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PUBLIC NOTICE BY THE

UNITED STATES NUCLEAR REGULATORY COMMISSION'S

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

Wednesday, 11 July 1979

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

SUBCOMMITTEE MEETING

on

IMPLICATIONS OF THE THREE MILE ISLAND ACCIDENT

Room 1167
1717 H Street, N. W.
Washington, D. C.

Wednesday, 11 July 1979

The ACRS Subcommittee on Implications of the Three Mile Island Accident met, pursuant to notice, at 1:35 p.m., Dr. David Okrent, chairman of the subcommittee, presiding.

PRESENT:

DR. DAVID OKRENT, Chairman of the Subcommittee
DR. MAX W. CARBON, Member
PROF. WILLIAM KERR, Member
DR. J. CARSON MARK, Member
MR. WILLIAM M. MATHIS, Member
DR. MILTON S. PLESSET, Member

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PROCEEDINGS

DR. OKRENT: The meeting will now come to order. This is a continuation of a meeting of the Advisory Committee on Reactor Safeguards ad hoc subcommittee on the Three Mile Island Unit 2 accident implications. My name is David Okrent, I'm the subcommittee chairman. We are ACRS members present at the moment, are Mr. Kerr on my left, Mr. Plesset on my right, Mr. Siess on my right, Mr. Mathis on my right, and we have four consultants present: starting from my left, Mr. Theofanous, Mr. Catton, Mr. Lipinski and Mr. Michelson.

There will be other members coming in later, I expect. The purpose of this meeting is to discuss the implications of the Three Mile Island Unit 2 accident. The 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. Rules for participation in today's meeting have been announced as part of the notice of the meeting previously published in the Federal Register on June 26, 1979. A transcript of the meeting is being kept and it is requested that each speaker first identify himself and speak with sufficient clarity and volume that he can be readily heard.

We received no written comments or requests for

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time to make oral statements from members of the public. We will proceed with the meeting, and the way the meeting is arranged is as follows: we have identified seven specific topics which we propose to cover between now and 3:30. At that point, we would go to a report on the Lessons Learned Task Force which would take about 2-1/2 hours, and assuming we stick with this timing, around 6:30 we could pick up other topics and have discussions on things as is appropriate.

The seven topics that I plan to try to cover in the next two hours, which means I have not too much time for each, relate to the following: pipe break isolation in loss of coolant accidents; generic safety questions with air systems; design and reliability of auxiliary feedwater systems; safety-related aspects of main steam and feedwater systems; environmental qualifications and location of equipment in containment and other buildings; possible adverse effects from share systems; and very small break LOCA in conjunction with the large scale secondary side blowdown.

I believe Dr. Mattson is going to give us a general overview on these topics, and then we'll get into specific discussion on each one.

Go ahead, Dr. Mattson.

DR. MATTSON: Well, we had two of them that we thought we understood sufficiently to prepare some remarks for you. Those were two that Michelson had written a memorandum concerning. He wrote a memorandum on each of them. The others, I would think we'd want to go through pretty much the same way we've gone through some of these other topics in previous subcommittee meetings. We have some thoughts in those areas, but nothing specific prepared.

DR. OKRENT: Fine. In some cases, these represent things we thought we might discuss in a preliminary way this time, with the idea that a later meeting would be in more detail.

DR. MATTSON: A couple of them will take us into our presentation on short-term recommendations of the Lessons Learned Task Force. So we may just skip over those and then return to them when we get into the presentation.

DR. OKRENT: Advise me of that if you think that's the case.

DR. MATTSON: I would suggest we start with number one, and then maybe skip down to number seven. And then, probably number three. One, seven and three are the ones we have some specific thoughts on. And then forge ahead with the rest of them to the degree you think they're applicable. Bob Tedesco has some summary information on what has been done, and what remains to be done on the pipe break isolation in the event of a loss of coolant accident. I'll

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let him summarize that, and we'll start the conversation.

MR. TEDESCO: Bob Tedesco, from the staff. Dealing with the technical issues that were raised in Mr. Michelson's memo, I'd like to start off by stating that this particular matter has been under review by the staff for a number of years now, starting some time around the review of the Vermont Yankee. More recently, particularly in the last year or so, we have been taking some actions on the BWR 3s and 4s to ensure that the particular valves that we're talking about, namely the isolation valves in each of the recirculation loops would not close in the event of a LOCA.

Now, in these plants, the valves had been programmed to receive closer signal upon initiation of the LOCA. So, as an interim action, the vendors have been working with the staff and in turn with utilities and in instances the problem has been removed on the recirc valve, and in some instances the automatic closure signal has been blocked out.

Now, BWR 5 and 6 plants have manual valves that are not in the automatic sequencing. They still use the flow control valves. These valves ought to be closed upon action from the operator. The staff is now meeting with General Electric on the Three Mile Island 2 accident and its implications with regard to the bulletin we do plan to include in this review, some of the emergency procedures that deal with potential operator reactions involving the isolation valve in recirculation loops.

This will also include PWRs which, as far as we know at this point, are relatively few of the Westinghouse plants who have loop isolation valves. The TMI plant didn't have them. We're not sure right now. The general thinking is that they do not. That, too, will be included in our review.

We'll check the procedures for these plants to see what the operator is instructed to do with these isolation valves. As far as the technical aspects of it, I fully agree with what Mr. Michelson has been reporting. We understand the nature of the concern, and it has been under review by the staff from the time that I indicated earlier.

That provides the summary statement of where we are as of this time.

DR. MATTSON: I think I would add that we understand the concern slightly differently than we understood it before. I think Carl has pointed out that procedures need to warn not only what to do, but what not to do, and that aspect will be factored into the procedure for both the PWRs and the BWRs.

MR. MICHELSON: In the process of looking at this problem, of course, I cited a particular LER which disturbed me because of the apparent understanding on the part of the operator that he shouldn't need these valves for break isolation.

This was in the last paragraph in the letter. I was a little surprised that that LER went through the LER process without ever precipitating some kind of a response or direction or something. Since the letter is so clearly written.

DR. MATTSON: I think your LERs are starting to get a better review today than they were.

MR. MICHELSON: That's how I just happened to even notice. I thought that this problem had really been put to bed a long time ago. You were putting it to bed, but the LER still came through, reading rather strangely.

DR. OKRENT: Are there any other questions or comments on the specific issue addressed during the last few minutes?

MR. MICHELSON: I have one more relative to small break analysis. There do appear to be some small lines that could experience failures and could be isolated some time during the loss of coolant process. Are we going to go back and look at those possibilities and in particular I'm thinking of the letdown line, which, for instance, if you were to have a failure of a letdown line outside containment, you don't get a containment isolation signal

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for some time.

DR. MATTSON: Well, we're going to talk about our recommendations for the analysis program for all machines over the next year, following Three Mile Island and the third phase of that program includes a new look at the chapter 15 events in their entirety. One of the purposes of that re-look is to factor in the kind of thinking that says, what if there are more than the single failure kinds of errors? What if there are operator errors, what if there are instrument failures, the sort of permutations and combinations of events following an accident or a transient. The abnormal or however we've described them, transient analysis -- what we talked to you about before.

Now, we agree with the point that you've been making about the need for operators in their training and in their procedures to have instructions on what to do and what not to do, and it's clear that this kind of thinking will be present in that third phase of the analytical mode.

MR. TEDESCO: Let me add something about the overall concern as it relates to BWRs. I think we have a back up system there, that would help us. That's the depressurization system. So if you did find yourself in a position where you for some reason isolated the leak, when you have a suspicion of cooling in the core, you do have your blowdown system, which would enable you to depressurize

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and get your pressuring system back on line.

MR. MICHELSON: I think you have to believe, though, that if the operator is attempting to isolate the break he is not inclined to open up another one, which is what ADS really does. It just opens up a hole to replace the one you just closed.

MR. TEDESCO: That's the whole basis of the depressurization system.

MR. MICHELSON: That's right, but it's in there for a little different situation. Without the high pressure make up available.

DR. MATTSON: I think that comment is very a propos to Three Mile Island and to the general subject of what kind of information you have available to the operator, that if he isolates a small break and is uncertain as to the status of water in the core, how does he make up his mind to take another action such as initiating the ADS system in a boiling water reactor?

DR. OKRENT: It wasn't clear to me whether they were addressing the specific question on the letdown line now.

MR. MICHELSON: I think, I believe that they addressed that. I'm satisfied.

DR. OKRENT: Dr. Kerr?

DR. KERR: As a general thing, I would urge that

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we not try to organize new methods of training at this meeting. It seems to me comments and questions are appropriate but I wouldn't want any of us to get the idea that this is a finished set of recommendations.

DR. OKRENT: I think you're correct. And what we were trying to ascertain, in part, by the first item was, in fact, whether this specific possible operator error was already covered in the operating instructions or whether steps were underway to include it, or what.

In fact, what's less clear to me is how you think you can address the more general question of what the operator shouldn't do. I don't mean only in the event of a small LOCA. I have to assume there could be situations in the electrical system, somewhere down some event, or what he would ordinarily have done had things gone according to his training where that kind of thing now leads you into an awkward situation. You may overload a diesel. Are you going to tell us something about how you plan to examine this more general question? Some time today, or is that something for the future?

DR. MATTSON: Well, I think I understand the general point you're making. None of our short term recommendations go to that point and, as we'll explain, in the things that we're still looking at, the Task Force, that subject is included, and I'm not sure we've got a bright

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idea as to how to come up with it now. There are ways you can think of it, or concepts you can examine. You could, for example, look through all procedures, emergency, normal, maintenance, and tests, and what have you, and require them to be reviewed.

With that kind of thinking -- I think that kind of thinking is what's intended by the analytical work where you go back and look at the chapter 15 events and look at the permutations and combinations of errors -- not just operator errors but electrical system errors or operator errors in dealing with electrical systems in addition to the mechanical systems. Obviously, it's an infinite set and it isn't clear to what degree the regulators ought to duplicate what the designers and the operators of these machines do.

All one goes about setting criteria and assuring that that kind of thinking went into the training emergency procedures and other preparations in an operating crew review of the design -- I think it's an open question at this point. How it ought to be done better I guess is an open question.

DR. OKRENT: I would guess if I were in your shoes, I would first try to find out the extent to which your thinking has or has not already taken place, and if there has not been enough thinking on these things, that is what you do before you try to train the operator.

DR. MATTSON: Another place that htis kind of thinking is going on in the Staff is the systems interaction, generic unresolved safety issues. I think you get into that territory pretty quickly with this kind of thinking.

DR. OKRENT: But I don't think they have yet, from what I've seen on that stuff. Let me just leave it as a general topic.

Are there other things on number one?

MR. MICHELSON: I'd like to make one other comment. You refer to chapter 15 events. I assume that you're thinking well beyond that, in particular, for instance pipe breaks outside of containment other than main steam feedwater. These are not generally dealt with in chapter 15 but rather treated in another section wherein they deal with the effects of pipe breaks.

I think it very important that adequate emergency procedures be written to guide the operator when he faces such a pipe break situation, whether they're in chapter 15 or not.

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DR. MATTSON: We did not mean to exclude them, and I think maybe the shorthand we were using when you said the Chapter 15 events, you mean the events analyzed. It may be, though, you have a good point. They have advanced less than the design basis events which fall within the envelope of design basis events which need procedures and training just like design basis events, permutations and combinations of design basis events. And where those things need the same attention as the traditional things analyzed in Chapter 15 is probably a pretty good question. I think, recognizing we have to take it in steps, it's a step down the road someplace, but it's a good point.

DR. OKRENT: Why don't we go on to No. 7, if that's next.

DR. MATTSON: This was the question, as I understand it, of secondary side steam line breaks, followed either causally or in some unrelated fashion by a small break in the primary system. Of course, part of the design requirements are that there not being mechanistic or causal relationships between multiple breaks -- that is, the pipe width criteria, the steam generator tube design requirements, plugging requirements, and what have you, or jet impingement. Those kinds of things are premised upon one pipe break not causing another.

So, recognizing that that is the case, we wouldn't propose that this idea, although it's an interesting idea, requires immediate treatment in the same context as the other things, that some of the other things from Three Mile Island are requiring of us at the moment. We do have a group

We do have a group of people in the Lessons Learned Task Force in the next couple of months looking at the question of design basis accidents: Are they the right accidents? Should they be changed? Should things be added to them? We will put this subject in that category of things for further study.

But for the moment, I don't see a basis for moving from previous design basis to this kind of thing, unless we misunderstand the problem.

MR. MICHELSON: I believe the memo pointed out at least one possibility where they postulated single failure, which was presumably part of the main steam line break analysis to involve a stuck-open relief valve. How did you address that?

DR. MATTSON: Well, we are addressing the qualification testing of safety and relief valves in our short-term recommendations. In the long term, we are continuing to look at reliability criteria for safety and relief valves, some to the extent of continuing to assure that there is no causal relationship between these two breaks. We are doing things now.

For the nonmechanistic nature of such an event -- that is, to just assume that it would happen despite things that are done to prevent it from happening -- that was more what I was addressing, that we don't intend to do anything right now.

MR. MICHELSON: I thought main steam line failure had to be in a main steam line as the initiating event. The break of the main steam line and the initiating event had to include a single failure in the analysis of the consequences of the pipe break, and it has to be, I assume, a single active component failure. And the active component, of course, is the relief valve, which has to open because the HPI pumps came on and the operator did shut them off and they opened the relief valve. So, it would appear to be straightforward.

DR. MATTSON: I see that connection. Of course, you have got the block valves for the stuck-open valves.

MR. MICHELSON: Yes, that's right. Now the question is, the real question that I raised was: In view of the large steam line blowdown and all the things going on and the confusing indications, if you think you've got a main steam line rupture you should have lots of indication, but don't lose sight of the fact that it also was a stuck-open relief valve.

DR. MATTSON: I think it's probably safe to say we haven't looked at that particular single failure for the steam line break accident, since I haven't heard anybody say so.

MR. MICHELSON: That was the one case that makes it look like a legitimate analysis you should now be requiring.--

DR. MATTSON: I think it's also fair to say we can clearly throw that one into this third phase of Chapter 13 events. It can go in there as another single failure and see what happens.

MR. MICHELSON: The second aspect of the question is:

Are there regulatory requirements that when the main steam line failure occurs inside of a containment that it not jeopardize any size of the primary side of the line? In other words, is the main steam break allowed to rip off an instrument line and thereby create a small LOCA or some other small attachment?

I have never found in my experience any regulatory requirement that says this must not happen. It now appears that there should be.

DR. MATTSON: Why should jet impingement criteria go to the primary boundary, speaking to the protection of the primary boundary? To the extent that the instrument line is distinct from the primary boundary, I suspect it would reach them.

MR. MICHELSON: That's something you might want to inquire about.

DR. MATTSON: But those instrument lines would probably be of a class where they fall outside of the definition of the loss-of-coolant accident; that is, they're a class that are within the capability of the normal makeup system. Then, of course, you get back to your confusion factor that you're talking about, with all these other things going on: What is the normal makeup system doing with the primary system.

MR. MICHELSON: It's very simply a concern over the possibility that you develop a small primary side leak and not necessarily recognize a situation. That's what my concern is.

MR. TEDESCO: You probably would have difficulty recognizing it right away because of the dynamic coefficient. You could probably finish your secondary side blowdown and keep changing the primary.

DR. MATTSON: What I am worried about here is to go down this track one at a time on these things, Carl, and one can only do as well as you or some other individual who might be interested in it, and that's really not the way to come at it. The way to come at it, I think, more generally, in that the question of looking in detail at the phenomenological events following an accident with this special that's developed since Three Mile Island of the positive and negative aspects of operator action following the event, the capability of the operating crew to understand what's going on and to do the right thing.

Instrumentation, there's a question there. Isolation capability, there's a question there.

DR. OKRENT: The only trouble, though, Roger, is a moment ago in your own mind you were sort of excluding small leaks in conjunction with a steam line break. And if the people who were doing this had the same frame of mind, they wouldn't be considering this particular combination and they wouldn't be asking then what would confuse the operator and so forth and so on.

So, while it's nice to treat things from a broad point of view, I find the boundary conditions on the analysis, as it were, frequently set, what you look at and what you don't, you know? Just as the design basis accidents for the reactors set what you looked at in the past and what you didn't.

If I could ask a related question --

DR. MATTSON: Would that say that the way to move is in a direction of -- we call them "exploratory analyses," to borrow your word, that really pays little or no attention to the design basis analysis, in order to understand possibilities that could result from multiple failures and sort of not with regard to their likelihood or probability or amount of design going into their prevention?

DR. OKRENT: If you want to set up a formal system so we don't have to, let's say, have someone like Michelson who may know from experience, having looked at some plants, that some little lines are running and there are some big lines okay?

There is a technique that's actually developing. It's partly funded out of Bill Vesseli's work, but other people are starting to do it. They are starting to build false tree systems where they group things spatially. So, they say, "What's in this room," and they list everything in the room. And then they ask, "Can one part of what's in the room bother something else in the room?" And, of course, one thing is you might have a fire, and that bothers all of it.

In fact, the fire analysis people are using that technique, but not only the fire analysis people.

So, if you want, I say, a kind of systematic way of organizing your thinking, that's one. But it's got flaws.

Sometimes something in the next room will get into a ventilating duct, so nothing is perfect.

Let me ask a related question that arises out of this question of big lines affecting little lines. Getting back to BWRs, has the staff looked to see whether the lines that affect the actuation of the rods can be affected by rupture of some process line to the extent that you could lose enough rods that you wouldn't be sure of shutdown? I mean, on as-built plants; I don't mean from the point of view of criteria.

MR. TEDESCO: The general configuration on the BWR is just that the lines are spread 180 degrees apart.

DR. OKRENT: I recognize that, but that's why I didn't say "all rods." But, again, if it turned out that all the rods on one-half of the plant went this way -- you know, half of a core all the way through can be critical, while the other half is shut down possibly.

MR. TEDESCO: But if the line severs, you could still SCRAM the reactors.

DR. OKRENT: I just asked if you have looked at this question.

MR. TEDESCO: We don't have a well-documented systematic evaluation, but the question has come up.

DR. OKRENT: I don't like the answer, because I remember I have been reading history lately, and we asked questions about fires, you know, back, roughly, 10 years before the Browns Ferry fire. You know, it's a question that came up. Maybe you have looked at in detail and it's not a question --

DR. MATTSON: I am not sure you understand what Bob said. There is an aspect of the deisgn which enables the rods to SCRAM even if the lines, the hydraulic lines, get their normal operations lost. That is the accumulator feature of those SCRAM devices.

MR. MICHELSON: The problem is the crimp in the lines and not the severing. A pipe break or a jet will just shove them against solid objects, whereas a crimp will close them. And the arrangement isn't all 180 degrees apart.

DR. MATTSON: Well, to the extent to which it's covered in the review, I guess I can't speak to off the top of my head.

DR. OKRENT: We are trying to introduce some BWR questions in to give equal time, you know.

(Laughter.)

DR. OKRENT: We are also trying to encourage the staff to, I guess, look at more books. That's an example of systems interaction. It's not a new question, in a generic sense. It's a specific example.

DR. MATTSON: Yes. But the effects of pipe whip and jet impingement on the safety systems is not a new question.

DR. OKRENT: I agree.

Any more on Item 2 or 7, which was the second one we discussed?

(No response.)

DR. OKRENT: I think you said No. 3 was your next preference.

DR. MATTSON: Yes. The Bulletins and Orders Task Force now has some prestige of its own with the subcommittee, and they came down here Monday, I believe, and spoke to that subcommittee and talked about the kinds of things that they'll be dealing with in their review of Westinghouse, Combustion Engineering plants in the reports they're going to issue later this month which will contain a number of recommendations regarding reliability and capability of auxiliary feedwater systems.

The shutdown orders for B&W plants also contained a fair amount of new thinking on auxiliary feedwater systems. The short-term recommendations of the Lessons Learned Task Force will speak to two particular areas of aux feedwater design: one, the need for those aux feedwater systems that are not now automatically initiated to be changed so that they are automatically initiated; and two, those aux feedwater systems without positive flow indication will be required to have positive flow indication in the control room.

Now, those things by Lessons Learned and those things being done by Bulletins and Orders are a bit of a piecemeal approach. They are aimed at correcting the things that are most significant promptly and don't go to the more general question of the safety grade nature of the auxiliary feedwater system, and that's an area that's a bit murky, especially as you look back at older plants.

You may recall that when the standard review plan was issued in 1975 it contained for the first time formal requirements for diversity, redundancy safety grade features. And plants being reviewed today are required to have seismic capability, for example, in emergency feedwater systems. Older designs did not have all those requirements. Witness the Oconee plants that are being required to install aux feedwater pumps, electric pumps, where in the past they only had steam-driven.

But the question of seismic capability is still an open one, and neither Lessons Learned nor Bulletins and Orders Task Forces has addressed the need to address safety requirements across the board for auxiliary feedwater systems. This is something that Lessons Learned needs to look at. And since we will be finished about September 1, another six to eight weeks, we would intend to speak to that question.

So, in a nutshell, that's what we've been doing with aux feedwater systems.

Was there some other view that you wanted to come at?

DR. OKRENT: Are there any questions?

MR. MICHELSON: Apparently, there is some overlap in our subcommittee and in the Bulletins and Orders Subcommittee.

