establishes written guidelines for formal professional conduct of operations in the plant. Types of items covered in this procedure are our policies on the following items:

Control Room formality

Control Room access

Control Room distractions

Eating in the Control Room

Trainee supervision

Shift Supervisor responsibility

Communications

Component labeling requirements

Working hours

Incident review requirements

Procedural compliance

Establishment of a key procedure book

Housekeeping and cleanliness

Personnel work attire and attention

The addition of this procedure establishes a firm written management position as items necessary to ensure a well organized disciplined plant operations.

FOR USE IN UNIT I ONLY

1202-3
Revision 14
04/10/81

THREE MILE ISLAND NUCLEAR STATION
UNIT NO. 1 EMERGENCY PROCEDURE 1202-3
TURBINE TRIP

CONTROLLED CO‾Y FOR USE IN UNIT . ‾LY

CONTROL ROOM FILE COPY

Table of Effective Pages

Page	Revision	Page	Revision	Page	Revision	Page	Revision
1.0	13						
2.0	13						
3.0	14						
4.0	13						
5.0	14						

Unit 1 Staff Recommends Approval

Approval NA Date ______
Cognizant Dept. Head

Unit 1 PORC Recommends Approval

M. A. Nelson Date 4/6/81
Chairman of PORC

Manager TMI I Approval

RJ Toole Date 4-10-81

QA Modifications/Operations Mgr

NA Date ______

DOCUMENT ID:0023N

FOR USE IN UNIT I ONLY

THREE MILE ISLAND NUCLEAR STATION

UNIT NO. 1 EMERGENCY PROCEDURE 1202-3

TURBINE TRIP

1.0 SYMPTOMS

1.1 ICS in the tracking mode.

1.2 Turbine stop and combined intermediate valves closed.

1.3 Generator breakers open and megawatts electric zero.

1.4 Reactor trip (if initial reactor power >20 percent).

> NOTE: If both main feedwater pumps are tripped and initial reactor power was >10 percent, reactor will trip.

1.5 Any one of the following turbine trips:

a. Generator fault.

b. Reactor trip

c. Both feed pumps tripped

d. Moisture separator level high

e. Main condenser vacuum <22" HG

f. Vibration 8 mills on Bearings 1, 2, 9, 10, 11, 12

Vibration 10 mills on Bearings 3, 4, 5, 6, 7, 8

g. Loss of both main turbine speed signals

h. Over speed RPM >108 percent

i. Backup over speed RPM >112 percent

j. Hydraulic press <1100 PSI

k. Thrust bearing failure or bearing oil <15 PSI

l. EHC loss of d.c. power

m. Shaft oil pump <105 PSI at >1300 RPM

n. Loss of Stator Cooling and load not <25 percent after 3.5 minutes

o. 2 of 3 exhaust hoods >225°F.

p. Manual actuation of main turbine and generator bearing deluge system.

3.2 Immediate Action

A. Automatic Action

1. Reactor trip (if initial reactor power >20 percent or if RCS pressure >2300 psig).

2. Turbine stop and combined intercept valves close, and generator breakers open.

3. Turbine bypass valves or atmospheric relief open to control 1010 PSI steam generator pressure (or at 895 psig if reactor has not tripped).

NOTE: The Atmospheric Relief Valves will also open if steam generator pressure reaches 1027 PSI.

4. Moisture separator drain tank pumps trip.

5. ICS trips to track and runs back at 20 percent/min., or, if the turbine trip is from loss of feedwater pumps, the run back is 50 percent/minute.

6. If both the main feed pumps have tripped, the steam driven and motor driven emergency feed pumps will start.

7. The feed demand will control O.T.S.G. at minimum level (30").

8. The Turbine Motor Suction Oil Pump, Bearing Oil Lift Pumps and Turning Gear Oil Pump will start as turbine speed decays.

B. Manual Action

NOTE: An asterisk (*) indicates that the parameter value must be reverified as the first step in the follow-up action. Use redundant indication where possible.

---

1. If initial reactor power was >20 percent (with feedwater available) or >10 percent (without feedwater), verify a reactor trip has occurred and also follow EP 1202-4, "Reactor Trip". If reactor trip did not occur at >20 percent power (with feedwater available) or at >10 percent (without feedwater), promptly trip reactor.