DR. MATTSON: In those areas where there were prompt reactions by the agency in the early weeks following Three Mile Island which required further study and more actions, this summer and next fall, you will see such overlap.

Containment isolation is another one. Training, of course, is another.

DR. OKRENT: We don't plan to look at Bulletins and Orders, in fact, to see whether there's something the ACRS should do. The other subcommittee got that privilege, so we're trying to just consider the questions in a general way. There's nothing wrong, from time to time, if we both talk about the same subject. But as I say, we leave the specific review to Bulletins and Orders.

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DR. MATTSON: Let me ask you a question. We have that general letter from the Committee, a very short letter, which is the most difficult of all of your recommendations on Three Mile Island, which says modify safety goals, set reliability criteria, and that sort of thing.

We talked about several approaches to coming at that problem, starting generally with an overall acceptable risk role, or starting at the other end of the problem and setting reliability requirements, numerical reliability requirements on specific components or specific systems.

Sta-ing at that end of the spectrum, a couple that occurred to us are the possibility of reliability criteria for safety and relief valves, for example, at a component level; or reliability criteria for auxiliary feedwater systems, since there is an apparent need for some broad-ranging relook at aux feedwater systems. Maybe that's an opportunity, if new criteria are needed, to attempt to set specific numerical reliability goals for those systems and develop guidelines for ways to go about demonstrating such reliability.

Has the Subcommittee got any thoughts along those lines in this particular area, or is that not something you were intending by your general remarks?

MR. MATHIS: Dave, one of the things that we talked about the day before yesterday is some means of getting an indication of flow from an open relief valve, and this could be, I think, a fairly straightforward, simple kind of gadget. It's a power-operated relief valve. It's an on-off proposition. It's either open or it's closed. I mean, it doesn't modulate. So you don't need anything very accurate. So you have an unreliable valve; if you know what it's doing, that's really what you need.

Now, a reliable valve is even better. But the first step of the sequence of attempting to get a better system would be to know if the thing is open or closed, and today all you have is an indication that the solenoid has actuated.

DR. MATTSON: On that specific one, one of our recommendations is to require positive indication on not only the power-operated relief valves, but all the safeties also.

MR. MATHIS: This is just one of the things we're going to have some overlap. But we're talking about some of these things. We're looking more or less at short-term kinds of things, where I'm sure Dave is going to be looking further downstream.

DR. MATTSON: There's another thing that relates to it, of course, and that's the loss of all AC power as a safety issue in station blackouts. I know Bulletins & Orders has done a failure mode and effects kind of review. Something like 24 auxiliary feedwater system designs that are operating today in the Westinghouse and Combustion Engineering plants. That is, there are 24 different designs done by architect-engineers for those Westinghouse and CE plants. And they ranked those designs according to their -- or giving relative reliability characteristics according to their ability to deal with loss of all offsite power and loss of all AC power.

One of the things they found in looking at the capability to deal with loss of all AC power was that, while some of the designs have good steam-driven aux feedwater systems for loss of all AC power problem, they depend upon AC power for valve opening or lube oil or what have you. Yet more recently designed systems with these kinds of thoughts in mind are able to drive lube oil systems off the turbines for the feedwater system, are able to open valves with DC power sources in addition to AC power sources, that kind of thing.

And the implementation requirements by Bulletins & Orders won't be out for some weeks yet, near the end of this month. But it's my understanding they do intend to speak to that kind of question, which again is the sort of traditional qualitative way of coming at the question of overall systems reliability.

Again, it's the piecemeal approach I was describing. When you get down to the bottom line, we need to say: Aren't we now safety grade across the board with all aux feedwater systems? If not, shouldn't we be? And if the criteria are to be written, should they be traditional qualitative kinds of safety grade requirements, or should they be numerical reliability oriented requirements?

I think that's an open question. We'd be interested in feedback.

DR. OKRENT: If we have time at the end of the day, let's come back to that. We can venture some opinions in the area, perhaps. But I think we probably should try to cover the specific agenda items.

Are there any more questions on Item 3 from the Subcommittee or consultants?

(No response.)

I guess not. Do you have a preference?

DR. MATTSON: Yes, 5. Those are the ones we've done some thinking on.

Environmental qualifications. I take the title to mean, how has our horizon widened as a result of Three Mile Island, in the sense of drawing more equipment into the environmental qualifications envelope. I think the answer to that is yes, but at this point we're not able to say which and to which degree, except to say we continue to have an interest in multiple classifications of safety grade, instead of the sort of binary system we have today, of either safety grade or out of People's Drugstore.

We would put some things in between, perhaps, instead of just Class 1-E or no classification. Do I have Class 2-E

3-E, 4-E or what have you? Not just for environmental qualifications, but also, because there are components whose reliability is of interest today and it was not of so much interest before, where environmental concerns are not the pacing concern. testability, diversity, redundancy, are things that are provided for safety grade equipment, that perhaps there are other categories or classifications of equipment that should have them. And in fact, we speak to them in some of our short-term requirements.

And should we have some systematic way of categorizing and keeping track of those kinds of equipment?

Now, environmental qualifications. It's not quite clear to me how you set a different set of environmental qualifications from the ones we have already, that is, how we would describe a different environment. The environment we describe today is the environment for which the component must perform a safety function. So if it's something which depends upon the steam line break, that has high temperatures but short duration for a steam line break; something that has to survive a loss of coolant accident, it takes a somewhat lower but longer temperature.

If we would say, the reactor coolant pump or the letdown system or the pressurizer level indicators, for example, are more important to safety than previously thought, as a result of the Three Mile Island experience, then I think we would probably go down the course of saying: Well, what kinds of accidents would these things be important for, and therefore what ought their environmental envelope to be?

I don't know if this is right or not, but I'll give you an example. A pressurizer level indicator, the transmitter failed because of lack of environmental qualification because it was not classified as safety grade, because it was indeed an enlarged loss of coolant accident, to oversimplify. If you decide that that transmitter for the pressurizer level indicator ought to have environmental qualifications, I don't think you look at environmental qualifications for the double end of the cold leg break. It serves no useful purpose for that.

It does serve a useful purpose for a small break. Small breaks cause a smaller pressure transient, less severe temperatures, lower pressures, what have you. How do you go about selecting an environmental for that kind of equipment, is, I think, the only question that remains. And I don't have any answer to it.

Is that the kind of thing you're interested in?

DR. LIPINSKI: You seem to have summarized it, namely: What are the various accidents that are of interest in identifying the instrumentation and the systems which have to function in order to follow the accident and mitigate the accident?

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Should you go back and look at Three Mile Island and make a list of all the instruments that were in containment, the systems that were in containment, that were needed to follow that accident, or even look at that plant today, and decide what instruments would you like to have functioning today that are not functioning today?

DR. MATTSON: We're coming at it from a different point than the one that I just talked to this morning, the way you just phrased the problem. Instrumentation to follow the course of an accident.

DR. LIPINSKI: That's only one category. That should be expanded to include the systems, the pumps, the valves.

DR. MATTSON: Ah, but Reg Guide 1.97 does include that.

DR. LIPINSKI: Not necessarily, by the examples that are in there. Reg Guide 1.97 touches on it, but it's not complete. It's based on what happened at Three Mile Island, Reg Guide 1.97.

DR. MATTSON: All I was suggesting is that you can come at it from the approach I was suggesting in a somewhat rambling way a minute ago, or you could come at it from an approach that says, a la the 1.97 approach: I don't care what the accident is or how it proceeds; I want to be able to understand the nature of the systems and their performance, no matter which systems inside of containment and probably outside of containment. and here's the minimum set of instrumentation I need, and I'll give it -- since it's some kind of minimum set, I'll give it some kind of super-environmental qualifications, make it good for any kind of discharge of the primary coolant system inside of containment, for example, and go with that minimum set, rather than coming at it system by system, accident by accident.

DR. LIPINSKI: I think you've got to go the other way.

DR. MATTSON: I think you've got to go both ways.

DR. LIPINSKI: What is submerged now in seven feet of water in containment that should not have been there in the first place, in order to survive the incident.

DR. MATTSON: Or should have, if it were going to be there, have been qualified to survive.

DR. LIPINSKI: Was it necessary to submerge it to qualify it for long periods of time? The main reactor coolant pumps, all the auxiliary systems that provided service to those pumps such that those pumps could be run; the pressurizer heaters, they were shorting out. The electrical connections are not qualified. The level detectors of the pressurizer system, they're gone.

Somewhere you have to go back, in not only the big accidents, but the little ones, and systematically review what's in that containment, what valves we have to control, what valves we have to control, what the pumps need to be, what the heaters.

DR. MATTSON: No question that we have to do that. What I was speaking to is that there are two approaches on how to do it and we haven't made up our mind on whether both of them are needed or one of them are preferable. We're looking at the problem from both directions at the moment, and clearly something has to be done along these lines. It's just a question of how to go about doing it, to my mind.

DR. LIPINSKI: We looked at it the other way with Reg Guide 1.97 and we missed with Three Mile Island.

DR. MATTSON: Because 1.97 wasn't implemented. My point was that, had 1.97 been something that could have been implemented, had it been done for Three Mile Island, there would have been instruments there to provide some functions that were lost because they weren't there.

DR. LIPINSKI: Right. But looking at Reg Guide 1.97, only four instruments are enumerated. The catch phrase is used that the licensee will analyze these events and have whatever instruments he may deem in addition to.

DR. MATTSON: I'm sorry, yes.

DR. LIPINSKI: All I see is that I would prefer to see that list lengthened so that it's not optional.

DR. MATTSON: My memory is escaping me. What I remember seeing in the last few weeks is a list of equipment, instrumentation, pursuant to Reg Guide 1.97, developed by the people who did the Generic Task A-34, which was drawing to a close prior to Three Mile Island. That list isn't in the Reg Guide, you're right. Such a list does exist. People have been working on it, and that's something we'll touch on at the end when we give you our status report.

MR. MICHELSON: This question of environmental qualification really contains, as I believe you touched on, possible incidents which are outside the primary containment. I believe those incidents pertain, even including things beyond the main steam feedwater line breaks, to actual pipe breaks inside the auxiliary building. Some of these breaks could put the plant in rather serious trouble.

What are your views concerning environmental qualification for the mitigating equipment for such type of an accident?

DR. MATTSON: We've been looking for several years now at high-energy and moderate-energy line pipe breaks outside of containment. There's been difficulty in deciding whether to be mechanistic or nonmechanistic in the criteria that were out there. You may recall things like superpipe, guard pipe and other things that were used for high and moderate-energy lines outside of containment, to keep them from whipping and keep the environmental effects of their breaking from spreading into the areas outside containment.

That in turn led in some designs to the placement of redundant safety equipment right alongside the superpipe. So, although you've done some special things to make sure that the environmental effects wouldn't spread, if they did they would get to equipment that was designed to mitigate the very thing that was happening. So you had a causal relationship there, although it wasn't mechanistic, that can get you in difficulty.

So there has been a fair amount of work surrounding the question of location of safety equipment, location of control rooms, location of instrumentation, separation of redundant safety equipment, what have you, in relation to high and moderate energy lines outside of containment.

The requirement is simple. If the environmental effects of these breaks can affect safety equipment that has to function in the event of such a break, then the equipment has to be qualified or relocated; going back to some plants that slipped through the CP process and were under construction and require them to redesign some fair measure for just this problem.

MR. M[illegible]ELSON: The difficulty you get into was the identifica[illegible] all the mitigating equipment from all of the possible pipe [illegible] outside the containment and the environmental conditions produced. This is generally not real readily or well developed outside of the AE's shop. I'm not sure what the NRC can even do.

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DR. MATTSON: We have been looking at it. But you're right, it involves an awful lot of detail. And if someone doesn't literally trace the lines, trace the electrical lines and the pneumatic lines and the instrument lines and the high-energy lines, and do that as a matter of detailed design, it's not possible to solve the problem with this approach.

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MR. MICHELSON: The point I was leading to was that it would be difficult, if not impossible, for you to review to that depth. Therefore, the alternative is for you to develop better regulatory guidelines as to how this type of problem should be handled.

I am not convinced that such regulatory guidelines exist. You need to convince me.

DR. MATTSON: The revisions of those regulatory guidelines were about to pop out just before Three Mile Island. Having been on the task force ever since, I don't know where they're at. But they're Standard Review Plan 3.641, 3.642. And if you'd like to know where they're at, why don't you call Victor Benaroya.

Victor, where are they?

MR. BENAROYA: In the last phase of being reconciled with other measures. The latest occurrences have delayed the implementation.

DR. MATTSON: The next step with those things will be to publish them for public comment in the new procedures where they go out for public comment before they go in the Register. Given that we get back to some semblance of order here in the coming weeks, I wouldn't expect that to be much longer.

MR. BENAROYA: It's almost finished.

MR. MICHELSON: Is it correct to assume that these kinds of thoughts are now incorporated in your revision?

MR. BENAROYA: Yes, they are.

DR. MATTSON: The point I am trying to make is that those kinds of thoughts were around before Three Mile Island.

MR. MICHELSON: Yes, but they didn't appear as regulatory requirements; therefore, you didn't appear to know how well the job was being done.

DR. MATTSON: That's because we thought we could handle it by separation. We were naive about how well things were going to be separated outside of containment. So we had to come to a more detailed way of handling it.

You will have to review for yourself whether you think they'll be effective or not.

DR. OKRENT: Are there any changed thoughts with regard to what radiation field you might want equipment which has to run for a long time in the auxiliary building or some other building to be qualified for?

DR. MATTSON: Some thoughts, but not any conclusions. Reg Guide 1.89 had been getting a fairly thorough review for just this point over the last year, as you may recall, the reports issued by Bahnsen and Sandia looking at DID releases and looking at the level of radiation qualification for equipment. There has been some work in DSE, prior to Three Mile Island, aimed at understanding whether the levels specified in 1.89 or the kinds of things derived form 1.89 and IEEE 3.174 were the right things.

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I know the people in Standards responsible for 1.89 --

VOICE: Right here.

DR. MATTSON: There's not much moving on that at the moment, but I have heard people express the thought that Three Mile ought to be factored into that continuing evaulation, and that's about as far as it's gone.

VOICE: That's right.

DR. MATTSON: The premise there is the TID release has been the source term for qualifications all along. There is some difference in the way people get from the TID source term to the exact kind of radiation and level of radiation felt by a particular component or class of component.

DR. OKRENT: Again, the assumptions you make might influence our requirement. There will be some systems that have to carry radioactive fluid, and so what they see depends on what you assume is in the fluid. There will be other systems that were supposedly remote from radioactive fluid. Of course, all of the systems carry radioactive fluid outside the containment, by definition, or extensions of the containment or whatever.

Now, if they have enough inherent radiation resistance that they can tolerate some event that's modest compared to what you postulate is inside of containment, then everything is all right. But if there is something that you are counting on running for a long period of time, that just would really deteriorate very rapidly and furthermore would be hard to fix.

DR. MATTSON: Okay. I thought your question was: Are you looking to change the radiation level?

What you're saying is: Are you looking to add more equipment to the equipment you previously designed?

DR. OKRENT: I am saying there may be equipment that now has no radiation requirement at all.

DR. MATTSON: Like reactor cooling pump starting circuits?

DR. OKRENT: I am not trying to say there is any equipment or to identify any. I was just asking.

DR. MATTSON: There is, and some of it should change.

DR. OKRENT: Again, the question is phrased not only for equipment in the containment.

DR. MATTSON: But outside the containment also. We touch on this in the short-term recommendations by requiring that process equipment, as distinguished from safety grade equipment, in the language of regulations. Those interpretations may change when you contrast process equipment to safety grade equipment.

Process equipment that can take radioactive fluid outside of containment and our understanding of that happening is better today than it was before Three Mile Island. For example, the chemical and volume control system.

DR. OKRENT: Let me give you a bad example. I will try to invent something. I will assume that there is no applicability. You certainly need the DC system. I will guess that there is nothing in the DC system that is normally qualified for radiation because you don't expect to have radiation in the battery room. But somebody might put the battery room next to the pumps for recirculating water through the core following the LOCA, not anticipating significant leaks, et cetera, et cetera. Okay?

DR. MATTSON: We have two short-term recommendations that go directly to that point: a shielding review outside of containment, and a leakage review for all systems that could pump fluid outside of containment. And it's with that kind of purpose in mind.

The accessibility of the equipment following an accident in which radioactivity could come in its proximity or the functioning of that equipment, in which high radiation is in close proximity. We haven't set any requirements yet, but what we're doing is asking them to go out and review their design from a shielding standpoint and from a leakage standpoint, with that kind of thought in mind.

DR. OKRENT: Any more on this topic?

(No response.)

DR. OKRENT: Do you have a preferred next number?

DR. MATTSON: I will let you choose the next one.

DR. OKRENT: All right. 2 follows 1. Generic safety questions with air systems.

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DR. MATTSON: You have to explain to me what you mean by that.

DR. OKRENT: You don't have any questions about safety arising from air systems, I assume?

DR. MATTSON: As a result of Three Mile Island, I could think of one narrow one. I don t think it's the one you had in mind. The air system for the contained air breathing apparatus for changing out charcoal filters in the auxiliary building is not very good, and that kind of falls in the area of preparation for an accident and will likely be treated in that area.

DR. OKRENT: Carl, do you want to mention a few things?

MR. MICHELSON: One of the things, of course, that did occur at Three Mile Island was the interaction between the air system and the water system on the demineralizers. That then opens up the question of possible problems with the design of the controlled air systems, particularly where the safety system is used to control both essential and nonessential equipment.

So, then you begin to ask questions about design philosophy for controlled air systems: Should you be using the same controlled air system for both essential and nonessential equipment? Should you have the same headers, same supplies, common air source, common contamination possibilities, and so forth?

So, really, what I was hoping to hear would be some of the basic rules concerning the design of the controlled air systems, whatever regulatory guidance has been issued. To my knowledge, there is very little in this area.

DR. MATTSON: We didn't have any indication at all that that's what you were interested in.

MR. MICHELSON: That's partly my fault for not having given you any time to write something better down.

DR. OKRENT: But at the last meeting, if I remember correctly, we had an example where water got into an air system and froze and negated actuation. And at that time the staff man correctly recalled an incident where a lot of dirt got into an air system and a lot of isolation valves concurrently didn't work.

And so, it's not as if there were no questions related to air systems.

DR. MATTSON: Victor Benaroya says he's got something he knows about that I don't, and he'd like to speak to.

MR. BENAROYA: The review plan for air systems has just been revised to upgrade the requirements for instrumentation.

MR. MICHELSON: Can you tell us a little bit about the revision?

MR. BENAROYA: It says, first of all, that all compressors have to be of the nonlubricating form. You have to have regeneration for the humidity to dry the air, and to maintain the humidity in the air. I think those are the two key ones.

MR. MICHELSON: The key problem, of course, is the fact that in most plants they use the same air source for both essential and nonessential equipment, and then provide some means by which, if a failure of this air source occurs -- and generally, they're nonseismically qualified -- then some automatic emergency air system starts on as a piggyback, isolates a portion of the air system that's nonqualified and feeds the rest.

This involves a lot of interesting problems about the reliability of such arrangements and their acceptability under seismic events and so forth.

DR. MATTSON: But wait a minute. You forget one thing. If the air system isn't safety grade and you cán't use it to mitigate accidents, and the seismic one is a particularly interesting one, because, you will recall, we were down here on Generic Issue 831, residual heat removal systems, and whether there should be a safety grade way of getting to cold shutdown following a design basis earthquake, and air systems were a problem there because some of the equipment was needed to get down from power to cold shutdown. And some ways of handling that and some requirements to get around that problem were proposed.

The point is that I understand now what the question is you're getting at. Doesn't it go to haven't we placed an undue emphasis on very stringent, thorough-going requirements for the so-called "safety grade" equipment needed for design

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basis accidents at the expense of not understanding to the extent perhaps we should have how systems interact with one another, leading to potential multiple failures or common mode failures or much lesser events like a stuck-open power-operated relief valve with potentially greater consequences because of this multiplicity of adverse systems interactions.

MR. MICHELSON: I think you're touching on the problem now. Really, the basic flaw is the common use of these air systems for both trains of equipment plus the common equipment and the possibility, for instance, of almost instantaneously contaminating the entire air system.

DR. MATTSON: It's not a problem between sharing air between safety grade and nonsafety. It's more a problem of the air system being the source of common mode failure to a lot of equipment.

MR. MICHELSON: Because they're sharing the common air supply.

MR. TEDESCO: Generally, when you have that kind of capability between the nonsafety and safety system, you do have accumulators. They use the air for the nonsafety aspects to charge the accumulators, to develop on the safety systems.

MR. MICHELSON: This is part of what you need to look into.

PROF. KERR: It's interesting that you've pointed up a problem on how you would -- I don't want us to try to design a solution to it.

MR. MICHELSON: All I wanted to do is make sure it's understood that air systems have some very interesting potentials.

DR. MATTSON: The point you bring from Three Mile Island, though, is that it's the source of the loss-of-feedwater transient initiating event. And to the extent that protection for feedwater transients needs to be increased -- that is, reliability of operations for these transients -- people will be looking, I am sure, in the coming years at how to decrease the frequency of loss of feedwater.

MR. MICHELSON: Keep in mind, Roger, what you want to look at now is somebody, instead of playing around with his air system on the feedwater line, over on the primary side using a local air service outlet to do something that somehow feeds fluid back into that air outlet. You've got to be much, much more careful about the use of service air to blow things versus air to control. It's like sticking a soldering iron in the bus.

PROF. KERR: As long as you say controlled air must be dry and clean.

MR. MATHIS: Free of oil.

PROF. KERR: You've got it.

MR. MICHELSON: No, you don't, because the same air is used to connect up the piece of equipment that can back feedwater directly into the air system way downstream.

DR. MATTSON: Bill, I would agree with you. The same criteria that say it ought to be dry and clean, then you should have it. If you haven't got a regulatory mechanism to assure that that gets done, then you don't have it.

PROF. KERR: That's engineering.

DR. MATTSON: That's right. That's engineering.

(Laughter.)

MR. MICHELSON: I think the philosophy then is that the air used to control equipment is not used for any other purpose. That's the philosophy.

PROF. KERR: I guess I have some questions about this. because you might be better off if you had good air for both systems, in which case you have a much more reliable system overall. I don't know. That's the reason I am reluctant to design a system this afternoon, because I think it may have implications that might go beyond it.

DR. OKRENT: We're not trying to design anything now, but it's not really clear to me whether in the regulatory process the staff has gone back to look at ways in which air systems can get one into trouble. Let's put it that way.

PROF. KERR: I would go further and say that it's probably clear that they haven't done that yet.

DR. MATTSON: It's clear that we haven't. The question is: Is that a way at cross-cutting some of these problems? Is that, for example, a way at having a systems direction question?

DR. OKRENT: Look, I am getting worried that the same way the term "generic items" used to be a buzz word, that the staff used, they're said we're going to study this generically, to me it meant that wasn't going to see any answer for quite a while. The term "systems interaction" is going to get that kind of connotation with me, I am sorry to say.

PROF. KERR: You started it, though.

DR. OKRENT: Yes, but not with that in mind.

DR. MATTSON: Was -- you're endorsing each other, you know. We've all had an awful lot of opportunity to solve this systems direction problem, and we haven't been able to describe it yet.

(Laughter.)

DR. OKRENT: I don't think there's any problem describing systems interaction. There was a memo sent in '74 that gave lots of examples. So, I just can't agree that -- there are many examples that occurred, in fact, before, like the Quod Cities.

DR. MATTSON: Examples, we have. Solutions on how to come at the problem is something that people have been having trouble with.

DR. OKRENT: Again, if air systems are fine and they can't cause any trouble no matter how badly they fail or whatever, because we don't depend on them and they can't in fact fail in the way we did anticipate, good. And if we know that, that's fine. If we haven't looked, maybe we should look. In fact, we have some occasions where we know in the past air systems have

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led to a failure of safety systems to work. Some of the things Beyaroya addressed are headed in that direction: Keep your essential air systems clean and so forth so you don't get the valves sticking, or whatever.

MR. BENAROYA: Most instrumentation systems are not safety grade. That's where our responsibility doesn't go over. That's the whole problem.

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DR. OKRENT: That's a good way of putting it, and I think we agree that we maybe have to look beyond that threshold.

One thing I think I have heard mentioned -- and it's just an idea of my own -- that in air systems you may have dessicates that are not necessarily seismically qualified, and in an earthquake you might get a lot of dirt where you didn't anticipate it. Am I off base?

MR. BENAROYA: There is always a filter downstream of the dessicates. Now, the filter is not seismic, either, it's true. But it's a small line. There are no big lines. It's two-inch lines, usually, in those areas. And you have a filter that's not very big.

MR. MICHELSON: Let's discuss that one for just a minute. Very often, the dessicates operates virtually as a fluidized bed as the air passes through it.

MR. BENAROYA: Not really.

MR. MICHELSON: It's virtually --

PROF. KERR: Let's hypothesize that it does.

(Laughter.)

MR. MICHELSON: Right. The problem is: During a seismic event, you get carryover. There's always a carryover, in the dessicate even during normal operation. But during a seismic event, you start shaking the basket, the carryover, you plug the filterates into the air system. Yes, the filter is there. That's the kind of thing you need to look at.

MR. BENAROYA: We do not need an air system for our plan to shutdown safety.

MR. MICHELSON: That's a whole other area that you can go into detail when you talk about auxiliary feedwater. The question is: Do you or do you not need air? Have you studied the effect of loss of air? Have you studied the effect of the degrading of air supplies, and that failure modes of valves are not necessarily closed or open?

DR. MATTSON: You've suggested several alternative ways to solve the problem. We've suggested one of those ways in the past, which is the equipment necessary to reach a safe shutdown.

MR. MICHELSON: Yes. That's the first and key one you need.

DR. MATTSON: I remind you, the committee sent it back to us and said don't do it.

DR. OKRENT: Anything more on Item 2?

(No response.)

DR. OKRENT: Let's see, Item 4, I guess, is next: safety-related aspects and, really, you might say, interactions along the main steam line and feedwater systems, and so forth.

DR. MATTSON: We couldn't interpret what those words meant.

DR. OKRENT: Too cryptic, I suspect.

MR. MICHELSON: Do you want me to hold forth?

DR. OKRENT: Why don't you give him a few comments?

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MR. MICHELSON: I will give you a few comments on that one. I guess you didn't get the outline papers.

There are a number of problems on the secondary side of the steam generators that have to receive very careful considerations. One of the first ones, of which I am sure you are well aware, is the possibility of overfilling the steam generator as the result of ICS failure, which causes the feedwater pump to go ahead and completely fill the steam generator, which you can generally do in something less than a minute.

This leads to a severe primary side transient, as well as a fast cooldown on the primary side, and that's one of the transients that we have looked at; but there are a lot of subtleties associated with it, including the fact that the water carries on out into the main steam line, creates hydraulic disturbances in the main steam line. Perhaps the main steam line isn't necessarily designed to even carry water in terms of the loading on support. It's designed for carrying steam.

So, this is some of what I was hoping to discuss a little bit, the basic problem of a safety-related implication associated with these main steam line systems.

You also get into the problem of what kind of single failure assumptions do you make now in terms of what kinds of things can go on on the secondary side associated with random single failures on the primary side. That leads to a lot of interesting problems, as well.

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It also gets back to the question of the air supplies to these main steam feedwater systems and electrical supplies and so forth. So that there is a number of them, but basically the problem is that of either overfilling or blowing down. In the case of blowdown, the question is what assumptions can you make concerning the check valves, either their failure or perhaps they have failed in the open position and don't reclose during blowdown.

This leads to the question of multiple steam generator blowdowns as in the feedwater lines.

So, this is what I thought we were going to get to. Since you didn't get the summary sheet, I guess it's really unfair to pursue this very much.

DR. MATTSON: I am trying to think of how you would come at that question. I suspect some of it has to do with failure modes and effects of the integrated control system. That's not an area that we have covered before on any plants. I have been getting into more and more, as people have tried to integrate these controls and protection systems, and B&W is now required to perform a failure modes and effects analysis for the integrated control system pursuant to shutdown. That's one way to start it.

MR. MICHELSON: Yes.

DR. MATTSON: It might be that this would be a good question to take to the LER reviewers, the new program for evaluation of LERs, and ask the question, "What's the frequency of occurrence in this time frame," and understand whether there might be a need for anticipated transients sort of treatment. You want to come at it in the traditional regulatory way. My mind-set call on each of these is: I hear what you're saying; I see a designer's role here, clearly, on trying to separate out if you're concerned that the designer's role isn't being fulfilled, then what's the regulatory device to come at it.

And there are two possible regulatory devices --

DR. OKRENT: I will give you a suggestion. There is a group called "probability assessment or analysis" or something.

DR. MATTSON: They're with the assessment staff.

DR. OKRENT: They're used, some of them, to thinking about systems analysis. You have people in various groups in your division who work with specific systems. You might in fact take this area and set up a little group that includes somebody who knows, let's say, the electrical systems involved, somebody who has a feeling for what I will call the "primary and secondary mechanical and thermohydraulic aspects," and somebody from the probabilistic assessment area who is used to thinking about systems and how they fail. You may want somebody from the control area.

And then, let them take this and see what events they can come up with -- not a complete set, just a characteristic set of events, large enough to give you a feeling for the nature of the problem and so forth. Then I think you will better know which way to go.

And you will want to ask each utility to do something or what, but I think -- furthermore, by the way, I think the experience would be useful because you would have some cross-fertilization among these people, and once having done it in this area, you could probably find a half-dozen other areas in which you could mix the people.

DR. MATTSON: Let me generalize on you now. One of the questions that the task force has to try to wrestle with over the next couple of weeks is: Is the compartmentalized cookie-cutter approach to technical review, which has been around since 1975 when the standard review plan was issued and the emphasis was on an expected wave of a bunch of new construction permits and standard plants, the proper structure for today when the cookie-cutters are not in use and the clear need and emphasis is of a more retrospective nature and the clear problem is of an interdisciplinary nature -- that is, the kind of thing that we're seeing as a result of Three Mile Island are gaps between the people responsible for operations on the one hand and design and analysis on the other hand, for example, or a gap between the control system designer or reviewer on one hand and the accident analyzer and accident preparer on the other hand.

I like your suggestion for this particular one. I don't know, once we get a list of what are the ones that ought to be looked at from this perspective, whether this was at the top of the list or the bottom of the list, is that a useful -- do you think that's a useful approach? Do you as a subcommittee have thoughts on that for how the staff, the technical review staff, ought to come at these kinds of problems?

You've seen how we've tried to do it with the cross-cut organization where we had these compartmentalized branches, narrow disciplines, and then we had the generic issues, now the unresolved safety issues, where we took teams of people, drawing them from the various branches, and coordinated them with project leaders to varying degrees of success.

Does this suggest that there ought to be -- to use the bureaucratic word -- some reorganization for the way we solve problems?

DR. OKRENT: Well, I will have to guess you will have a continuing need for some people who are, let's say, all strong, in control, and have a chance to talk to each other. But if they only talk to each other all the time, and to the project manager who is the very generalist, let's say, then you won't get the interdisciplinary attack of the type we were just discussing, by example.

So, I would assume you don't throw away your current structure of where you group people, but you have in some way a method of mixing people to work on problems, and you may have some group we call "systems engineering," which in fact would include all of the kinds of people I have mentioned, including the systems analysts coming from the event tree, fault tree, probabilistic area, and not necessarily a permanent home for somebody. He may stay in that for a while, then you shift other people in. Because, as we see, just around this table, different people bring in different ideas to the overall problem at hand.

But that's just a quick reaction.

DR. MATTSON: What I hear is a little bit of both, is probably the way.

DR. OKRENT: That's what I would do.

DR. MATTSON: I wonder if we could get back to the specific point.

Carl, is there a piece of paper you could give us that would help us understand it better? We do have a group of people looking at the question of what kinds of combinations of things ought to be analyzed for training on the one hand and another group looking at what kinds of things ought to be changed on design basis events, which is a different approach to it.

MR. MICHELSON: Are you referring now to the question on the safety-related implications of the main steam feedwater?

DR. MATTSON: Yes.

MR. MICHELSON: I will write a letter on that. I did have outlined a number of topics, but they are not necessarily

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self-explanatory.

But I think it's a very important area that you'd probably want to look at more closely.

DR. LIPINSKI: One other aspect. If you postulate a loss of feedwater, of loss of condenser vacuum through leaks in both steam generators in a two-steam generator system, radioactivity in the primary system and atmospheric release, and that cannot be tolerated, the question is: How do you go about improving the reliability of the system?

DR. MATTSON: I understand that.

DR. OKRENT: Okay. I think No. 6 is the next one: adverse effects from shear systems.

DR. MATTSON: Well, that's an old question in nuclear safety. We didn't know enough from those words to know what particular thing you wanted to talk about as a result of Three Mile.

DR. OKRENT: Well, as you have been able to ascertain, no doubt, this particular subcommittee has been asked to take a fairly broad look, and so we don't necessarily ask ourselves did something occur at Three Mile Island, in order to ask ourselves whether it might be relevant to possible significant improvement in reactor safety. Okay?

Now, there may have been some events at Three Mile Island where systems were shared and an accident in one plant could adversely affect the other. In other words, you could have a situation, I think, and I don't know whether it was at Three Mile Island or not, but where you could conceive a radioactivity leak in one plant leading to a loss of your ability to maintain decay heat removal long term in the other.

Again, I don't know whether that was there or in some other plants. But that's one example.

There was a recent example that, in fact, arose out of Three Mile Island here at Point Beach, in trying to look at the Westinghouse systems where they used to have a requirement that level and pressure to actuate ECCS where there was a suggestion for change, where at Point Beach, where, if I recall correctly, they share one diesel between the two plants, the design basis is you cannot have simultaneous ECCS actuation both plants at once. You overload the diesel system with that. It's not designed for it; it's designed to accommodate the ECCS load in one and decay heat removal in the other.

I think that's not the only pair of reactors where there is a swing diesel with this kind of function. In fact, in looking through the requests for this change, I think they found that they might not become -- it might not be so improbable there'd ever be a call for both ECCS systems to be actuated as one would like.

And there are some changes made from the original intent in the electronics so that specifically there they didn't get into a high-probability situation calling on ECCS actuation for both reactors at once.

But it raises a question, for example: Is a shared diesel like this a condition which poses a sufficiently high probability loss of all AC power? In other words, when you have two plants sharing a diesel this way, is the likelihood that you will be calling on the swing diesel to do too much too large, or has anybody looked to see if it's acceptably small, or however you want to do it, however you want to word it. Even though you know within the single failure criteria it's all right, I think we're looking beyond what the single failure criterion permits.

So, that's another kind of example of where one might look at shared facilities, and I think, as you go back and look, there may still be others.

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DR. MATTSON: On that particular one, I'm trying to figure out which way to generalize your question. A question of that particular sharing I recall being discussed at the time of licensing. Now, that was without the benefit of reliability approaches and the sort of things we're now seeing in the reactor safety systems. Their capabilities seemed to be more, in those days, to come at it with a quantitative degree.

S for that particular one, the station blackout unresolved safety issue, is one that will speak to that. As I understand the approach that's being used in station blackout, it's analogous to the concept, to the approach used in ATWS: to find out how reliable the systems are and decide whether something ought to be done to increase that reliability, using tools like reactor safety studies.

But that doesn't really get at your question. I'm giving that as an example of how sharing can get you into difficulty in ways you might not have thought of before. Clearly, there's been no broad look at that question.

DR. OKRENT: I don't even know whether you would pick that up in your station blackout look, because it depended, again, on what you assume, given a station blackout. In fact, in the station blackout --

DR. MATTSON: Two steps. The first step is to figure out the likelihood of station blackout, since station blackout involves the loss of a diesel, you have to look at the likelihood of the loss of a diesel in various configurations, not only the configuration where it's sitting there and not called upon, because both plants are at power.

DR. OKRENT: It may be at Point Beach that the power-operated relief valves are not seismically qualified. I'll assume that's the case. They might, in fact, be opened by an earthquake. You lose off-site power. You would get a signal from both of them for initiating ECCS. But I'm not sure, there may be more probable events. But when you look now, let's say, in the new light or where you just don't stay with the single failure criterion, however you want to put it. Again, I am just asking whether--

DR. MATTSON: Well, one of the questions is, if you now say you don't want to live with the single failure criterion, it doesn't make you that uncomfortable any more, then what do you want to put in its place. And what you put in its place is some other way of reviewing the assurance of reliability of performance of function.

And possibly one aspect of that could be some measure of the goodness of sharing or the badness of sharing. Is that the kind of thing that you're suggesting, that one way to look beyond the single failure criterion is to crosscut it from a shared systems standpoint, sort of a retrospective reliability assessment?

DR. OKRENT: I guess you could say that. I'm generalizing the term, because sometimes you have systems that seemingly are separate, but they may be in the same building. I'm using it in a somewhat general term, at least at the moment.

DR. MARK: Dave, I heard some of what's been said here. I don't see any reason whatever why Roger should be apologetic about the fact that this shared diesel problem was looked at pre-RSS. The means of looking at it then were just as good as they are now or as they have been since, if it was in fact looked at.

DR. OKRENT: Oh, in fact it was, and it was talked about.

DR. MARK: The fact that there's been a reactor safety study doesn't mean that there's been a great new light shed on the way of estimating the probabilities. The only question is, were the probabilities estimated.

DR. MATTSON: I wasn't trying to suggest it.

DR. MARK: You suggested -- you sounded apologetic -- in the early days, before we had all that wonderful machinery to look at it with.

DR. MATTSON: Before you came in, Dave had been talking about, were traditional things like the single failure criterion good enough for assuring.

DR. MARK: That's a slightly different question.

DR. MATTSON: And he brought up, when we were talking about shared system, something that bothered him in the sense of, was reliability assured well enough by things like a single failure criteria for shared systems. And I meant to say -- what I was trying to say was, we have tools today to look at that question that we didn't have back when we dealt with the particular example that he's talking about.

DR. MARK: There were some pretty damn good tools back then, too.

DR. MATTSON: But that's a different question than what was asked in those days.

DR. OKRENT: Actually, I must confess I was not displeased, in a sense, to read about Point Beach, because I was uncomfortable back when we agreed to swing a diesel. Because it's never been clear to me that you couldn't get the ECCS signal from both plants at once. Well, the earthquake was always a possibility. But here was a case where, in an effort to fix something because of TMI, we almost rewired it to make it a relatively probable event.

It's just an example that these things can occur, you know. But I think the question I'm raising --

DR. MATTSON: Maybe you remember something from Three Mile I don't. Your passing reference just went by our heads.

DR. OKRENT: No, no. Again, there were instructions that went out to Westinghouse vendors -- not vendors, Westinghouse NSSS owners, to no longer use the requirement for pressurizer level and pressurizer pressure for ECCS actuation. Once they got into the process of changing Point Beach and not do that any more, they almost got into a path where there became a relatively high probability of calling on the one diesel for both plants for ECCS. Okay?

So this was the sort of thing that's a somewhat interesting twist. Well, the intent is to raise this question of shared systems in a broad way. At least somebody initiate a look. It's probably, at least I hope, one of the lesser important ones I have to say. I hope this; I don't know.

I think we've covered 1 through 7. Are there any more comments on these?

(No response.)

If not, I suppose that before we begin, then, on the report of the Lessons Learned Task Force, we take a ten-minute break, since then we'll have a two and a half hour presentation.

(Brief recess.)

DR. OKRENT: This meeting will reconvene.

Dr. Mattson?

DR. MATTSON: What I hope to give you today is a status report on where Lessons Learned is. Basically, the position is that we have in the typewriter for distribution the first of next week a short-term report and set of recommendations. This will be one of two reports for the task force, the other being a final report on or about September 1st, at which point we run out of work.

I'll summarize today the kinds of things we've looked at, the approach we've taken on making our decisions as to what's important to do in the short term as opposed to what we can afford to look at a little longer, also some things that we think are well beyond the task force and its charter for eventual resolution, because of other groups that are studying some of these same problems from a different perspective, probably requiring some long-term Commission rulemaking or a basic change in approaches to some of these problems. And the decisions will just have to wait until some of those other perspectives are heard from.

The set of recommendations was developed from the standpoint of assuring safety of plants presently in operation and those cases pending near-term licensing decision, that is, those cases about to go in operation and those whose review is otherwise completed and is pending before a hearing board, construction permit stage.

So, to say that succinctly, we believe that the set of recommendations that I will describe today are both necessary and sufficient for continued operation of light water reactors or the granting of operating licenses between now a' the first of the year, where the first of the year is chosen on the basis of when we suspect further study may show other things to be necessary, rather than from the standpoint of something specific we've identified for plants with decision dates after the first of the year.

(Slide.)

The Task Force started in late May, people from NRR predominantly. From other offices, the executive legal director was represented; Standards Development, Inspection & Enforcement. The scope is limited to the reactor licensing areas, that is, the scope of nuclear reactor regulation, and does not include other broader responsibilities of the Commission.

So we are coordinating those in our interest, with other groups looking at these broader problems raised by Three Mile Island. Examples are: the Emergency Preparedness Task Force of the Executive Director's Forum, the ongoing I&E investigation of the accident, and a recently initiated I&E lessons learned sort of activity which parallels the NRR activity.

We are helping to review and develop NRR positions on standards and research program changes related to Three Mile Island, and we're coordinating with the ongoing licensing functions, both by Bulletins & Orders Task Force for operating plants, Three Mile Island, and the normal DPM, BSS kind of review for pending OLs.

We had opportunity to talk with several of the industry groups that are working in this area: the Edison Electric Institute's Ad Hoc Steering Committee, the Nuclear Safety Analysis Center that's been recently formed by EPRI, the Atomic Industrial Forum's Steering Committee on Three Mile Island activities.

In addition, we are serving as a sort of oversight function for a number of Three Mile Island-related generic activities that are going on inside of NRR. The Quality Assurance Branch has under way a study and development of new criteria for licensee technical qualifications. The Operator Licensing Branch has a rather thorough study under way and some recommendations about to be made on short-term changes in operator training and licensing requirements.

Both of these branches are working with the ANS-3 Committee, which has recently reconstituted itself with an eye toward revising the ANS-3 standards dealing with qualifications and training.

We have also initiated some work on Regulatory Guide 1.97 that I'll describe in a little more detail later. It's actually a three-phased aproach to revision of that guide treating instrumentation to follow the course of the accident. We, of course, are keeping track of Steve Hanauer and the unresolved safety issues questions, as we see things from Three Mile Island coming to be factored into standards programs for treatment of unresolved safety issues. And we will be advising Mr. Denton on ways to staff and organize and develop his licensee event report evaluation function that has been formed as a result of the actions taken by the executive director following a report of the task force that he formed several months ago.