2. If turbine trip is due to loss of both Main Feedwater pumps also follow EP 1202-26A.

3. Verify that the Turbine Stop Valves are closed, generators breakers and field breakers are open. Close turbine extraction steam valves as follows:

4 Stage	EXV1A/B	6 Stage	EXV4A/B
8 Stage	EXV5A/B/C/D	10 Stage	EXV6A/B/C/D

*4. Verify steam generator levels are at 30" on the startup range. If any feedwater stations are in hand, total feedwater should be reduced manually to keep steam generator level at 30" on the startup range.

*5. If reactor trip has not occurred at low initial power levels, verify turbine bypass valves control steam generator pressure at 895 psig and reactor power is stable with constant Tave.

3.3 Follow-Up Action

Objective:

If the reactor has tripped, the objective of this procedure is to conserve RCS inventory to offset shrink, ensure the core is 1 percent shutdown, remove decay heat thru the steam generators and arrive at a stable hot shutdown condition.

If the reactor has not tripped, the objective of this procedure is to maintain the reactor at a stable low power level.

_____1. Reverify the parameters marked with an asterisk (*) are in the required range. Use redundant instrumentation if available.

> NOTE:
> a. If a turbine rotating component failure occurs causing a Reactor Trip, then an Unusual Event shall be declared (carry out EPIP 1004.1).
> b. If a turbine failure occurs resulting in casing penetration, then an Alert shall be declared (carry out EPIP 1004.2).

_____2. Verify that the pressurizer safety valves and RC-RV-2 (PORV) are closed by verifying that the discharge Δp indicators indicate approximately zero, that no flow is indicated on the acoustic monitor for the RC-RV-2 (PORV), and the PORV demand indication light indicates closed. Also check backup indications of relief valve flow such as RC Drain Tank level and discharge pipe temperature indication. If the PORV or pressurizer safety valves are open, evaluate symptoms and determine whether other emergency procedures apply.

____3. Verify that turbine bypass valves (or, if vacuum is lost in main condenser, atmospheric reliefs) are controlling steam generator pressure at 1010 PSI (if reactor is tripped).

____4. If reactor has tripped, maintain hot shutdown conditions per OP 1102-10 unless it is desirable to proceed to cold shutdown conditions.

____5. Verify that the feedwater heater water levels are below the high level alarm point and open all extraction steam valves that were closed in step 3 of manual action.

____6. Check 6th Stage Heater Drain Tank Level.
Stop Heater Drain Pumps if level is less than 12 inches.

____7. Start or verify running the A.C. Motor Suction Pump, the Turning Gear Oil Pump, the Bearing Lift Pumps.

____8. If reactor has not been tripped maintain stable low power conditions per OP 1102-2 until cause(s) for turbine trip is found and corrected or it is decided to proceed to hot or cold shutdown conditions.

MAJOR TOPICS FOR DISCUSSION

1. DEFICIENCIES REVEALED BY THE ACCIDENT (LESSONS LEARNED)

2. INFORMATION FLOW/REPORTING

3. CONCLUSION OF THE REPORT BY THE MAJORITY STAFF OF THE HOUSE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS

4. ABBOTT REPORT

T.16 Moseley

FIRST IE INVESTIGATION—NUREG 0600

UNDERLYING ACCIDENT CAUSES:

1. EQUIPMENT PERFORMANCE (FAILURE AND MALOPERATION)

2. TRANSIENT AND ACCIDENT ANALYSES

3. OPERATOR TRAINING AND PERFORMANCE

4. EQUIPMENT AND SYSTEM DESIGN

5. INFORMATION FLOW, PARTICULARLY DURING THE EARLY HOURS OF THE ACCIDENT

6. IMPLEMENTATION OF EMERGENCY PLANNING

INFORMATION FLOW--REPORTING

1. NUREG 0600
2. KEMENY REPORT
3. ROGIVIN REPORT
4. FRAMPTON REPORT
5. SENATE REPORT
6. NUREG 0760
7. REPORT BY THE MAJORITY STAFF OF THE HOUSE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS

ACCIDENT DEFICIENCIES ADDRESSED BY

- NUREG 0600 (FOREWORD)
- KEMENY COMMISSION
- LESSONS LEARNED TASK FORCE
- ROGOVIN
- NRC ACTION PLAN

NRC NOTICE OF VIOLATION (NUREG 0760)

- LICENSEE RESPONSIBLE TO OBTAIN, EVALUATE AND IMMEDIATELY COMMUNICATE IMPORTANT INFORMATION ONSITE AND TO OFFISITE OFFICIALS. ON THE DAY OF THE ACCIDENT THERE WAS A CLEAR FAILURE OF MET ED TO DO THIS.