(Slide.)

The task force started by trying to gather from a variety of sources all the things that people were saying were the important lessons from Three Mile Island. We started with the many and tried to sort down to the few that were important, urgent, of higher priority. Examples of places we looked were, of course, the ACRS recommendations, the NREG-0560, the Tedesco report on feedwater transients in B&W machines, the I&E investigation, Congressional hearings. Commissioners have generated a number of ideas on their own. The Commission has directed a number of specific things to be done. The Presidential Commission hearings have generated ideas and thoughts.

We broadly solicited input from individual staff members inside the Office of Nuclear Reactor Regulation. And, of course, we get cards and letters by the dozens from people outside the NRC, unsolicited things from private citizens or corporate representatives, a wide spectrum of people.

We tried to separate, from all of those sources, the ideas for action that were important in the short-term. And since we tried to define a set of short-term actions of a sort that provide immediate substantial additional protection required for public health and safety, those were carefully chosen, of course --they come from the regulations --separating those from the longer-term actions where further study is required before it's clear whether additional things need to be done or areas where fundamental questions, fundamental policy issues or regulatory issues have been raised piecemeal or Narrow solutions at this point are likely to not satisfy the need or are likely to be overturned as further study goes on toward these more fundamental problems.

We separated these issues in the task force by voting on them. A two-thirds majority of people present in the room is generally what we followed, trying to pay some attention to whether it was a quorum. All of our recommendations are majority opinions save one, which I will describe in more detail later.

DR. MARK: This being your own opinion?

(Laughter.)

DR. MATTSON: As a matter of fact.

(Slide.)

I think this slide's important, because we need to recognize that not everything about Three Mile Island -- that is, the specifics of what happened, how it happened and why it happened -- is understood at this point. There are ongoing investigations, there are engineering evaluations that are not yet complete, one inside the NRC, another one being performed by the Nuclear Safety Analysis Center people in California, and I'm sure others that we'll hear of later.

But based on the information that we have today, we understand four contributors to the accident. We've talked to you about the first three before. Since the fourth one was implicit, we decided we'd put that one up on the slide, that is, errors in design, equipment performance, humans, and the regulatory process.

Operating on that understanding of the accident --

DR. MARK: Roger, I am kind of on a kick of some sort. You listed four things -- design -- I've forgotten what they were. They were all up there.

But why the regulatory? Design, equipment malfunction, human errors and regulatory.

Now, I don't recognize in that list a thing which strikes me as being of really basic importance, and that is the question of the capability of one man, one conscious, intense, concerned human being, to cope with what he had to cope with. And that isn't equipment malfunction, it isn't design, it isn't human errors, and it's got nothing whatever to do with regulatory. And I think it has everything to do with what happened.

MR. MATHIS: It's got a lot to do with design.

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DR. MATTSON: It also has to do with human error. It depends on what you mean by human error.

DR. MARK: Human error is not when a fellow is so assaulted from this side and that side that he doesn't know which way to turn.

DR. MATTSON: I would include in human error the possibility that people were called upon more than what they were capable of doing or trained to do.

DR. MARK: Okay. I think it deserves a slightly different description. And it is also so close to being central that you could almost drop the rest of it.

DR. MATTSON: I don't know that I'd agree with your conclusion. But I agree that it's a very important point.

DR. MARK: All right, good enough.

DR. MATTSON: Training we'd put under human error.

DR. LIPINSKI: But you talked to those operators. They followed their training and they kept that pressurizer from going solid. Whether their training was correct is something else. They didn't make an error. They did as they were told.

DR. MATTSON: I'd put that one both on the regulatory side and in the human error category.

DR. MARK: I wish you would give it more specific recognition. The confusion --

DR. THEOFANOUS: How about "human factors"?

DR. MARK: The confusion that was imposed on those people should be reduced.

PROF. KERR: Could you just call it chaos?

(Laughter.)

DR. MARK: You see, operator training might help you driving on the L.A. Freeway in the good old days when gas was available. But it isn't enough.

DR. THEOFANOUS: Oh, we have plenty of gas.

(Slide.)

DR. MATTSON: Okay. With the prescriptions on our scope that I described and with the understanding of where the causes and contributors were, we come up with a list like this of the kinds of things that we're looking at. I don't want to spend a lot of time elaborating on this, because you will see as I go on the kinds of things that can flow from that.

One ought to note some omissions, some of a broad character -- for example, what is the NRC role in an accident, is the kind of question that is beyond the scope of the Lessons Learned Task Force. It does influence some of the things we might recommend, and so some of our recommendations will be parametric in nature, depending upon what that role eventually sorts out to be.

DR. OKRENT: Is there a task force on that?

DR. MATTSON: The NRC Special Inquiry is addressing that question, as is the President's Commission on

Three Mile Island.

DR. OKRENT: Within the NRC, it's only the NRC at the moment?

DR. MATTSON: Yes.

Siting questions are not being handled by the Lessons Learned Task Force. As we see things of a siting nature, there is a standard committee on siting policy, which has been develcping a statement of NRC siting policy, and Three Mil: Island-related questions will be referred and are being referred to that standing committee.

DR. OKRENT: Is that a new standing committee?

DR. MATTSON: It's the Muller group. Dan Muller is the head of it. It's been around for some months, maybe a year almost.

DR. OKRENT: Is this the group that's been developing proposed changes in the regulations?

DR. MATTSON: Yes.

DR. OKRENT: Okay. So previously I would say they were addressing a different type of question.

DR. MATTSON: Sabotage is not being treated in the Lessons Learned activities. The engineering evaluation of the accident is not being done by Lessons Learned; it's being done by the NRC Special Inquiry. And off-site emergency preparedness, as I mentioned earlier, is being handled by the B&O Task Group.

(Slide.)

With the recommendations that we've made, with the implementation of the recommendations that we've made and the present work of the Bulletins & Orders Task Force implementing the things that have been described in the bulletins and orders, we think present operations can continue and that licensing can continue. You will notice that some of our recommendations, when the report is issued next week, allow implementation of the change after licensing, although the commitment to make the changes is required now.

Some of the implementation extends beyond power operation, the initiation of power operation of the plant.

(Slide.)

That slide essentially says what I've just said. And with all that as background, I'll try to take you through the short-term recommendations.

(Slide.)

They come in two general categories: operations on one hand, and design analysis on the other. We'll start with the operations recommendations. There are three general ones we've already defined specifically, which you see up there.

First, reactor operations management, the first bullet, to define and implement command and control functions. It's the task force view that the responsibilities of command and control were not clearly understood or carried out in the

Three Mile Island accident, for a variety of reasons, perhaps. But as we look more generally at, is the reactor command and control function being carried out in other plants today, whose normal operations are under emergency situations, the answer we come up with is we haven't high assurance of that. We would like to increase our assurance.

DR. MARK: Does this imply that there should be an extra guy milling about or that there is somebody who has this more clearly in mind?

DR. MATTSON: What we want to do is establish the senior reactor operator as the command function and relieve him of some other duties which we understand have accrued to these shift supervisor type people down through the years, administrative duties, things other than being in command and control of reactor operations as a continuing matter while he's on shift; require this commander, if you will, to be in the control room unless replaced by a designated replacement of the command function; and to specify both up and down from that individual clear lines of authority and responsibility.

DR. MARK: But it might be the same number of people, with slightly different assignments, or not?

DR. MATTSON: There may be cases in multiple reactor plants where this function is currently carried out by one individual for two units. And under our recommendation, that individual would have to be doubled. There'd have to be one in each control room.

So, except for that possibility, this particular recommendation doesn't add anything. There may be an indirect influence on a number of people, in the sense that if this person can't do administrative things while he's on shift and those administrative things need to be done in that same time period, then perhaps administrative assistants or other management people would have to be added to carry forth with that function.

MR. MICHELSON: Roger, if this gentleman is really the commander, then how about the higher-level engineering and supervisory people in the general area? Can they make decisions and tell him to do it, or is he really the commander?

DR. MATTSON: What we say in the recommendation is that we want his decision authority up and down to be clearly specified for him by senior management of the utility operation. We have not at this point prescribed how the management organization should function, but that the man understand clearly what his responsibilities are, what decisions he's to make, who he reports to and is accountable to, and who can countermand his actions -- the sort of thing that you described.

MR. MICHELSON: You don't envision him yet as the captain of the ship, then?

DR. MATTSON: No, because you will see when we get into some other things that we're going to have the execution of the emergency functions off-site and the hands-on control of subordinates outside the control room rests in other people. So he has the command function for the operation and manipulation of the controls, but he doesn't have overall captain-like responsibilities for the entire site.

MR. MICHELSON: So this doesn't necessarily address the problems of TMI, wherein there was some difficulty with the division of ideas and then, you know, who was really in charge. The operators were taking their instructions, apparently, from more than one person.

DR. MATTSON: It does address that question. It does require that this is the man that makes that decision. But you also have to address from whence does he get his advice and recommendations and what are the authorities of superior people in management with respect to those operations as an ongoing matter.

It's especially important, I suspect, for an accident like Three Mile Island, where the time scale is considerably stretched out, which is really one of the primary sources of the confusion in the NRC role in the course of the accident. Had it been a design basis accident of the traditional sort, there wouldn't have been time for us to get involved in the way we became involved.

DR. MARK: I think these remarks are on Item 1 up there. On Item 2 you want to limit the control room access.

Are you saying at TMI there were too many people in there?

DR. MATTSON: Yeah.

DR. MARK: There were also people who wanted to get in and couldn't, and who should have gotten in and couldn't.

DR. MATTSON: That's the point of the recommendation when we get down there, Carson. Let me get down through there.

DR. MARK: I'm sorry, I didn't mean to jump the gun here.

DR. MATTSON: The second one under reactor operations management is that we recommend that a shift safety engineer be required for each station. That is, a multiple unit station would have one of these people on shift, not necessarily in the control room but accessible to the control room, on call, who would report in an emergency situation, which would be defined by the management under this command and control function, report as a sort of deputy to the command function in the control room.

Now, the requirements that we will place on the qualifications of this shift safety engineer are that he have an engineering degree or equivalent -- and the equivalent would be stated in terms of operations experience and training, including training at the university level, the college level, in systems engineering, nuclear engineering, and that within one year of the time these people are required to be on board serving this function, they have completed the training required of a senior reactor operator; not necessarily that they be licensed as a senior reactor operator, but that they have attained the same training.

We also speak in a recommendation vein to the normal duties of a person who would be the designated shift safety engineer, that is, his duties during normal operations, which would have to do with an engineering oversight of the operation of the plant, wherein, for example, the senior reactor operator may look at a resin transfer in the secondary system from an equipment standpoint and a management standpoint, the shift safety engineer and his counterparts on other shifts would have been looking at that action days in advance or hours, if necessary, from an overall plant reliability, overall plant engineering standpoint.

Also, duties having to do with operating experience feedback from that plant and other plants of similar design, perhaps eventually growing into a cadre of people that each operate the plant responsible for LER feedback, the counterpart to the regulatory role of operating experience.

Finally, in operations management, the definition and implementation of the shift turnover procedure, the checklist approach, from one senior reactor operator to the next senior reactor operator at the time of shift change, plus logging and subordinate turnover procedures for technicians and auxiliary operators for the kinds of problems that you see when maintenance or testing is begun on one shift and not completed until the next shift, and assuring that the information is passed.

PROF. KERR: The shift safety engineer implies that there will be one available for each shift?

DR. MATTSON: Yes, on-site.

PROF. KERR: This person's responsibilities are being defined or have been defined -- are they going to be sort of loose?

DR. MATTSON: His normal responsibilities will be loosely defined, as suggested at this juncture.

PROF. KERR: For example, could he be the plant superintendent for some shift?

DR. MATTSON: I guess I haven't thought through that question of could he be the plant superintendent, because that places him in a difficult position. In normal operations he would be a senior manager to the shift supervisor, but in an accident situation, where he was providing the engineering assistance to the shift supervisor, who has the command function in the control room, he'd be subordinate.

We had more in mind that he might be more on the normal engineering staff of the utility, reporting through, under normal circumstances, an engineering management organization. But in the event of a transient or an accident or some emergency situation, he would immediately assume another hat and report as this technical adviser cum deputy to the senior reactor operator.

PROF. KERR: Being shift safety engineer is not the only thing he has to do.

DR. MATTSON: That's right.

DR. CATTON: And he's not a part of the operations side of the house.

DR. MATTSON: We're not requiring that he be; only under emergency situations.

DR. CATTON: As I understood it, one of the problems was the separation of the engineering function from the operations function. It doesn't sound to me like this addresses that problem.

DR. MATTSON: It sounds to me like it does. It makes people go across that interface. If he's going to make people assume these emergency functions, of course, he has to be trained in them, he has to be drilled in them, he has to have a coordinative capability with these people day in and day out, interacting with the shift safety engineer on all sorts of operations problems, but with his engineering viewpoint. So I think it does go to that question, and that's one of the reasons that we haven't come down hard on recommending that he be a part of the operations organization necessarily.

DR. OKRENT: How many reactors are running now?

DR. MATTSON: 70.

DR. OKRENT: How many stations?

DR. MATTSON: 50. Five shifts is 250 people.

DR. OKRENT: Do 250 people exist who qualify for the position?

DR. MATTSON: Yes, except the SRO training requirement.

DR. OKRENT: What are the qualifications, in your opinion?

DR. MATTSON: Let's see, how did we state it? A bachelor's degree in engineering --

VOICE: A related engineering field, or the equivalent, being six years operations, two years of which would be supervisory capacity, plus a year of engineering, university-level training.

DR. OKRENT: I've seen a lot of graduates from college, including some with master's degrees and even Ph.D.'s, who were in fact very intelligent and very good in what they'd done, but they wouldn't have the breadth of knowledge that I would envisage I'd want for this shift safety engineer. In fact, it's not even obvious to me that the first thing I would have them do is learn how to be a reactor operator. It might be the first thing I'd want him to learn was how did the reactor perform and what, you know, were really all of the system's behavior characteristics from the designer's point of view, and so forth and so on.

DR. MATTSON: I agree with what you're saying. We haven't come to a way to cleverly describe that kind of person. We think it's important to start now to introduce the engineering function in the control room or in close proximity to the control room, in the way I've described. We're going to have to look to others, like the ANS qualifications standards writers and the Quality Assurance Branch, Operator Licensing Branch, over a longer period of time, to come to uniform and generally accepted standards for these people. But given that that takes some time to articulate, we've chosen to just go with a general engineering expertise type of requirement and ask that those people be in these duties by January 1, 1980, and have the --

DR. MARK: When?

DR. MATTSON: January 1, 1980.

PROF. KERR: How many people did you calculate would be needed?

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DR. MATTSON: 250.

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DR. MARK: This is an additional person per plant by January 1, 1980?

DR. MATTSON: Yes, sir.

MR. MATHIS: That will be tough.

DR. MATTSON: Most of these people will not be new hires.

PROF. KERR: Most of the people you want on this kind of job are not people who do shift work, so you're going to have to provide some extra incentive of some kind for them to do shift work for them to be good.

It will take a lot of money, if they haven't got the jobs available.

DR. OKRENT: Money makes pilots fly at night.

(Laughter.)

PROF. KERR: And they get a lot of time off during the day.

MR. MATHIS: It's going to be a tough job, Roger.

PROF. KERR: If you totalled the pilots' hours, it's not five, it's about double that number per plane. Maybe that's what has to be done?

DR. OKRENT: I think the idea, in fact, is a good one. I think the qualifications that you're proposing are not adequate for the job and as an ANS member I feel perfectly free to suggest that it's not appropriate to wait for the ANS to develop the qualifications.

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DR. MATTSON: I didn't mean to imply that, but through those kinds of vehicles and our own stimulation by that ki d of thinking I think we can get to those kinds of standards very soon.

PROF. KERR: What you want is to have engineering know-how available when it's needed, and in order to get that you have concluded that there has to be somebody available in the plant, 24 hours a day.

Is that it

DR. MATTSON: Yes.

PROF. KERR: It isn't a 24-hour-a-day man in the plant that you want. You want the knowhow there when you need it.

DR. OKRENT: Money makes pilots fly at night.

(Laughter.)

PROF. KERR: And they get a lot of time off during the day.

MR. MATHIS: It's going to be a tough job, Roger.

PROF. KERR: If you totalled the pilots' hours, it's not five, it's about double that number per plane. Maybe that's what has to be done?

DR. OKRENT: I think the idea, in fact, is a good one. I think the qualifications that you're proposing are not adequate for the job and as an ANS member I feel perfectly free to suggest that it's not appropriate to wait for the ANS to develop the qualifications.

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going to be used, the talent for which you want him.

DR. MATTSON: I don't think so. I think that there are meaningful things that he can be occupying himself with other than emergencies in the control room. Even though it's the middle of the night.

PROF. KERR: I'm talking about the talent for which you want him, most of the time will not be used for that purpose.

DR. MATTSON: But if he's doing the right things off the shift, then he's helping to assure that the times that he's needed in a crisis situation in the control room don't occur as this engineering operation's viewpoint of actions that are taken day-in and day-out that don't come to a negative happening months or years down the road, the kind of things that are done with maintenance and replacement equipment year-in and year-out in engineering of the plant.

PROF. KERR: Would you anticipate, then, in an accident of the duration, say, two or three minutes, that this man would be useful?

DR. MATTSON: In two or three minutes he might not even be in there, but within ten minutes he would be in there. And yes, I think he would. And it goes to the kind of thing that we've spent a lot of time talking to you about over the last couple of months, that is having a command and control capability in the control room to effectively intervene in the course of an accident that isn't going by the books.

Carl comes at it from an angle of well, tell them not only what to do but what not to do. But both of those things are limited by your ability to project.

PROF. KERR: You're not talking about an operator. You're talking about a safety engineer.

DR. MATTSON: Over the long term, I think I may be talking about an operator too, you know. The associated things going on are increasing the capability.

PROF. KERR: If you're talking about an operator, then that's another conversation.

DR. MATTSON: Let me finish the thought, because I failed to mention this and it's important. It may very well be that a year from now or two years from now or three years from now a requirement for a senior reactor operator is that he hold an engineering degree.

The industry has announced the formation of the Nuclear Operations Institute for the generation of standards, the conductor training, the sort of third-party inspection and auditing of nuclear operations. The Commission has directed the operator licensing branch people to develop increasing requirements for reactor operators.

We look at the experience of the people like the Navy where Naval operators in a comparable position to the

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SRO or all college graduates.

PROF. KERR: The trouble is because this may be just an interim situation.

DR. MATTSON: Yes, and one acceptable way to meet this, in my judgment, is for the shift safety engineer and the SRO to be the same person. I don't see any reason that that should be outlawed. If you have an SRO with the right engineering systems understanding --

PROF. KERR: I agree with what was written. It says "and." Had you written it to have the SRO be a shift safety engineer that would have a flexibility of which I was unaware.

DR. MATTSON: That flexibility is built into the recommendation

MR. MICHELSON: Roger, I'm still not clear what you're gaining, what you think you're gaining with the shift safety engineer. Wasn't there the equivalent of several shift safety engineers in the control room at TMI within an hour or an hour and a half, and their real trouble didn't arrive until two hours.

They didn't seem to avert the difficulty and I think there were several highly qualified people there, so having one somehow gives you a lot of warm feeling?

DR. MATTSON: Two answers to that question. One, I'll use the same answer that Dr. Okrent used an hour ago.

DR. OKRENT: I copyright that.

DR. MATTSON: Some of these recommendations do not necessarily flow directly from the Three Mile Island experience. They flow from, let's call it a fresh perspective on operations reliability afforded by viewing the Three Mile Island experience.

The second answer is more related to the Three Mile Island experience. We haven't looked at the specific qualifications of the engineers who came into the control room. We do understand that people with engineering degrees did come into the control room in the time frame you described.

Whether they were ineffective as was the rest of the operations staff in understanding the situation they had, because their qualifications were poor, their training was poor or their perspective was poor, or because there were too many people t -e or because nobody had ever thought about this kind ..! ent, and couldn't imagine that it happened.

I don't know that anybody will ever sort through, but from a fresh perspective it affords of reactor operations we want an engineering viewpoint in the control room for emergency situations.

MR. MICHELSON: I guess my c ly comment, really, was leading up to the fact that really you're not just looking for a college graduate, you're looking for a different kind of discipline in the control room than maybe you have had presently. Maybe you won't even acquire it by putting a college graduate in the control room.

DR. MATTSON: That's why I agreed with what Dr. Okrent said. It's too easy to grab onto, oh, the NRC is going to put college graduates in the control room and everything is going to get better. That's misunderstanding the recommendation. We want engineering expertise of the right character, and the difficulty is being able to describe and well articulate that character promptly.

People ought to be working on that and they are. In the short term, we'd like to begin to introduce that engineering competence now. To a large measure it's going to be a learning experience in the next six months to a year, as operations people go about choosing what kind of engineers they want in those control rooms. And as we think about it with them, and what the qualifications in more specific detail ought to be, what the recurring training for these people ought to be, whether they ought to be licensed, whether there's a need for them at all over the long term.

If you decide that you want an engineering degree for every senior reactor operator five years from now or three years from now -- it's an evolutionary process we're trying to set in motion.

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DR. MARK: I have grave misgivings about the whole picture. The kind of guy you want, I vaguely can imagine, he is not going to sit still and work at his shift engineer capacity. He's going to get the hell out of there. I think you should approach this very slowly.

Bill made a good, actually the right, remark. He is the guy who might be forced to live within a five mile radius, but he's not going to sit there at midnight in the control room playing solitaire. There will be nothing else for him to do.

MR. MATHIS: I disagree, Carson. I think you can design a job that the man can make a contribution with, and learn and serve the purpose that they're shooting for, and it's going to be an evolution process, but -- for example, there's a need, I think, in most plants, for some operational analysis on a continuous basis and the people that are in there today just do not have the talent nor the time really to do that kind of thing.

A secondary function -- I'm just talking off the top of my head now after listening to Roger, but planning of coming events in the maintenance area. Other jobs that need to be done, and how do you approach that job, these are activities that are not getting the consideration that they should today.

DR. MARK: Look, I'm not scorning the kind of work

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and attention that is in fact across the long haul, necessary. But, being in the control room from midnight --

MR. MATHIS: He isn't going to be in the control room all the time.

DR. MARK: I thought he was.

MR. MATHIS: He is going to be on the plant, that's all.

DR. MARK: Oh, all right. From midnight to eight a.m., it's very nice to do the long range planning except he'd rather do it from eight a.m. to four p.m.

MR. MATHIS: You're right.

DR. MARK: And I think that also might be enough.

DR. CARBON: I don't think that at all holds together, Carson. I can see financial incentives and long weekends.

DR. MARK: Like Dave said, if you give pilots enough, like $110,000 a year, they'll fly at night.

DR. CATTON: They also get off 50 days.

MR. MATHIS: You'll have a lot of turnover. People won't stay in these jobs very long. That's another problem.

DR. MARK: I can see it being the main problem. If they're good enough, they'll go out and sell themselves to another job.

DR. MATTSON: It might be if they're good enough and they do the kind of things that they have to begin to do, planning operations analysis as it was just described --

DR. MARK: Operations analysis -- look, I believe we all --

DR. MATTSON: There are other ways for them to change their job including promotion and what-have-you.

DR. MARK: We need the talent within reach where you need it, on a shift basis. That's still in my mind a big question.

PROF. KERR: It is certainly not wise, it seems to me that an accident that takes less than about 20 minutes to run its course, it could occur rapidly enough that the people who are going to be influential have to be in the control room when it starts, almost. If it goes longer than 20 minutes, or 30 minutes or something like that, you could almost get somebody from a radio set up X miles. I don't know.

And it seems to me if your objective is to have a backup of engineer expertise available within zero minutes or five minutes, you'd have to do what you say. If it's to be had available within 30 minutes, I'm not sure. I would hope that you'd give some serious consideration.

DR. MATTSON: The longer term goal is to have him there in the control room in the person of the engineering officer of the watch at each shift, and I want the next best

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thing I can get to that today, which is engineering expertise.

DR. MARK: You've been working for 20 years to make these plants so safe that they're getting dull as dishwater, and there's nothing to do one day, the next day, the next day, and all your ambition has been to make sure there's nothing to do. And now you want a genius sitting around there.

DR. MATTSON: I suspect we're saying the same thing over and over.

DR. MARK: Well, I'll stop.

DR. MATTSON: The in-plant emergency preparations limit control room access.

DR. CARBON: You wanted to talk about that 20 to 30 people within the first hour, 50 to 60 people later. On Saturday, 80-some people. Too many people in the control room, stepping on one another's toe, confusing lines of authority.

In one instance we're aware of actually blocking access to an operator who wanted to do something at the control console. We think that that can be fixed fairly easily with administrative procedures of the command control function, and a simple recommendation or requirement to people to develop control room access protocols and people recognizing who has the ability to grant access to the control room in what kinds of situations.

Given that you do that, you've got to do something with the other people that have a role to play in the emergency. Communication with people off site, the supply of back up technical support, engineering support, the trending -- if you will -- of what the course of the incident has been, the capability to lay out drawings and understand the details of what the plant might have on its hands that you can't see, from the summary descriptions that are available in the control room -- those things we would put, actually we'd put them in two different rooms.

The second line there says, establishing on-site emergency. It should say, a technical support center which is the center I just described. Then a third point of control, which we've called an operations support center, would be the place to whence all of the auxiliary operators, technicians, others who assemble in the event of an accident, would go for dispatch on the direction from the

In one instance we're aware of actually blocking access to an operator who wanted to do something at the control console. We think that that can be fixed fairly easily with administrative procedures of the command control function, and a simple recommendation or requirement to people to develop control room access protocols and people recognizing who has the ability to grant access to the and you probably need communications requirements and instrumentation. Those are things that will have to wait a while, as questions involving the role of NRC and the kind of information that has to be sent to NRC, the new requirements that might come on interaction between the site and the off-site authorities.

Clearly there will have to be a transition period. What we're speaking to now is more the establishment of the concept and the function. If there's a habitability problem in the event of an accident and the only place that has habitability protection is the control room, then an interim solution will have to be some way of performing these functions in the control room with more thought ahead of time as to how to control or limit the interference -- these functions perform on each other, so there's flexibility in these recommendations but it points in a direction.

PROF. KERR: Had somebody estimated the probability that these will be used during the life of the plant?

DR. MATTSON: No.

PROF. KERR: Because it seems to me you need to in order to establish what sort of things will be done there. The probable accidents in which one would need this or the probability that they will occur, it seems to me goes into

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what you put there, and how you expect to manage it.

MR. MATHIS: Bill, you've got to accept Murphy's Law on this, and that is that it's going to happen.

PROF. KERR: Something is going to happen, but this is designed to handle emergencies. Now, what is an emergency?

DR. MATTSON: That's an important thought. You could say you wanted a duplicate control room. That would probably be kind of silly. All the same indications, all the same recording capability or what-have-you as in the control room, and you have this infinite set of equipment that's in many aspects superfluous to the thing you have in mind when you have an accident, which is usually a finite set of equipment, a finite set of instruments, a finite set of controls having to do with production of core cooling, maintenance of core cooling or the protection of the primary coolant boundary, and that kind of thinking, or synthesizing information and aiding the operator by perhaps requirements to backfit these kinds of measures to control rooms.

I think it leads to a kind of thinking that is needed for this technical support center where you have trending instruments that is key instruments for monitoring the core cooling for example with a recording and playback capability so you can see the trends.

You're dealing not with an infinite array or an

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infinite variety of accidents, but a finite array or primary indicators, plant safety.

I think it's a workable problem, but not from the standpoint of the probability of whether it will be used. It's sort of like recognizing that accidents can happen instead of saying, I don't think accidents can happen.

If accidents can happen, then be non-mechanistic about what they'll be and recognize that once they do happen, there's a finite set of things you'll want to follow to control decisions on and provide that finite set of equipment.

PROF. KERR: There are a number of mishaps in reactor operations. It seems to me that probably Three Mile Island is the first one we've had in which one has needed this sort of thing. Maybe not.

DR. MARK: It will be all right, Bill. You control the number of people in the control room keeping it down to those who have something to do there. And the NRC can be put into some waiting room outside.

But you do have a place for them.

PROF. KERR: I'm trying to get a feel for how often one would expect such a thing to be useful. I would hope that there be many plants that would never use it during the life of the plant.

Maybe, in fact, only one out of 100, one out of 1000. I'm trying to get an idea of what it is that one is going to do here, so that one has some idea of how you build.

DR. OKRENT: This is where the shift supervisor keeps

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all of the LERs.

(Laughter.)

DR. MATTSON: The third area under operations has to do --

PROF. KERR: What I don't want and what I don't think you want is to design this thing to handle Three Mile Island.

MR. MATHIS: No.

PROF. KERR: If you're not going to design it to handle Three Mile Island, then you ought to decide what you are going to handle.

It's very murky to me.

DR. MATTSON: Well, we could go into some of the details, but I suspect that it wouldn't be productive, Bill.

The third bullet up there is operational reliability and quality assurance. We're proposing that the commission undertake rule-making to establish in 50.36 of the regulations the limiting condition for operations related to operations reliability and the assurance of high quality operations.

We've looked at ways to increase operations reliability to try and get the problem of auxiliary feedwater systems isolation valves being closed while the plant was in operation and people not realizing it, other operational errors of that sort, maintenance errors, surveillance errors, control room manipulation errors, looking at what the

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experience has been in the LERs in a given year and ways to increase assurance that the important mistakes that have been made are brought under control or eliminated.

One approach to this that we considered was simply placing NRC in the review of operations procedures, not emergency procedures, but maintenance procedures and day-in and day-out operating procedures and operations management and management organizations to provide a check and balance in the regulatory sense on what's done in these plants.

That seems to us to be burdensome and to interject the regulatory presence in a place where it shouldn't be necessarily.

And also to have regulatory resource implications and, hence, a long-term effectiveness problem that we weren't satisfied with.

So the alternate that we've come up with is this limiting condition of operation which would say upon passing a certain threshold of poor operations reliability, the plant has to be placed in a cold shutdown condition and the situation examined, the reasons found, the corrective action chosen generally. Not a specific corrective action, but a general corrective action on how this kind of problem could happen.

The threshold we've chosen is loss of safety function So a loss of the emergency feedwater system, a loss of the high pressure coolant injection system, loss of containment isolation capability, the loss of emergency power, loss of low pressure emergency cooling. Operational errors that lead to that sort of loss of safety function would trigger the use of this criterion and would trigger this limiting condition of operation.

DR. OKRENT: Is that different from the current tech specs?

DR. MATTSON: It is in what we would do as a result of the discovery of such a violation. Current tech specs say those things are limiting conditions of operation. The plant is required either to fix the mistake or shut down.

In the case of a design error where you find a design error that takes time to correct, it's usual to shut down and then go about fixing the design error, changing the equipment, or whatever.

In the case of an operations error like emergency feedwater valves weren't closed, it would be common practice to open the valves and to continue in operation.

Under this proposed approach, the plant would not be allowed to continue in operation even though the loss of safety function had been corrected. Whether the plant would be shut down --

PROF. KERR: Did anyone ever advise you that it would enhance plant safety by opening or shutting the valve?

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DR. MARK: Obviously not.

DR. MATTSON: And we think it's a penalty. It is human. We think it's a penalty commensurate with the size of the problem.

There are operating utilities that don't have any of these problems. There are other operating utilities that have these.

PROF. KERR: Is shutting the plant down better than a fine, for example?

DR. MATTSON: This kind of mistake raises questions about the capability of the operating organization to provide safety of the plant. That is, the loss of the safety function the failure to provide a system of operations management that prevents this kind of mistake from being made.

But we're not talking about 3000 of these kinds of things a year. The estimate is that like 1 percent of the 3000 LERs per year are of this magnitude.

PROF. KERR: You would anticipate that the plant might be shut down like for six months?

DR. MATTSON: No. I would anticipate that the plant shouldn't be shut down for six months. I think that it would be a matter of days if decisive and meaningful corrective action can be developed by an operations organization.

PROF. KERR: But if the organization is in such poor shape that the safety of the plant is threatened, and you want

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to shut it down, are you telling me that in two or three days you can make corrections that would assure that everything was go again? Or is this just a way of putting pressure on the utility because of the financial penalty?

I'm not against either one. I'm trying to find out what it is that you're getting at by shutting the plant down.

DR. MATTSON: I don't disagree with what you just said. It is a way of requiring people to put the attention, resources, the management clout behind operational reliability that we think is necessary.

PROF. KERR: The reason I think that we ought to explore alternatives is because within my recent memory, there have been situations in Michigan and in Ohio which, if you shut a plant down in mid-winter in the middle of a coal strike, the consequences would go far beyond the financial liability to the utility. And you might want to consider a fine as an alternative. If what you're trying to do is impose a financial penalty, if you're really concerned about the health and safety of the public, clearly, that is not what is going to do it.

But if what you're just looking at is a building, I would be reluctant, if I were you, to get myself in a box, or if I found a safety system shut off, I had no alternative but to shut the plant down, because there are going to be situations, I think with a fairly high probability, in which

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you would rather not get yourself in that situation if what your objective is is to impose a financial penalty.

DR. MATTSON: Your objective is not to impose a penalty. Your objective is to preclude this kind of occurrence.

PROF. KERR: You could perhaps preclude it by a financial penalty unless you have included that the organization is in such bad shape that you have to start over.

In those cases, a two or three day shutdown is not enough.

DR. MATTSON: That's true.

PROF. KERR: I have made my point, but I think that you ought to think about it.

DR. MATTSON: With this potential being raised for that organization that is in such poor shape that it can't get itself out of this kind of problem in a few days, I think those organizations would recognize that with this staring them in the face and take steps now to correct that --

MR. MATHIS: Roger, don't you have those tools basically in hand today through the tech spec and the other kind of violation activities? Now maybe not as immediate or as big a clout, but you've already got a tool. Why don't you try using that before it gets worse?

DR. MATTSON: People have tried using that tool.

MR. MATHIS: Not very much.

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DR. MATTSON: And they've been slowly escalating the severity and the number of penalties over the years. And these kinds of problems don't seem to go away as a result of that.

PROF. KERR: But Roger, part of the problem has been that the regulatory process has not made very much distinction between technical violations that have very little to do with safety and fairly serious violations which are.

And hence, you've had difficulty deciding when to shut a plant down or when one has a problem serious enough to shut it down just on the basis of the violation.

DR. MATTSON: And that's the genesis for this kind of recommendation. This is serious enough to shut a plant down.

PROF. KERR: But I don't see why you have to have rule-making to make this decision. You still have a discretion to shut plants down right now. If you decide that a plant is unsafe, can't you shut it down?

DR. MATTSON: But the burden is upon the NRC.

PROF. KERR: Of course it is. It should be.

DR. MATTSON: To go out and research the LER literature in a post facto way months after the events, where the system allows this kind of mistake to be made and the plant to sail along in operation without meaningful corrective action being taken by the senior plant management.

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MR. MATHIS: That's going to happen here.

PROF. KERR: If the NRC concluded that a plant was unsafe, it could shut it down. Is that not the case?

DR. MATTSON: That's true.

PROF. KERR: What is the rule that permits you to not make a decision?

DR. MATTSON: I don't understand that.

PROF. KERR: It seems to me that the decision that a plant is unsafe is a fairly serious decision. It's an important one when you reach it. A plant ought to shut down. But it does not seem to me that one ought to set up an automatic system that requires really no thought on anyone's part.

It seems to me that the decision to shut a plant down ought to be taken fairly seriously.

DR. MATTSON: I understand your point.

DR. OKRENT: Did we cover all the items on the page?

DR. MATTSON: Yes.

(Slide.)

Nine general areas where design and analysis recommendations are being made in the next three slides. First, the emergency power for process equipment.

The pressurizer heaters and pressurizer level indicator requirements here are to provide the capability to manually switch pressurizer level indicators and pressurizer

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heaters -- I guess the heater switch, the indicators on emergency bus so as to increase the capability to go to hot standby in the event of loss of off-site power without reliance on a safety system.

A number of plants already have this capability. There are some without it. In the vein of decreasing the frequency of challenge to safety systems, we think that this is a good capability to have.

For the heaters, it's stated in terms of the minimum number of heaters required to maintain pressure and volume control for loss of off-site power.

DR. MARK: Did TMI have this capability?

DR. MATTSON: No.

DR. MARK: Did it mean anything to them that they didn't?

DR. MATTSON: It would have if they had lost off-site power.

DR. MARK: Okay. It would mean something in the case of loss of off-site power. It's not partly TMI event-oriented.

DR. MATTSON: No. The middle one there, the PORV and block valves, is to give the capability to control and operate the PORV or its block valves with loss of off-site power. Neither of them are on emergency buses in the B&W designs and a certain amount of other designs.

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DR. OKRENT: Is the block valve an ASME code valve?

DR. MATTSON: In the sense that it's part of the primary coolant boundary, yes. I'm not quite sure what you're getting at.

PROF. KERR: You don't mean it's an ASME safety valve?

DR. OKRENT: It meets the code with regard to its body. What are the requirements on the actuation of the block valve with regard to the reliability of its actuation?

DR. MATTSON: I believe that there are none.

VOICE: It's not considered safety grade as far as that goes.

DR. OKRENT: It's not. So the power-operated relief valve is not considered safety grade. And the actuation of the block valve also isn't.

VOICE: That's right.

DR. OKRENT: I'm not sure why it's correct, though.

VOICE: Your statement is correct.

DR. OKRENT: I had assumed that one of these, at least, would be — the block valve would have some kind of safety criterion since the power-operated relief valve didn't, but I guess that I was wrong.

DR. MATTSON: I think so.

DR. CARBON: Before you leave it, why is it that it doesn't?

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DR. MATTSON: Why is it that it doesn't have a safety grade requirement?

I think the PORV and its block valves have been treated as non-safety classification because they're not required by the code to provide relief capability and they're not used in the mitigation of accidents.

And so, if their pressure-retaining capability meets the code, that's as far as it was examined. It's not used to control an accident. That gets back to the question of the reliation between equipment that doesn't perform an accident mitigation function, an engineering safety feature, and what should its qualifications be, either in terms of reliability or in terms of environmental qualifications, or what have you, which is an issue that we have not made conclusion on in the short term, but expect to before we're finished.

DR. OKRENT: Which? The qualification, or whether it should be safety grade with regard to actuation?

DR. MATTSON: Both.

PROF. KERR: Speaking of safety grade equipment, does that flashing red light on the overhead projector mean that the thing is going to blow up?

(Laughter.)

DR. MATTSON: We could turn it off if people have got enough of these slides to follow along.

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PROF. KERR: You're closer to it than I am.

(Laughter.)

DR. MATTSON: The second bullet there is the performance testing of relief and safety valves. The requirement is by January, 1982 to perform full-scale, full flow two-phase and solid water performance testing of all safeties and all reliefs on the BWRs and PWRs.

MR. MATHIS: How do you propose to do that?

DR. MATTSON: It's our understanding that at the moment there is no facility in the United States in which those tests could be performed. We also understand that facilities are under design and that the industry is moving in this direction anticipating this requirement.

Dr. Kerr, we will probably couple it with the ATWS problem. That comes into this same area. We've talked about it in the ATWS subcommittee.

That is the capability of the safeties and relief valves to do what is assumed of them in ATWS analyses. That will be part of this performance testing requirement.

PROF. KERR: Is it going to be straightforward to express the criteria they must meet in the tests? It certainly seems to me that such testing is desirable, but I don't know enough about it.

Are the criteria fairly obvious?

DR. MATTSON: The general criteria of this one I gsn

just stated are obvious. The specific test program that's required to be developed by the industry and submitted to us for review and approval, I think it's in the next 120 days, with the bones on the flow and pressure and other conditions of the test derived from accident analysis, with the upper limit, of course, being the ATWS.

PROF. KERR: You won't have a lot of difficulty telling them what it is you expect them to demonstrate. Then it will a question of how to go about demonstrating it.

DR. MATTSON: The performance testing is to show the capabilities to close. This is not a reliability kind of testing. This is a functional capability kind of testing. Performance qualification, if you will.

PROF. KERR: Do you have to worry about whether they close after 30 seconds of operation, five minutes? Or are these things all fairly straight-forward?

DR. MATTSON: I think that that would be a fairly straight-forward test. The ability for the valve to function following conditions for which these valves have never been tested.

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PROF. KERR: Do you want one of these things to function after it has been open for an hour or after it has been open for 30 seconds, or doesn't it matter?

DR. MATTSON: That would come from an accident analysis and the places that these valves -- the kinds of events for which these valves would have to operate, those are minimal to description.

MR. MATHIS: Aren't nearly all of these valves welded in place and you have got to cut them out and take them to a test station?

DR. MATTSON: Typical testing, not the precise valves. Protypical testing methods.

MR. MATHIS: Okay. That's quite different.

DR. MATTSON: I'm sorry. I didn't say it clear enough.

MR. MATHIS: What are you going to do about problems such as boot in the systems which has been a real trouble so far for power operated release valves. That's another area. I just wondered to what extent you were going to consider that kind of a problem. That's one of the precipitators of the failure.

DR. MATTSON: We're still looking at some way to specify reliability to operate for these valves. What we are looking for here has started now because it takes some time to do and it has been necessary to do for some time,

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is the qualification testing for conditions we know can happen to these valves and for which they have never been tested.

In the meantime, we are continuing to look at how do you overall specify the reliability fore safety relief and other valves in the primary boundary.

In the general area of information to aid the operator there are two things that we think are necessary to move on now: Direct indication of relief and safety valve position and instrumentation for detection of inadequate core cooling.

The relief and safety valve position indication is left a little bit flexible at this point, although I've either a direct indication of seating or flow measuremente downstream. By flow measurement we mean in shorthand something better than temperature measurement. More details are specified in the report. But I think this is sufficient to give the picture of what we have in mind.

The next one is a bit of generalization of the ACRS recommendation to provide pressure vessel indications. What we've done is break it into two pieces. The first piece is consisent with another recommendation that I'll show you a couple slides down having to do with analysis. That is to analyze what happens when the core uncovers and then transform those characteristics into

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indications from equipment already existing on licensed power plants.

For example core exit thermocouples , in-core detectors, ex-core detectors, hot leg temperature indications, that sort of thing.