- SPECIFIC CITATIONS
  - FAILURE TO OBTAIN AND EVALUATE
  - FAILURE TO REPORT TO NRC/PENNSYLVANIA

REPORT BY THE MAJORITY STAFF OF THE HOUSE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS

HOUSE COMMITTEE STAFF REPORT CONCLUSION

"THE RECORD INDICATES THAT IN REPORTING TO STATE AND FEDERAL OFFICIALS ON MARCH 28, 1979, TMI MANAGERS DID NOT COMMUNICATE INFORMATION IN THEIR POSSESSION THAT THEY UNDERSTOOD TO BE RELATED TO THE SEVERITY OF THE SITUATION. THE LACK OF SUCH INFORMATION PREVENTED STATE AND FEDERAL OFFICIALS FROM ACCURATELY ASSESSING THE CONDITION OF THE PLANT. IN ADDITION, THE RECORD INDICATES THAT TMI MANAGERS PRESENTED STATE AND FEDERAL OFFICIALS MISLEADING STATEMENTS (I.E., STATEMENTS THAT WERE INACCURATE AND INCOMPLETE) THAT CONVEYED THE IMPRESSION THAT THE ACCIDENT WAS SUBSTANTIALLY LESS SEVERE AND THE SITUATION MORE UNDER CONTROL THAN WHAT THE MANAGERS THEMSELVES BELIEVED AND WHAT WAS IN FACT THE CASE."

ABBOTT REPORT LESSONS LEARNED

1. OPERATORS SHOULD NOT BE FORCED TO VIOLATE LICENSE LIMITS IN ORDER TO MAINTAIN CORE COOLING.

2. OPERATING PROCEDURES SHOULD BE CORRECT.

3. DURING EMERGENCIES, PLANT MANAGEMENT MUST GIVE PRECISE AND COMPREHENSIVE PLANT STATUS INFORMATION TO PUBLIC OFFICIALS RESPONSIBLE FOR PROTECTING HEALTH AND SAFETY.

TECHNICAL SPECIFICATIONS VS PROCEDURES

1. TECH SPECS COVER NORMAL OPERATING AND SHUTDOWN CONDITIONS. THEY ARE IMPLEMENTED THROUGH OPERATING PROCEDURES.

2. IN ACCIDENT SITUATIONS, EMERGENCY PROCEDURES PRESCRIBE ACTIONS TO TAKE. SOME CALL FOR ACTIONS CONTRARY TO TECH SPECS.

3. IN ACCIDENT SITUATIONS NOT COVERED BY EMERGENCY PROCEDURES, OPERATORS ARE EXPECTED TO TAKE INDEPENDENT ACTIONS TO RETURN THE PLANT TO A SAFE CONDITION.

4. RULE CHANGE BEING DRAFTED.

FURTHER CONCLUSION—ABBOTT REPORT

"SIGNIFICANCE OF THESE (ABBOTT'S) LESSONS IS THAT NRC'S ACTION PLAN IS INCORRECT BEING BASED ON THE FALSE CONCLUSION THAT THE SERIOUSNESS OF THE ACCIDENT WAS THE RESULT OF OPERATOR ERROR. IN FACT IT WAS THE RESULT OF FAULTY PROCEDURES."

GPU COMMENTS ON CONCLUSION OF
EDWARD C. ABBOTT, ACRS SENIOR FELLOW,
CONCERNING LESSON LEARNED FROM A
REVIEW OF TMI-2 ACCIDENT REPORTS
AS TO REPORTING OF INFORMATION TO
PUBLIC OFFICIALS DURING AN EMERGENCY
WHICH IS SET FORTH ON PAGE 11 OF THE
ATTACHMENT TO MR. ABBOTT'S JUNE 4, 1981
MEMORANDUM TO DR. DADE W. MOELLOR, CHAIRMAN,
ACRS SUBCOMMITTEE ON THE TMI-1 RESTART.

T17
Arnold

GPU has concluded that the aggregation of plant information, the synthesis of that information into an assessment of the safety status of the plant and its potential for hazarding the local populace, and the communication of that quality of information to the company management, state authorities, and the NRC was inadequate during the first few days of the accident. GPU does not believe that the communication failure was the result of a conscious effort to mislead.