Then on the second phase, and to develop a guideline in a fairly short term basis, to get that information into the training program and into the procedures in the plants and them over somewhat longer time scale over the next year, I think, to develop, analyze and propose direct level indication.

We've seen several alternatives proposed for direct level indication. We aren't aware of a thorough going analysis at this point to show that any of the proposals are reliable enough to depend upon if they were installed tomorrow. And so, we have taken this two-step approach which is, we believe, consistent with the priorities that you placed upon this direct level indication in your recommendation which would to the effect, well, go out and do the development and then literal work and find a way to do it.

DR. CATTON: What kind of requirements are you going to require?

DR. MATTSON: I think that is going to have to come with the studies of the development as it goes on.

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I don't know what the answer to that is right now.

DR. CATTON: The reason I asked is that reading through this report from Metropolitan Edison it seems to me they had after the fact used instrumentation that they already had.

DR. MATTSON: First conclusion of this is that the best instrument that you can develop is the one that is already there. You can't foreclose that possibility. I don't remember the gentleman's name, but somebody from Oak Ridge called me a couple of weeks ago and I got in touch with people on the task force who claims to think that you can get within plus or minus six inches of the ex-core detectors if you've got the right kind of equipment, which might be different than what we have now. We use now ex-core detectors. Even accounting for the shielding effect in the annulus. If that's true, that's a pretty good capability. How good it performs in a transient and what kind of a level it is really sensing, what weight fraction trips it and tells you what the level is. I haven't seen any analysis -- I haven't seen any kind of a study to show those things, and I think they have to be done.

A possibility is that when you thoroughly understand what is available at some plants and maybe it isn't available at all plants, but it may be enough that it is the direct level indicator that's called for,

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DR. CATTON: Maybe it is plus or minus a foot.

DR. MATTSON: Yes.

MR. MICHELSON: I think Roger, isn't one of the important factors here the tracking of your event before you get to the point where you've uncovered the core. You're now wondering about where the water is in the core? It's nice when you get there, I guess, but I hope we put in something that will tell us long before that that there is difficulty and that corrective actions are needed.

MR. MATHIS: That's the intent. This kryptor up there that's a failure of those words, but the detailed words do affect that.

MR. MICHELSON: If you're going to look for anticipatory things.

DR. MATTSON: You don't want to know when you get there. You want to know, not only that, but while you're on the way there.

DR. OKRENT: And what was that again that you are going to do prior to having some direct means of measuring the level?

DR. MATTSON: If you'll slip over two sides --

DR. OKRENT: I'll wait.

DR. MATTSON: Well, it will come to the analysis things and I might as well do them now, because it does relate to it.

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(Slide.)

DR. MATTSON: It talks about three kinds of analysis that are phased out over the next year down here at the bottom. The first one, of course, is already ongoing and for some designs are already completed. B&W designs, the analysis of small break LOCA characterizing small break LOCA, conseqences, phenomena, what have you in the reactor cooling system transforming those into guidelines for procedures. But training, getting the procedures written, that sort of thing is one along or is finished for B&W, on its way for Westinghouse and Combustion. The manufacturers and their owner's groups have been told generically that these other two kinds of analyses are necessary over the next year.

The second one is the one that's important to this instrumentation to detect level or inadequate core cooling. That is not worrying so much how about the level decreases, that is the initiating events, but more about how the system level is lost, whether the indicators from the core that the core is losing its cooling, what the indicators in other portions of the system that water level is decreasing. That kind of analysis is coupled in timing with this requirement to see what you can do with the equipment that's there and develop training and procedures to make maximum use of instrumentation that is already in the plants.

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That kind of analysis is also necesary for the development of more direct level indication, if more direct level indication is necessary. If it turns out that that kind of analysis shows that more direct level indication on some plants isn't necessary because the best you can do is something that's already there, and that's what it will show.

In any event, before you finally decide upon what is the proper direct level indicator you need to do these kinds of analyses.

DR. OKRENT: I'm lost, I guess, a little bit.

Suppose, we had a way of measuring the level in the vessel that you thought would work and was practical and could be installed in an acceptable fashion and so forth. What analysis would you need to do?

DR. MATTSON: In order to reach the judgment that it was acceptable, you have to show how it would perform for the conditions that you were trying to detect.

VOICE: There's another reason to do it and that is if the core doesn't cover you do see a lot of other indications which you don't want the operators to misinterpret as the ex-core detector was mi preted at Three Mile Island. Even if you had an exact indication you still want to know what other things show up.

DR. OKRENT: That's a separate question. I am

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not sure why you are relating the possible use of a level detector to this analysis. By the way, it raises another point.

If we want to measure the level and if it's a way of measuring it directly, it's not clear to me that we wanted to find a way of doing it imperentially because somebody may fool you with that imperential measurement and give you another set of circumstances where your imperential measurement is wrong.

Maybe in fact you get that reading outside if that says you have voiding, and that is not the case at all. Maybe the count rate is going up or whatever. Okay? Whereas, if it's something -- I mean, if I want to measure power I'd like to look at neutrons because I know that neutrons go with power more so than gammas.

If I want to measure level it seems to me that if I can do it with something that is responsive to the water in the system, Im less likely to be fooled, but I may still be fooled as we know if we think about it, but I am less likely to be fooled.

DR. MATTSON: I am not sure that I understand your argument. Is the argument that there is something that is clearly acceptable that can be put on today without analysis?

DR. OKRENT: I am not quite sure where you are

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DR. OKRENT: I am not quite sure where you are headed on this business of measuring level in the vessel or next to it. That's all.

DR. MATTSON: We tried to head it toward the phenomenon of concern that is unconfirm the core and so we wanted to track the event, whatever it is from as early a warning as possible that you are losing level right on through to the end product that you were worried about, that was then covering the core.

And then, back through the recovery of the core to give an indication of core cooling. That's a little bit general.

DR. OKRENT: I am trying to find out how this analysis -- Now, if you had told me there is a need to do some instrumentation development we don't have a way of doing it and --

DR. MATTSON: It's a problem that the analysis over the years seems too long. Analyses are due to be done this fall sometime. Is that the genesis of the difficulty? We don't mean analyses that are going to take forever and ever.

DR. OKRENT: Well, I don't want to get into that subject as to how long analyses take. I am still not clear why the analyses are related directly -- why they are needed to the question of instrumentation for detection of

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inadequate core cooling. That's the topic. Or instrumentation for detection.

DR. MATTSON: I don't understand why that isn't clearly obvious, because the thing that was relied upon before, the pressurizer indicator hadn't been analyzed for this kind of an approach and it led to an underreliance.

DR. OKRENT: It wasn't in the reactor vessel; was it?

Or it wasn't next to it.

DR. MATTSON: No.

MR. MATHIS: Do you have to figure out how to do it in the vessel?

DR. MATTSON: Is there a way that is clearly obvious without analysis that you could put in a plant tomorrow and tell that operator this is his direct indicator of level and with the force that that would have behind it, eventually leading to the disregard of other indicators without the analysis to suppor what that thing might or might not do in the event of core uncovering accident?

We looked at that and said no, there isn't one.

DR. OKRENT: Do you have candidate instruments in mind at all?

DR. MATTSON: We have a pressure tap. There is an instrument that's been used in LOFT. I am afraid I can't speak to how it works, but it's a continuous monitor of some

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sort. I believe some people have talked about acoustics and what others --

VOICE: LOFT test thermocouples on the cladding.

MR. MICHELSON: Is the purpose of some of these exterritory investigations to confirm whether or not the particular instrument will perform in all the situations that I'd like to have it perform in? Is that what you are doing? I'm just as confused maybe as Dr. Okrent. I am not sure now what you are doing. I thought that was your intention was having candidate instruments. You were going to determine their performance so you can pick the best candidate as so many already have instruments that can do the job, but you are just not quite sure if they will do it in all situations. You want to make real sure; is that what you're after?

Or are you really trying to search for a good reason why you don't even need it?

DR. MATTSON: I think it's more the approach you just said.

MR. MICHELSON: That's what I thought it was, too. I assume that you have reached a conclusion that you need to know the level.

DR. MATTSON: Yes.

MR. MICHELSON: If in the process you stumbled across enough indirect instrumentation that you have a high

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reliance on, you might say, Gee, I really don't need to put another instrument in per se. But most likely it will take an instrument in addition.

DR. MATTSON: I think we've gone a little further than that. We said use these inferential things and then develop a direct indicator.

MR. MICHELSON: You are striving to pick the best direct indicator. You are searching all the things that might go through to make sure that it won't fool you in the process.

VOICE: What some of these things are are the analyses, I think, then to give you some indication of what accuracy that instrument needs to have or what its transient response needs to be, also. And the answers to those questions come up with totally different instruments.

MR. MICHELSON: You have to create some criteria, first of all, as to what you really want.

VOICE: Yes, sir, that's the purpose.

MR. MICHELSON: You're working on those criteria as well.

VOICE: Yes, sir.

DR. OKRENT: It sounds reasonable except I can also see how doing analysis and developing criteria and so forth can become a multi-year event at which point you have the difficult job of funding.

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DR. MATTSON: The recommendation is to require implementation on the first phase of this thing by next spring. I don't remember the dates.

VOICE: Earlier than that, it's January.

DR. MATTSON: And one year to have them in?

PROF. KERR: At the risk of being extremely naive, I guess I am willing to take that risk. What you really want to know is whether the core is covered or not. You don't just want to know whether a particular level indicator indicates there is water at the level indicator. That requires a little bit of analysis. It may well be, for all I know that you need one level indicator, five level indicators, ten level indicators.

DR. MATTSON: You want to know whether the core is uncovered or not, but you also want to know if you are on a trend that it is uncovered.

MR. MATHIS: The trend is important.

PROF. KERR: So, it isn't clear to me that one doesn't need at least a little thought. Maybe you don't need any analysis, but I would think one should give thought to what it is you are trying to determine, and what is the best way to do it. And I am puzzled.

DR. OKRENT: I just wanted to be sure we weren't substituting thought for an instrument.

(Laughter.)

DR. MATTSON: I don't have your recommendation in front of me, but I could read it. I think you said study and develop. I don't think you said slap something on the board.

DR. OKRENT: Good.

MR. MATHIS: It also said unambiguous.

DR. MATTSON: Yes, it did say unambiguous.

While I'm on this page, I'll just stay there.

Auxiliary feedwater we touched on earlier this afternoon. There you see the automatic actuation and the direct flow indication. But for now that's all we're seeing on auxiliary feedwater. Other things are under consideration.

Now, instrumentation to follow the course of the accident, I said I'd return to this. Denton has asked Minogue in standards to undertake prompt revision of Reg Guide 1.97 as part of a three-phased approach to this longstanding problem.

The first phase is rapid implementation of these four requirements: improved sampling for the reactor coolant system and the containment; high-range effluent monitors; high-range containment monitors; and improved capability in plant and in the effluents to discriminate iodine from nobles. Those four things the Task Force felt were clearly within the state of the art, clearly were things necessary to accident management and decisionmaking for emergency procedures and what have you.

Not all plants have all of those things. Some plants have most of them.

A second step in this three-phased approach is to have Standards Development working with some key staff members from NRR, take Reg Guide 1.97 and derive, over the next two to three months, a set of additional instrumentation for prompt installation in operating plants. That will not be all of the instruments that were previously specified in 1.97. The difficulty that we see in looking at the past history of 1.97 is trying to solve all of the problems at the expense of things that are clearly agreeable, within the state of the art, could be installed, but are dragging on year after year and not getting implemented.

The idea is to try to work for the next two or three months to reach decisions on some finite set of important instrumentation to follow the course of the accident, for early implementation.

The third phase being a description of the things which require more study, require instrument development, are not amenable to resolution over the next two to three months, and defer those for specific study either in Research or in Standards Development, for final issuance over the course of the next year or so, try to break it into pieces and get some of this instrumentation on now.

DR. OKRENT: Is pressure hard to measure?

DR. MATTSON: No, and that's one that I would expect would be in this next set -- containment pressure, containment water level, hydrogen concentration, those kinds of things that are within the state of the art, ought to be amenable to writing down and making conclusions on them and getting them out. Lessons Learned is looking at a lot of things, with a limited staff, without the ability to go into the details on those things now while we're doing some other things. We chose to break it off, give the people two or three months to get them specified and documented and proposed for implementation.

DR. OKRENT: I would think you could have gotten a majority vote for measuring containment pressure up to three times design pressure, instead of going off range.

DR. MATTSON: The kind of votes we took were things that we thought were necessary to do right now, as opposed to things we thought we could wait another two months on. So it was harder to get that kind of vote than you might suspect.

DR. OKRENT: I hope you can wait ten years.

DR. MATTSON: That's all I had to say about that one unless you have other questions.

(Slide.)

We're now on the second sheet of our design and analysis recommendations, having finished the first and the third.

Containment isolation. There are really three things. One of them got left off that's going to be done under containment isolation.

First, we want to backfit the diverse actuation requirement by Standard Review Plan Section 6.2.4, giving people the choice of two out of three, the three being high radiation within containment, high pressure in the containment, or emergency engineering safety feature actuation. Those we would expect that plants that have containment pressure now, in order to meet the short-term implementation requirements, will probably go to engineering safety feature actuation, since it's safety grade and it can be tapped into outside of containment.

Over the long term, we're considering whether containment isolation might ought to be by all three for all plants. One of the questions we're wrestling with is the implementation of defense in depth for containment design bases, and something that's more important than the radiation signal for isolation is hydrogen, for example. We find that the containment, albeit a separate level of defense in depth from emergency core cooling, for example, is in fact tied to emergency core cooling through the specification in the hydrogen design basis or in other ways, like the engineering safety mte 5

feature actuation signal.

Ways to make it separate from those other layers of defense in depth would be, for example, a radiation initiation signal or a hydrogen design basis separate from the design requirements for emergency core cooling systems. Trying to maintain some consistency in the way we're approaching these problems, we chose not, at this time, to require three out of three kinds of containment isolation signal. But the backfit requirement has been applied to new plants since '75.

DR. OKRENT: Before we leave that, in the end I guess the thing we're trying to isolate against is radiation. Does it make sense that it be radiation and something else, if it's going to be two out of three? Because you're allowing the choice to be one that does not include radiation. And I don't know at what point you may get to three out of three. It could be some period of time.

Are you satisfied that there are no situations where you might have substantial radiation and not have isolation either, because you didn't get the signal or because it occurred and was reset?

DR. MATTSON: We were caught in a dilemma, you see. No, we're not satisfied that there might not be such situations. That's why we're continuing to look. But we do know that diversity would significantly improve the kind of thing that happened at Three Mile Island, and said diversity can be obtained rather quickly with safety grade equipment by allowing the second alternative to be engineered safety feature actuation. So, while we want to look a little bit longer, we're still not satisfied that the mechanistic approach is the right approach. We rather like the nonmechanistic possibilities. But if we take that approach, we might want to take it with some other things besides isolation actuation.

DR. OKRENT: Again, I want to make a point I tried to make before. If you're trying to measure power, I think neutrons are a good indication. If you're trying to measure radiation in the containment to isolate, that's the most direct thing. If you look for pressure or you look for ECCS actuation, that's related.

But you might conceivably have radiation and not have the others, or whatever. There'll be other areas where we may be measuring things indirectly that we might do better to measure directly.

PROF. KERR: On the other hand, we'd find occasion in which you'd want to measure pressure even before you got radiation.

DR. OKRENT: I said, in fact, radiation and one other.

PROF. KERR: But you might even want to isolate on pressure alone.

DR. MATTSON: Most of the problem we've got as a task force in wrestling with all of these ideas and thoughts about how to do better after Three Mile Island have to do with trying just to characterize and define the problems, that is, where is it that you think you're weak, what are the fundamental things in safety regulations that caused those weaknesses, are they simple things or are they basic things, and understand the problem before you set about to solve it.

Piecemealing can be dangerous, if you put things on plants that inadvertently mislead an operator or overturn a safety decision that was made 20 years ago. The impact of the short-term decision hasn't been well thought through, and that's one reason for some continued caution and further study on some of these things.

That doesn't answer your specific question.

DR. OKRENT: Well, I certainly wouldn't urge that you implement isolation on radiation if you don't have reliable equipment to use in the laboratory.

By the way, with regard to the pressure, Bill, it's conceivable that you in fact might have to isolate on pressure such that the valves don't close early on. They might have difficulty later. That's a possibility.

DR. MATTSON: Post-accident hydrogen control. I've already alluded to the fact that an open question is whether the design basis in the current regulations is an adequate design basis, in light of the degraded core consequences at

Three Mile Island. Briefly stated, the present design basis is five times the calculated metal-water reaction for the design basis loss of coolant accident. It used to be 5 percent metal-water reaction, rather arbitrarily chosen. It's been changed over the last year.

We're not ready to make a conclusion on whether to change that design basis for hydrogen control. But there are some things in the hydrogen control vein that we think ought to be implemented promptly.

The first of those is raised by the fact that after the recombiners were put in service or one was put in service at Three Mile Island, it was susceptible to violation of containment isolation by single failure. And we'd like to see the penetrations at plants with purge systems and recombiner systems currently in place, go back and dedicate the penetrations, rather than using the large containment purge penetrations the way they were used in Three Mile, and speak to this reliability problem.

MR. MICHELSON: Roger, are you saying that the question of single failure was relative to continuing the recombiner function or relative to loss of containment?

DR. MATTSON: Loss of containment.

The second one is a little more -- has a little greater impact. This is a task force recommendation, in view of the acceptability of release as we understand it and perceived it at Three Mile Island. The Commissions regulations grandfather -- I'm sorry, I haven't got it right. I'm talking about the third one instead of the second.

Well, let me talk about the third one, because I've already started. This is the minority recommendation which I mentioned.

The regulations grandfather about 55 operating plants from the requirement to have recombiner capability. That is, there are 55 plants operating in the United States that, in order to deal with the design basis hydrogen, must, over the long term -- that is, some days after the accident -- vent the containment atmosphere so that it not become explosive or flammable.

MR. MICHELSON: How many operating plants are there?

DR. MATTSON: 70.

MR. MICHELSON: Five of them have to vent?

DR. MATTSON: All plants whose notice for construction permit hearing occurred prior to November 5th, 1970, were exempted by 50.44 from having to have recombiners.

MR. TEDESCO: It's 46.

DR. MATTSON: Are those units or plants?

MR. TEDESCO: Plants.

DR. MATTSON: I think the 55 number is units.

MR. MICHELSON: Not quite, plant units. There are 55 units without recombiners.

MR. TEDESCO: 46 plants. There were 26 on the boilers and 20 on the PWRs.

DR. MATTSON: The recommendation is to provide penetrations and hookup capability for recombiners and to demonstrate the capability to install a recombiner within a few days following an accident in which a recombiner is shown to be necessary. That is, the recombiner need not necessarily be provided at the site, but the stockpiling or other capability to obtain a recombiner within a few days, to handle post-accident hydrogen.

So you will see that this does not address the 50 percent metal-water reaction question from Three Mile Island. It does address the problem of, is venting an acceptable method of post-accident hydrogen control. And it's the minority view of the task force that it is not and that recombiner capability ought to be added to these plants.

Okay. Now I'll go back to No. 2.

MR. MICHELSON: What dose levels are you assuming when you start venting? At what point in time do you feel you have to start venting?

DR. MATTSON: It's typically 25 days, isn't it?

MR. TEDESCO: It depends on the size of the plant.

MR. MICHELSON: 25 days.

MR. TEDESCO: The Mark I's could be a lot earlier.

DR. MATTSON: 25 days of large dry containment.

MR. TEDESCO: Then you're dealing with both metal-water reaction and hydrogen.

MR. MICHELSON: There is something like five times the 1 percent.

MR. TEDESCO: Five times, either five times the calculated amount on the low-level tests made on the new approach -- the old way was 5 percent metal-water reaction.

DR. MATTSON: The second line up there is to require the inerting of all Mark I and Mark II boiling water reactor containments. There are two in the United States that are not inerted, Vermont Yankee and Hatch 2. This is a hedge, if you will, or a change in the design basis hydrogen for containment, the hedge being that the Mark 1 and 2 containment designs are small and cannot take a whole lot more than five times the calculated amount for the design basis loss of coolant accident.

On the other hand, the large dry containments for the PWRs are capable of sustaining more than the 5 percent or the five times of the amount of design basis LOCA. The best evidence I know of that is that the combustion that occurred at Three Mile Island, where a significant amount of hydrogen was burned without loss of containment.

So as an interim measure until the Lessons Learned and some other people sort out what Three Mile Island should cause us to do about design bases for containment or emergency core cooling systems or several other things, we're calling for the inerting of the Mark I's and the Mark II's. So this would be Vermont Yankee, Hatch 2, and all new operating licenses for Mark I's and Mark II's.

DR. OKRENT: I have two questions here. Were you going to come up with some answers on the hydrogen question as part of this study to be completed by the end of August, or do you expect that to be something that's in a follow-on?

DR. MATTSON: I think we'll make some recommendations on how to go about solving that problem. But I suspect that the Commission will want to hear from other quarters before decisions are made on that problem. And so, I can't say that we expect to solve the problem by the 1st of September. We expect to offer our advice as to how the problem ought to be approached.

DR. OKRENT: A different question. You propose inerting a couple of BWRs on the basis that they're small containments. The ice condensers are not large containments and they're lower pressure containments, and they're less likely, in my opinion, to take large hydrogen deflagration, or whatever term you want to use, than the Mark I or II. So what's the consistency?

DR. MATTSON: The rationale is that they are of somewhat larger size, they do have good mixing, and, although they don't have the same capability to withstand combustion of

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large amounts of hydrogen that the large dry containments have, they're better than the small pressure suppression containments. And we drew the line excluding them rather than including them.

DR. OKRENT: I must say that I feel less comfortable with that than I would with a Mark I or II.

MR. TEDESCO: It may be burning, but there could be a detonation.

DR. OKRENT: It all depends on what it costs. But --

MR. TEDESCO: There is an additional one that we have seen at this time from the license that has a large volume.

DR. OKRENT: You've got 28 psi in a building that is about three times the volume of this, than an ice condenser.

MR. TEDESCO: 2 million.

DR. OKRENT: An ice condenser is around 700,000, isn't it?

MR. TEDESCO: 1 million to 1-1/4 million. An ice condenser has a large volume.

DR. OKRENT: I guess I'm thinking of one of the chambers, then.

MR. TEDESCO: Without the mixing system, I think you're in an entirely different situation. With the mixing system, there are devised engineering safety feature standards.

DR. CATTON: Are you sure it was an explosion at TMI?

That was pretty broad.

DR. MATTSON: We sent a memo over to the investigation group on that matter a couple weeks ago. The pressure peak is a kind of funny thing on the trace. There are two or three lines on the point at the top. It's spread out over about six minutes. And it's hard for us to understand whether that's a direct indication of a transducer, whether that's a hand plot or what it was.

But we noticed, in reading some of the interviews from the operating staff, people talking about pressure cycles or pressure waves. I don't remember the precise words. But the implication was that there was some explosive type phenomenon associated with it.

We've asked the investigators to try to bore in on that question, to see if they could amplify it a little. I don't think we know the answer.

DR. CATTON: It seems to me that if it was a burn and not an explosion, that there's a different slant to the conclusions.

DR. OKRENT: Roger, it's been suggested that you might need a break.

DR. MATTSON: I just took a break.

(Laughter.)

DR. OKRENT: Let's go on, then.

DR. MATTSON: The next under the radiation control for systems outside of containment are also a step in this direction of expanding to design basis for systems heretofore unreached by safety grade requirements and in the direction of beyond current design bases associated with design basis loss of coolant accidents, i.e., performing leak tests for safety and process systems. So that, to the extent the leakage can be reduced, it is, but, more to the point, so that an operations organization understands the leakage, the protection in systems like the chemical and volume control system that could be processing a primary coolant highly contaminated outside of containment.

The second one is of a similar nature, perform a shielding review for safety and process equipment, to think through the questions of: Where is access needed? What critical equipment is located next to equipment that might not have been thought of before as equipment that could contain high amounts of radiation?

Particularly here we are interested in control rooms and motor control centers and places like that, where personnel access is required. It gets us into that point that you raised, Dr. Okrent, earlier, about generalizing it: Do the DC batteries need to be radiation-hardened because of their location?

I'm sure that isn't specifically addressed in the details here, but the point is encompassed.

MR. MICHELSON: At what point along your slides are you going to discuss the occurrences in the control room relative to the condition of the air and the need for masks and so on?

DR. MATTSON: We did that.

MR. MICHELSON: Did I miss it?

DR. MATTSON: Yeah, you missed it.

(Slide.)

It was one of those things. It's improve in-plant and effluent iodine.

MR. MICHELSON: I heard that. I never associated that with the problem of the masks in the control room.

DR. MATTSON: It's the conclusion now that the masks in the control room were never necessary, that the habitability systems were doing what they were supposed to do, that it was an erroneous indication of iodine that caused the masks to be put on both times it happened, that is, early in the accident and then when the switch was made to natural circulation cooling.

And this was an attempt to give them the capability to not do it when it's unnecessary.

MR. MICHELSON: I hadn't heard that at all. That's what that's all about.

Why was the same erroneous indication in Unit 1 as well?

DR. MATTSON: They had no capability to differentiate iodine from noble gases at Three Mile Island, effluents or in-plant.

MR. MICHELSON: So you have now drawn the conclusion they never needed the masks?

DR. MATTSON: That's the conclusion we have drawn from the investigation, yes, sir.

Now, in discussing operator training, I remember we had a session one day where we were talking about the communications when you do have masks. This doesn't cover the event when you really would need them, Carl.

It's my understanding that some operating crews actually drill in masks occasionally, so that they learn that there are ways to communicate in masks. If you're not used to it, unaccustomed to it, if you have to do it in an emergency, you don't do it well. And I would suspect that you may see something like that start to appear in operator training requirements as those are developed.

Okay. I think we've been through 23 short-term recommendations in 12 areas. At the end of the package there were some slides that gave a general indication of things that we're still looking at, referred to as --

DR. CATTON: Further lessons to be learned, as more long-term?

DR. MATTSON: Pardon me?

DR. CATTON: Are they long-term?

DR. MATTSON: Some of them are, some of them aren't.

It's quite likely that in the course of the next two months, as we study some things further, we may want them done on a rather short time stream.

Radiation isolation requirement for the containment is a potential one in that regard. Venting of the reactor coolant system, you'll notice, is not in the short-term requirements. We didn't know where to take the venting. It was also tied into how much there would be, which was also tied into how much is the design basis for hydrogen in the containment.

. We think venting's a good idea, but we also might think eventually that some higher pressure relief capacity for pressurized water reactors is a good idea, and we wanted some time to be consistent and sort through some of those things in relation to one another before we decided on venting.

There are other examples that don't occur to me off the top of my head. There may be other specific near-term, call them, recommendations from the Lessons Learned Task Force by the time we finish in September.

DR. CATTON: Is there going to be any attempt to include in the short-term moving some of the instrumentation around, like the backup consoles? Is there any of that kind of thing in the short-term?

DR. MATTSON: They're not in what I've just given you.

DR. CATTON: We've seen none of that here so far.

DR. MATTSON: I guess one of the reasons, in a sense, that the Task Force hasn't been hot to do that is because we see a lot of people working very hard to study that problem, both individual sites and generic. EPRI's doing some pretty good work. Research is talking about doing some work.

We're going to have some specific things to say in that area by the time we're done. We didn't see our way clear to doing them now.

DR. CATTON: Some of these things will turn up in the long-term things.

DR. MATTSON: Yes. We've got our eye on a couple of things. Reg Guide 1.47 is something in this area that's appealing to us. That's status monitoring. The first operating plant with instrumentation in Reg Guide 1.47 is Sequoyah, which is one of those that's due to receive an OL in the next few months.

We want to look at the backfit ability of Reg Guide 1.47 to give status monitoring aid to operators in the control room. We are pursuing a general approach to the problem that I alluded to earlier, this finite set of information for accident control, for use by, say, the safety engineer and the senior reactor operator, to keep the broad overview of core cooling and primary boundary protection. If we're able to see our way to some general requirement in that area, it would be of that nature, that is, pull from behind the panel or around the panel or in front of the panel, front and back, a set of instrumentation of an overriding important nature for safety in an accident, for limited scope attention by the people in command at that point.

DR. CATTON: Just eliminate things like that 24-channel recorder that reads out 72 pieces of information.

DR. MATTSON: At Three Mile. But what is it at all the other 70 plants? So we're trying to come to a way to cause that kind of change to occur without having to go plant by plant and review it and tell each specific plant what to do. We think people at those plants are thinking that way now and we're searching for regulatory ways to make sure that it's done according to some minimum standard.

Although we may come up with some other near-term specific recommendations, the majority of our time right now and within the next couple of months is being spent on more fundamental areas. You see them listed here: reliability goals, how do we do it, how do we approach it, several kinds: system and component reliability, frequency of challenge to safety systems, ones we've talked to you about before.

We would like to try to define ways to solve those problems. Clearly, if you move to those kinds of requirements in lieu of things like general design criteria, there are long-term rulemaking sorts of actions and beyond the lifespan of this task force, that we think we have some uable insight by virtue of looking in detail at Three Mile Island that we'd like to offer.

Degraded cooling. This goes back to the question of a few minutes ago on the size of degraded cores or degraded cooling, if it should be a design basis, if so, how much. Alternatives there would be a better job of preventing it during design and training, or make a decision that you've got about as much prevention as you can get and that you have to move to a system of mitigation. That sounds a lot like the approach to ATWS in concept. I'm not saying the answer is the same, but the concept is the same approach.

Whichever approach looks like the most promising would have an effect on core cooling systems. Rad waste and effluent systems, containment systems safety and process system design classifications, we talked about that earlier this afternoon.

(Slide.)

Operational safety. Let's see, there's a control room display, computer-aided fault diagnosis. Those things generally come under the area of human engineering. There seems to be technology there that is amenable to backfit that does provide significant improvement in the current situation for some of the older plants, and we expect to say something in that area.

The training licensing qualifications we've talked about. One thing we haven't mentioned today is simulators. There is a set of short-term recommendations coming up from the Operator Licensing Branch to the Commission --it should be getting here right soon, I should think -- that has maybe ten or a dozen changes in the way things are done. One of the things that it will require is the use of simulators in retraining. That's pretty narrow and short-term.

The long-term interest of the Task Force is how can simulators be improved, and then how would they be used for training for the off-normal transients and accidents they can talk about. These analyses that are started now will be ongoing for a year or more. How do you feed the phenomenological consequences of those analyses into the simulators and provide a sort of gaming capability to increase the response characteristics of the operator for dealing with situations that he's never even thought of before, or that are unique, novel permutations and combinations of events previously analyzed?

At the moment, we don't think that would lead to a requirement for simulators for every reactor. That's an obvious question that comes up. If they're going to be relied on to that extent, you'll need one for each control room design.

The FAA requires that each unique design of an airplane control room be exactly simulated on the training simulator. We think there are ways to use -- we call them more generic simulators -- for plants that don't already have them, like the B&W simulator for the seven B&W trains. If there's some kind of transition between the specific simulation used in training and the exact layout of the control room at the plant to which the person is assigned, it might be classroom training as an intermediary between those two points, or it might be an apprenticeship of some kind in the actual reactor, and that could solve the problem of retraining.

Does that mean a guy has to serve an apprenticeship every time he goes through retraining? Those kinds of things need to be thought through.

But clearly there's a large role for simulators. We are also thinking about the use of simulators by the NRC staff. I've been talking to people about hybrid simulators that marry the digital and analytical tools like RELAP or TRAC or whatever to the analogue simulation for gaming by, say, the people who do the evaluation of licensee event reports. So, for example, if the Davis Besse experience were to come in tomorrow, it might go to a person using such a hybrid simulator, who would do permutations and combinations on the Davis Besse event and maybe come up with a Three Mile Island event.

That's fairly long-term. It may take a while to build. There's some promise there.

Emergency preparedness we'll be looking at, again from the NRR perspective, the technical and management roles of the NRR and the NRC response, and then some better thought along the lines that are in the short-term recommendations about the technical support center, the operational support center, the data needs, the habitability requirements and those sorts of things. Also, the relationship between the on-sight decisionmakers and the off-site emergency coordinators is something that we'll be working with with the EDO task force.

(Slide.)

I'm sure we'll have some more things to say about analyses. The general question of realistic analysis turns out to be very important for simulation, for understanding how accidents go in reality as opposed to how they go in design.

Code development. What audit capability ought the NRC to have, given what NRC's role ought to be in improving the state of regulation.

Code verification. I think the use -- the need for realistic calculation capability is understood differently today than it was before Three Mile Island, and probably the code verification needs and their timing have changed somewhat. We've got to think about that a little.

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That's all I have to say.

DR. CATTON: Let me start again. When and how do you determine whether a given procedure or a given plant will be executed as intended by the engineering facility that put it together?

DR. MATTSON: I should have mentioned that earlier. That's a very important question. Just to make sure we're talking to the same phase, we understand the condition that exists today, or prior to Three Mile Island --it's changed somewhat since. In the industry there's a group of people who do plant design, analyze it for engineering purposes and analyze it for licensing purposes.

There's another group of people in the industry, the utilities and operations organizations and vendor shops, who direct procedures, conduct training and the coupling between these two groups is not good enough.

A counterpart to that in the NRCsame problem, the division of systems safety who reviews analyses and who develops design requirements. We've got the Office of Inspection and Enforcement, who inspects to ascertain that procedures exist in the field for the required transients and accidents. No review as to the adequacy of the procedures and the operator licensing branch who uses the procedures at a given plant.to test the operators to see if they know what they're supposed to know. There's no real

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coupling between the analysis and designer on the one hand and the procedure trainer on the other hand.

DR. CATTON: There's another step to that, too.

DR. MATTSON: That coupling has to be provided, and you see it going on right now in the bulletins and orders task force, as Dr. Rosztoczy works with the vendor to develop the analysis, he's got with him to develop the analysis and the guidlelines and then the procedures. It's a multidisciplinary approach, you've got the I&E inspector type, you've got the operator training type, the systems type and the analysis type from NRC sitting in review of that process from beginning to end, and forcing the same kind of approach on the industry side.

And some utilities will argue, hey, you've mischaracterized how we do it. Some utilities do a better job than others at accomplishing that. But as a general matter, it's not been good enough.

DR. OKRENT: I'm going to propose we take a break and come back to discussion. I think there'll be this and other points that we'll want to take up, cause we've been going almost three hours.

Let's take ten minutes.

(Recess.)

DR. OKRENT: Let's reconvene. Let me, if I may, first do a little bit of planning and in that regard, I'll

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do the long-term planning before the short-term planning. I'll note that we contemplate, although it's not completely definite, having some subcommittee meetings between the July full committee meeting and the August full committee meeting. We currently are contemplating one the day before the August full committee meeting, which in fact Dr. Carbon would handle. And at that one he would take up a range of things which are I guess loosely categorized as administration/regulation type of questions out of TMI.

As you may recall there was a group that had been sequestered in one of the previous efforts to distribute the various issues and there was one that we thought the Procedures Subcommittee at one point would handle. I think the suggestion now that this subcommittee do it, but that he would handle that session. So we currently envisage that on August 8th, I think is the date.

Then, assuming that there is appropriate material for discussion, I'm thinking of a meeting on July 26 and 27.

DR. CATTON: That's fixed?

DR. OKRENT: That's tentative. What I would hope we would do if we have that meeting then is to pick up relatively broader topics, longer range topics, maybe somewhat more difficult topics to grapple with than some of the sort of hardware-oriented things, for example, we put on today's agenda before we discussed the Lessons Learned.

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So, there might not be all that, but those kinds of things tend to get shunted into the background because they are a little bit harder to define sometimes. We may have a few more hardware-oriented things -- we don't want to give them all at once to Roger since that would be too bit a burden considering his workload.

Anyway, that's one kind of planning. With regard to the newer term, that is this evening, we have I would guess an hour to an hour and a half, I don't think this is going beyond, say, 7:30. We can pick up some of the additonal topics on the agenda, nine, 10, 11, or 12.

DR. MARK: Is this ours, nine, 10, 11, or 12?

DR. OKRENT: Yes, these are things that arose somewhere in the ACRS system. Another thing is, we can hav further discussion that arises out of the things Dr. Mattson was discussing in his Lessons Learned or other things we think should be included in that category. And then, we will tomorrow afternoon, in the middle of the afternoon, begin discussing a possible interim report number four. That's on the agenda, I believe for the full committee.

So in that regard, as a minimum I would ask the members and consultants here to look through the draft paragraphs that they have and to write down specific modifications that they would have in mind, elaborations or

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shortening or whatever, and also, if they have other topics, there are quite a few here, but I think the only way you get to look at them is to have them written down.

If they have any other topics, would they write paragraphs and would you give me all this material by first thing tomorrow morning, 8:30, so I can try to have it assembled before the beginning of the afternoon. In other words, I would try to get a cleaned-up copy, as it were, for the full committee.

Well, what's your wish, then, for the next hour, roughly, that we have left? Are there questions for Dr. Mattson on the material he discussed? Are there questions or comments concerning the presentation by Dr. Mattson and his associates?

DR. CATTON: I guess there was the question I was in the middle of. Maybe just sort of towards the end of it, I can see how you go about creating a procedure and I can see where all the interaction of all the different people -- all this is very good.

What I don't see is where you test the procedure to see to it that the operator is going to carry it out correctly when he performs the action. I think giving him a written examination, even talking to him about it is one thing, but if he's going to actually perform it, that's something else. That's something else.

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MR. HOLMAN: Ivan, that's in our testing procedures, on the simulators, as one of the things that we're going to be doing. In the past we have not universally given simulator exams, but that will be done in the future. Other than that, we've talked through it with them.

DR. CATTON: In essence, then, the procedures will be tested on the simulators.

MR. HOLMAN: Not all of them, but selected emergency procedures will be, and they also will be required to be done on an annual reserve basis.

DR. CATTON: Now, are these procedures going to be tested early on in the game, when they're created? I would think that would be the time you'd want to do that.

MR. HOLMAN: That is one of the great benefits for a utility, owning their own simulator, okay? And they found that that's a worthwhile thing to do. As soon as they work up the procedure, they try it out on a simulator and they've found some very interesting things.

DR. CATTON: I would imagine, thank you.

DR. MARK: How many utilities own simulators? Vendors?

MR. HOLMAN: I'm sorry, they're what? There are about four or five of them in operation now, and there's five more in construction in Silver Spring, over at Singer.

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Con Ed, VEPCO, TVA, CP&L, and Duke, all on their own, and the four vendors have theirs, WPPS is under construction, Limerick is under construction, Perry, Black Fox, and who was the other one -- Seabrook.

DR. THEOFANOUS: This sort of a short-term design analysis, analysis of design, and design events for improved training procedures, I'm interested in that. Can I ask you more specifically, what do you have in mind? How much of an effort are you envisioning here in this area, and by whom will the ball be carried, so to speak?

MR. HOLLAHAN: What we expect is that the analysis will be done by NSSS vendors, and proceding in the normal way that they generate commercial procedure guidelines, the guidelines will be translated into specific procedures, either by the utility or the utilities consultants.

DR. THEOFANOUS: Do you feel that the vendors are capable of doing a best-estimate realistic calculations for the different scenarios and accident sequences? Or do you say -- I must assume that you believe that they can do it?

MR. HOLLAHAN: You can get better procedures by trying to do best-estimate calculations, exactly how good the calculations are I think it's still a question --

DR. THEOFANOUS: Unless you know how good the calculation is, how are you going to factor that in? Let's suppose you take a calculation and it's a procedure that is

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indicated by that calculation, and include that.

DR. MATTSON: We're going to do that as rapidly as we know as we go along, is the only answer we can give to you. We appreciate your problem. The way it was handled with the small break LOCA analysis was to introduce what was thought to be the necessary elements for realism, and then to stand back and use more qualitative engineering reasoning on what should be going on, and to give a wide spectrum of people an opportunity to review that, recognizing some of the tools have had a conservative analysis backdrop throughout their previous development.

DR. THEOFANOUS: I want to say that I feel that this answer is grossly inadequate and I'm sorry to say it, because I think that -- in my opinion, at least, one of the lessons that we really learned as a result of TMI is that we have to better know the response of the system.

Like you very well said it some other place, where we talked today -- yet the answer that you give me is, Well, we'll do as well as we possibly can, but --

DR. MATTSON: I said also earlier that we'd be working hard to develop better codes for a more realistic representation of transients and accidents. But that's going to take some time, and I don't think it's worth delaying progress that can be made in better explaining these transients and accidents in a realistic way for

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training and procedure writers, while we wait for them.

DR. THEOFANOUS: Great. I'm very happy you said it. I'm with you all the way. But I think there's something missing here, because you're going back to vendors to ask them to do calculations with tools that you wrought, and you agree they're probably very good and probably can help in some of those calculations, while somehow, you don't seem to know or remember that there are also other codes around and they do much better.

Now, why nobody seems to mention about that --

MR. TEDESCO: But, look, even in the existing codes there are certain things that we can't do now, namely, the more realistic modelling of what actually exists in the plant. We didn't put in the PORV. We bounded it by having the high-pressure -- don't worry about the PORV --

DR. MATTSON: Let Gary come back to that.

MR. HOLLAHAN: As part of the calculations to be done there will be pretest calculations of some of the small break tests to be done in September or later on, so we are interested in verifying how good the codes are against tests. In addition, what the small break calculations already run. B&W has also asked to benchmark their code against the actual TMI accident, for the very purpose that you added, to show how good is the code when using it to develop procedures?

DR. THEOFANOUS: I can understand why the NRC has been developing codes for many years now, at the expense of many, many millions of dollars, and we come to this meeting, and also to other meetings. And we see all kinds of talk about more development and more assessment and verification. And we see no plans at all for application of the codes to actually learn something from them. And that kind of bothers me.

I keep saying that for meeting after meeting and yet nobody seems to know that those codes are there? They've been developed at great, great expense and nobody wants to do anything with them.

DR. MATTSON: This is a memorandum to Mr. Denton, signed by Mr. Fraley on July 10, two days ago, commenting on the research supplemental budget for FY '80.

Paragraph A. It talks about transient and small LOCA events, last sentence, NRR will emphasize the need to produce quick running engineering analysis codes for sloping and barometric studies in transient and accident sequences. I think it's completely sympathetic, what we intend here, with what we're saying.

We take those codes for which millions of dollars have been spent, turn quickly to engineering and scoping analysis capability, fastrunning and use them now.