Tens of thousands of pages of testimony, interviews, and depositions exist relating to the accident. Conclusions drawn from those records must give adequate recognition to the state of knowledge prior to the accident, the stress of the situation, the extended time period of the record, the degree of inseparability of original knowledge from acquired knowledge, the influence of the interviewer, the background and interests of the diverse participants, and many other factors. The Three Mile Island accident is probably unique in terms of the number of in-depth, public investigations. These investigations were conducted by competent individuals who had no allegiance to the Company or the technology and who sought only to extract the full learnings from the accident.

We would urge that Mr. Abbott, as well as anyone else reviewing the "Report by the Staff of the House Committee on Interior and Insular Affairs on the Reporting of Information Concerning the Accident at Three Mile Island", would take into account the conclusions resulting from those various extensive investigations. Specifically:

1. Report of The President's Commission on The Accident at Three Mile Island - The Need for Change: The Legacy of TMI - October 1979

   Page 18 - We do not find that there was a systematic attempt at a "cover up" by the sources of information.

2. Three Mile Island - A Report to the Commissioners And to the Public - Vol. I., Nuclear Regulatory Commission Special Inquiry Group (Rogovin), Jan. 1980

   Page 156 - While both the public information performance of Met-Ed and the NRC can be faulted in many instances, we found no evidence that officials from either the utility or the regulatory agency willfully provided false information to the press or public.

   Page 159 - In sum, we concluded that the evidence failed to establish that Met-Ed management or other personnel willfully withheld information from the NRC.

3. Memorandum to Chairman Ahearne from Mitchell Rogovin and George T. Frampton, Jr., Subject: Questions Submitted by Congressman Udall, March 4, 1980

Page 2 - The evidence failed to establish that Met-Ed management or other personnel willfully withheld information from the NRC. There is no question that plant information conveyed from the control room to offsite organizations throughout the day was incomplete, in some instances delayed, and often colored by individual interpretations of plant status. Indeed, information conveyed by Met-Ed, NRC, and B&W employees in the control room to their own managements and offsite organizations was in many cases incomplete and even inaccurate.

"However, based on the evidence, we could not conclude that the causes of this breakdown in information flow went beyond confusion, poor communications, and a failure by those in the control room, including NRC and B&W employees, to comprehend or interpret the available information, a failing shared to some extent by offsite organizations as well."

4. Nuclear Accident and Recovery at Three Mile Island - A Special Investigation - Subcommittee on Nuclear Regulation for the Senate Committee on Environment & Public Works - July 1980

   Page 13 - The evidence reviewed by the special investigation does not confirm any intentional concealment of information by the utility on the first day of the accident.

5. Investigation Into Information Flow During the Accident at Three Mile Island - NUREG-0760 - January 1981

   Page 11 - 5. Information was not intentionally withheld from the State on the day of the accident.

   6. Information was not intentionally withheld from the NRC on the day of the accident.

Members of GPU's senior staff have spent many hours discussing the conclusions of the various reports. We agree that there are many human behavioral factors that can contribute to or impede effective communications. We do believe that these kinds of influence should be given specific recognition. GPU has (a) issued to all shift supervisors, and posted for the benefit of all nuclear personnel, a policy statement emphasizing the importance of candor and timeliness in all communications, has structured lines

and, (b)/to better assure that meaningful information critical to the best assessment of any emergency situation is communicated and that such communications are thereby less vulnerable to inadvertent omissions due to the stress of the moment or the specific focus of the reporting or the receiving party.

Since the TMI-2 accident the Company has undertaken a complete re-evaluation of its response capabilities during an emergency situation, resulting in the development of an entirely new Emergency Plan. The Plan, the basic document which directs and governs the Company's response to an emergency, is the end result of a process involving the Company, the NRC, the Federal Emergency Management Agency (FEMA), Pennsylvania state agencies and others.

The Company submitted Revision 3 of our new Emergency Plan in January 1981. Throughout this one and one-half year process, the Company has met, and coordinated its Emergency Plan, with the Commonwealth of Pennsylvania (including PEMA, BRP and PennDOT), and the five counties of Dauphin, York, Lancaster, Cumberland and Lebanon. This coordinated planning process began with agreement on organization and communication concepts, including such matters as which offiste agencies would be notified of an emergency situation at TMI, when and by what means that notification would take place, and what information would be transmitted. Additional meetings continued throughout the detailed planning stage. Items discussed at these meetings -- for example, initial and continuing notification procedures, early warning system, evacuation time studies, and the specific support role of BRP -- assure that, in the event of an emergency at TMI, the proper interface between onsite and offsite response personnel will occur.