DR. THEOFANOUS: But, Roger, you're still talking

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about producing still one more code or more. The point is, that they went through that exercise of getting small and fast, superfast line codes, many years ago, and they have decided that the cost of developing more codes, probably by expensive codes, to learn something from them.

We're still in the stage of talking about producing still one more code. I forget, it was in the meeting, now two weeks ago, the 27th. He showed us -- they showed slide after slide after slide which was number of codes, but nobody talked about using those codes for nothing. I can't see myself, any application for those codes except for developing more field equations and developing another three equations into a set, making nine, making 12, with no limits, and I see no applications. And this is surprised.

DR. MATTSON: Those calculations go with the codes, with RELAP.

DR. THEOFANOUS: No.

DR. MATTSON: Some go with TRAC -- we did a calculation with TRAC for TLTA. I think we've done them with the asymetric blowdowns on BWRs.

DR. OKRENT: One conversation at a time, please.

DR. MATTSON: What are you proposing? What do you think we ought to do, use TRAC to develop procedures, plant by plant?

DR. THEOFANOUS: First of all, I wrote some letters, and in those letters I outlined it. I think it would probably be too long now to discuss them, so I suggest -- to look at these letters.

But I certainly feel that by reading these letters, after a lot of thought, because we've had many, many talks before not only with people from the staff, but also with people from research. And I found a lot of thread there.

It looks like there is one thread going along the development path, and there's another thread that goes along the application, but at a very different level. It just looks like there is no communication.

I feel there is much -- benefits to be gained by both sides. It seems that we come closer together into what we call application. Thusly, these people don't develop codes; they're only worried about analysis. All they want to do is print more equation here, one more there -- more time and more dimensions -- and they never worry about learning something from using those codes.

On the other extreme, I see people -- like you people -- that you want to do another calculation, and you tell them, "Do this on RELAP." That's two extremes. There's nothing in between. And something ought to be done about it. I think otherwise it's a shame, for all this money that's been spent --

DR. CATTON: TRAC has been given to the people at Idaho.

DR. OKRENT: Excuse me. I am going to make one comment that arises of a subcommittee meeting yesterday, because this question was discussed somewhat at the Reactor Safety Research Meeting.

And, in fact, the point you're making was raised on your behalf, and the people from Research said they would like to run TRAC more. They can't get the time on the computer at Los Alamos to run it as much as they would like. So, in fact, they're limited now by computer time availability in their use of TRAC. And I don't think it's running on any other machine except the Los Alamos machine.

DR. MATTSON: We have the same problem now.

DR. OKRENT: The only place where they have the free time, I think they said, was the Los Alamos group.

DR. CATTON: It's running at Sandia. They're using it for overhead injection studies. It's also running at Idaho. so that's not quite true.

DR. MATTSON: It's under contract by us to the licensing application.

DR. MARK: They can't get extra time at Los Alamos, but I think they can get it wherever they have a 7600 and put the code in.

DR. MATTSON: Running time is a problem.

To get back to the suggestion, it might be possible to take some version of TRAC, whatever we can find now that's amenable to PWR deck, and do some audit calculations to understand how good some of these realistic analyses are over the next nine months.

Why isn't that a good idea?

Let's go back and look at it. It's a good suggestion.

DR. CATTON: They haven't mixed that up for a typical PWR, and they haven't set it up for a small-scale and semi-scale.

DR. THEOFANOUS: You can do these calculations.

DR. OKRENT: If this is the case, I am pleased to be corrected, because the impression I was left with yesterday -- apparently I was --

DR. MARK: I think they were talking only of in the hands of the Los Alamos group.

DR. MATTSON: The impression you got is a generally good impression. It is very difficult for us, even running RELAP, to get the computer time we need to do the audit calculations we do. And we don't do enough audit calculations.

DR. OKRENT: TRAC or cited, as using 20 hours for a typical kind of calculation you're interested in. I don't know many --

DR. MATTSON: I don't know.

DR. THEOFANOUS: Dave, I think the point is that we somehow have to do some synthesis. That's the only thing we have available.

DR. OKRENT: I'm very sympathetic toward us trying to learn. I was, at the moment, reciting what I thought I had heard yesterday, which was either misheard or misinterpreted, or whatever, but there nevertheless is a long running time involved.

DR. MATTSON: A long running time and a difficulty of getting to the computers.

DR. OKRENT: In any event, I think this is something to be pursued. What's not clear is how much TRAC itself can be used in this regard.

I think Carl Michelson wanted to raise one or two points on -- either with regard to item 9 on the agenda or something else, I'm not sure.

MR. MICHELSON: There is a new item I wanted to discuss with you before the next meeting -- for you to take a little look at it.

You're probably familiar with the fact that the pressurizers for Westinghouse, B&W, and CE all contain some type of a diffuser where the surge line enters the pressurizer tank.

This diffuser, in some cases, consists of three-inch diameter holes. In other cases it would be quarter inch. In other cases it would be a large slot.

In the case of three-eighths-inch diameter holes and three-quarters-inch diameter holes, he gets some rather large steam velocities just from an open relief or safety valve.

Now, the question you get into is whether or not you can indeed ever dump the pressurizer even in a CE or Westinghouse machine, the reason being that the flow velocity growing through the open relief valve, open safety valve, or break in the top of the pressurizer gives you sufficiently high steam velocity, that countercurrent flow can't occur through the small holes.

To be perfectly frank, I was unaware of these things. I hadn't really looked into it. I became aware recently --

DR. MATTSON: You don't get interested in that until you start from the purpose that you've got a void in the system and see what happens as a result of that.

MR. MICHELSON: You find though that they have these rather fine diffuser screens in the surge line entrance to the pressurizer. And if you postulate continuous flow, it isn't altogether obvious that the water will ever dump from the pressurizer. I am wondering if you would look into this.

DR. MATTSON: No.

MR. MICHELSON: Maybe before our next meeting -- I have, but I don't want to bias your thinking -- go back and get the numbers from the vendors. I suspect it'll even be quite specific. I'm not entirely sure -- in fact, I know in one case, where these designs changed from one plant to another --

DR. OKRENT: Let's see if I can understand what you think may occur.

MR. MICHELSON: Well, the model is pretty straightforward.

In the area of depressurization, the pressurizer fills with water, and the two-phase flow proceeds to pass out through the leak valves.

As time goes on and the void grows large in the vessel and finally fills the upper part of the head, the steam proceeds now -- the two-phase proceeds to enter the pressurizer.

And eventually, as the water drops even lower into the core, only steam enters the surge lines on that pressurizer.

The question is now will the water that's in that pressurizer drain back down to the surge lines and work its way back and forth, or will it sit up there and indicate that the pressurizer is still full?

DR. MATTSON: Carl, that's an interesting question. I think I know a way to ask of the vendors in these ongoing small break LOCA and degraded cooling analyses that are going on. We'll see that that's done.

I want to say something -- earlier, you brought up another suggestion, and it troubles me a little bit -- in the conversation today -- I don't know if it troubles me, if that would be the right word. Questions are being raised today, after Three Mile Island, of a sort that imply that the NRC Regulatory Staff is intimate with the design analyses for light water reactors.

The Regulatory Staff is not intimate with those designs.

MR. MICHELSON: Could we say "familiar"?

DR. MATTSON: Has never performed them. It has never been the function of the Regulatory Staff to do the kind of analysis you just described for the design of a plant -- down to that detail.

. Now, over the years we've gotten into more and more detail, and one of the compelling directions that we feel pulled in at the moment by the kinds of questions you're raising, and the kind of assumptions that the people of the United States seem to make about what we do to ensure reactor safety, is to jump, both feet first, right in that direction.

And I almost guarantee you that if I jump, both feet first, into that direction on all of these kinds of questions which we raised -- I suspect we're as good at generating them as you are. It's not this agency that's capable of handling all of those questions today. 2600 people can't do that with the myriad of designs that exist in this in this country.

MR. MICHELSON: The reason for raising this --

DR. MATTSON: And if that's the direction we're headed, as a lesson of Three Mile Island, that's the right direction -- so be it, that's the right direction, but that clearly isn't where we've been.

DR. OKRENT: I would say that's a question that Dr. Carbon should address as part of his subcommittee meeting on August 8th, which is the role of the NRC in the regulatory process and so on.

DR. MATTSON: I thought that thought earlier when you brought it up. We can look at the other one and this one, too.

As we go along, we ought to watch what we're doing with one another and where we're headed.

MR. MICHELSON: May I at least indicate to you that this is an area you ought to look at. It doesn't necessarily mean that now you have to go down and do the work. It means that you have to assure yourself that the work has been done.

As a regulator, you ought to assure yourself that the work has been done.

DR. MATTSON: Yes.

DR. OKRENT: You already have a recommendation that you should get as much of this information as you can from the Licensees.

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DR. MATTSON: But there's a counter tendency -- I want to talk in generalities again -- there's a school of thought in the Task Force and elsewhere, and it goes something like the following:

One of the reasons that we haven't appreciated some of the system's interaction possibilities and some of these holes with no coupling between between the analysts and the procedure writer, for example, is because we bore in in too much detail. We got down to a component level on some things that eat our resources up and drag us away from the systems level understanding.

Now, that argues to bring us back out of the details and put us in higher plane, but if you're at that higher plane, how do you make sure the details get done?

That's really an important question, I think, for regulation after Three Mile Island. I don't have the answer yet, but it's an interesting subject to talk --

DR. OKRENT: I would put it, myself, somewhat differently. I think there are some areas in which the Regulatory Staff has had very considerable technical depth as they were able to raise broad questions, general questions, detailed questions in the area and really cover it quite well.

And I think there are some areas -- for example, where the ACRS has had less depth. And I think they did cover the area either with detailed questions or perhaps some of them, more general ones.

DR. MARK: It's not clear to me they were on a higher plane.

DR. OKRENT: I think it's just been a fact of life. I'll put it that way.

DR. MATTSON: Well, one we ought to think about how to correct.

DR. OKRENT: All right.

Did you have any others?

MR. MICHELSON: Can we back just to finish this up? And give us some indication -- it was my understanding, at least, that at Three Mile Island the diffuser was a two-inch hole size; the system of a large screen of two-inch holes located all over it.

But from the other things I've found out, this is not necessarily the only design. In fact, our plants have different designs, depending on who did it -- at what point in time they did it.

So I'm just cautioning you to find out from the vendors how they might have varied their designs, because a lot of the operating plants which we've looked at, they look significantly --

DR. MATTSON: What's the purpose of the diffuser?

MR. MICHELSON: It's mainly to be sure that you get a good flow distribution on the heaters. The heaters are in this area, and you want to make sure that you don't get a channeling of the surge coming up. You want to spread it around good and make sure that the heater elements -- and I submit that you can't find it in the Safety Analysis Report.

MR. MICHELSON: Possibly not the Safety Analysis Report -- none of the information I've got actually came out of the Safety Analysis Report. I didn't honestly go back and look to see if it was.

DR. MATTSON: I have read a few, and I don't ever remember seeing them. I'll take your word for it.

MR. MICHELSON: I think you'll find that there won't be any detail whatsoever. You couldn't even imagine what it looked like at that level of information.

But it does seem to possibly affect the answer about where the level goes on these others, and then it's very important as far as operating instructions are concerned.

The loop seal grade is a deceptive situation.

DR. MATTSON: We'll see that that question is formally brought before the Task Force for their formal consideration with the Westinghouse and Combusiont Engineering people.

MR. HOLLAHAN: I might also tell you that one of our consultants is Graham Wallace at Dartmouth College. We have a contract, part of which he is looking at the two-phased flow phenomenon characteristics of various components in a reactor coolant system.

Following Three Mile Island, we told them, "Look at the pressurizer surge line."

MR. MICHELSON: Make sure he looks at the diffusion. It's a very simple problem: An orifice with water on one side, steam on the other -- under what conditions will only steam pass through and under what conditions will the head of water also drive --

MR. HOLLAHAN: I think Dr. Wallace is familiar with countercurrent flow flooding problems.

MR. MICHELSON: The only data I could find was for larger tubes. I couldn't find anything for an orifice, but there is this critical diameter and critical flow rate and so forth at which the same amount occurs.

MR. HOLLAHAN: In the past, Dr. Wallace has done flooding type of tests with mini-tubes as well.

MR. MICHELSON: He may have already looked at this, relative to TMI.

DR. CATTON: Sort of like a coarse pore plate.

MR. MICHELSON: Sort of like that.

DR. LIPINSKI: On your viewgraph, you show that you provide emergency power for the pressurizer heaters.

When B&W came in, describing how they designed their pressurizer and sizing it, they pointed out that under reactor scram conditions the pressurizer level shrinks. And they have a level control system in those heaters that when the level goes down, the heate. is going to on automatically. And unless the level control cuts them off, as the reliability of that level control circuit, it's not safety grade, and I have no idea what they would claim for reliability.

But the result is -- the thing they fail to cut the heaters back on, so you could lose control of the heaters -- of if it fails to cut them off, you could burn them out.

DR. MATTSON: If you'll bear with me a minute, I'll get into the details on that requirement.

DR. LIPINSKI: They saved a few feed on the pressurizer height.

(Pause.)

DR. LIPINSKI: Whether that's true in the case of the other vendors, I don't know. I became aware of this in B&W's presentation.

MR. HOLLAHAN: There is -- true, there's no automatic shut-off on that.

DR. LIPINSKI: I heard of a case in the Naval System, where the heaters didn't turn off, and they burned a hole through the pressurizer.

DR. CATTON: That was a different reason though.

DR. OKRENT: Everybody, if you're going to talk, speak more distinctly so that the recorder can hear you.

Dr. Lipinski raised the point --

DR. MATTSON: We have the point. I believe the consideration is that we want to speak to the reliability considerations on those components, and we're not doing it because I think they're specifically addressed, but I can't find them in the draft item.

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RMG 1

MR. MICHELSON: There are a number of items here that go beyond 6:20 in the evening.

DR. OKRENT: Why don't we take a few, and we will adjourn in the not-too-distant future.

Under valve operability, under accident conditions, there are some of these that we should raise.

MR. MICHELSON: At least I can indicate the concern, and then you can use it as you see fit.

In the case of the isolation valves and let-down lines, if the let-down line were to fail downstream of the isolation valves, then the isolation valve sees a flow which is probably on the order of 10 times normal, somewhere in that neighborhood.

The question simply is, has operability assurance been provided on those valves to accommodate interruption under the blowdown conditions?

It's particularly complicated, depending on where the breakdown occurs in this system. If the breakdown orifice is downstream of the isolation valve, and the break occurs between the isolation valve and the breakdown orifice, then the valve itself becomes the breakdown orifice, and those valves are then procured to assure closure under those conditions.

It is very important, because otherwise it is an uncontrolled blowdown of the reactor, and we certainly don't

RMG 2

want it to go on very long.

DR. MATTSON: I don't have a specific answer to your question.

We are looking, as you said, at operability requirements and testing and what have you for things other than safety relief valves that we spoke to in the short term.

We are not ready to say generally what ought to be done.

MR. MICHELSON: It is a good one to look at.

DR. MATTSON: Pump and valve operability standards have been under development in sort of a tripartite thing by industry, the ASME, and NRC for lo these many years, are designed to speak to this question in the testing business.

MR. MICHELSON: I worked on these things for four years. I think they are still wrestling with the question of nonconformance.

DR. MATTSON: They are also concerned over the difficulty with some of the sizes. I don't think that is the answer to your question, because I don't think it is a short-term product.

MR. MICHELSON: This item wasn't brought up as a question, necessarily, but rather a comment. Indeed, these isolation valves need some type of comparability assurance under the situations which they see for the situations for which they have to close.

RMG 3

DR. MATTSON: I go back to my general point I was making a minute ago. I'll give you an example here.

It is possible for me to understand how a designer might not have had the insight to think of a small break and a CVCS downstream of the isolation valve. They would be very high flow, and wouldn't the valve close against it.

Somehow in my mind, that is a pretty specific question. It is a good question, and it is one that ought to be answered.

But I suspect I know the answer. If the designers have procured safety and relief valves from manufacturers who certify today that those valves have no design assurance of operability over two-phase and solid water discharge and there have been no tests. Yet we know that the designers have known for some years that those valves could experience those kinds of flow.

Then how is it that a system of regulation can work where that kind of knowledge is there and the assurance doesn't need to be provided at that level of detail?

MR. MICHELSON: I think you have stated it rather precisely.

DR. OKRENT: We are just trying to raise some questions to see whether the system is working.

MR. MICHELSON: The next item under the same general category was purge valves. Purge valves are the same

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kind of question, except I think they have been treated rather extensively, but of late there have been some questions.

DR. MATTSON: The question here is whether they will close.

MR. MICHELSON: Under the blowdown condition which exists when you have LOCA inside of a containment, and you have --

MR. TEDESCO: That is a requirement. That is a requirement.

MR. MICHELSON: I think it has gotten pretty good treatment. Purge valves weren't mine --

DR. MATTSON: Victor Gilinsky raised a question on that, saying what if the purge valves had been open at Three Mile Island, which is a little bit different question because there they would have sensed the radiation, they would have shut, and the consequences would not have been much different.

The question you raised is, but what about a larger break yielding a higher pressure rate?

MR. MICHELSON: This is not a new question. It would appear to be put to bed, I believe, recently.

DR. OKRENT: I'm not quite sure now why it is on here, but I do recall a recent LER or something within the last year, where Duane Arnold found that their purge valves were not designed to take the forces, given a large LOCA.

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And I don't know anything about the question of degree, whether anyone has looked at that.

But I had thought that the very first step was routinely asking them all to look at their purge valves, so it wouldn't surprise me if it was being picked up for this year.

Maybe that's why we put it on now. I am not sure, Carl.

MR. MICHELSON: I believe that is why it is on here, because you had raised the question.

The atmospheric dump valves are often upstream of the main steam isolation valve. Occasionally they are downstream, but often they are upstream.

MR. TEDESCO: No, no, no, no, no.

MR. MICHELSON: There are some times where they have been downstream, yes.

MR. TEDESCO: They shouldn't be.

MR. MICHELSON: Not normally, that's right.

Now, the question is, they are generally nonsafety related in terms of design requirements.

MR. TEDESCO: I really don't understand why they would be downstream at the opposite point from their function.

MR. MICHELSON: Let me retract the statement.

I will let you in on the details later, but let's assume they are upstream, which is where they normally are, in

RMG 6

which the area of concern for me --

They are generally nonsafety related in their categorization. They do not have operability assurance on them.

MR. TEDESCO: Under perhaps manual capability, if you lost power, he should be able to go out there and actually --

MR. MICHELSON: They are not generally on the active valve list.

The problem or the question is then, what is their extent of reliability, and in particular, of course, under certain actual situations, you wouldn't want them to stop open. And if it is possible for them to open under those conditions, that has to be included in the analysis of the event.

And generally, I do not see these valves being treated as having potential for opening under certain of these events, and they are not treated with comparability assurance. And certainly, at least, a single failure criterion ought to be applied to them.

DR. MATTSON: That is an analogous problem to the PORV. Probably the thinking has been that the conservative way to bound it is to stick that valve so that you can test the safetys, and nobody has asked it from the inverse, of does the valve open when you don't want it.

MR. MICHELSON: I'm not claiming that there is indeed a problem. I am saying that I can't find the analysis, but I can see some possible problems, and ey certainly ought to

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be looked at.

DR. MATTSON: That would fit into your category for your Item 4, Safety Related Aspects of Main Steam

MR. MICHELSON: It has got some interesting control circuits, by the way, and that has some very interesting possibilities for gang-opening of these valves.

So I think if you want to look at the control, and don't limit your attention just to the valve itself, but rather to the entire control system --

DR. MATTSON: Back to the regulatory process again.

What I see, following this train of logic, is that the arbitrary subdivision between safety on one side and nonsafety on the other side in deciding what is important to safety, that is put in the wrong place.

DR. OKRENT: That has been clear a long time, I would say. That is not a new thought.

MR. MICHELSON: That is why the main steam line is on here, and that is why the dump valves are on here.

MR. TEDESCO: Again, you are still dealing with the question of safety-grade, nonsafety-grade, like in the Class 2-E system. You would be more precise in your definition.

MR. MICHELSON: One further thing you might want to look at is the check valves on the feedwater system. Since the feedwater lines are going together in the common feedwater system, if you have a failure of one feed line and

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your check valve on the other feedwater line for some reason fails to close, that creates a dual steam generator blowdown, and that failure to close might be postulated as the single failure.

MR. TEDESCO: Check valves have fewer components.

MR. MICHELSON: But checkvalves have been known to stick open, and it is not passive, because it is opened, and it must close. So I would argue that it is an active component. If it was open at the time the event started, it must close if you are to prevent the blowdown of the steam generator.

MR. TEDESCO: It doesn't require power.

MR. MICHELSON: That's right, but by the way in looking at operability assurance --

DR. MATTSON: Now, you have got to be careful. I am not even sure that is consistent with what we have traditionally done. If it had to move, it was active; if it didn't have to move, it was passive.

DR. OKRENT: In any event, we are trying not to be hidebound by tradition in this Subcommittee.

MR. MICHELSON: What we are trying to point out is areas that you might want to look at, and that check valve is another area that if you want to be realistic on, you know, single failure criterion rules and so forth, one would argue why aren't you claiming that valve sticks open.

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MR. TEDESCO: We hit that problem when we start talking about the boilers. And when we start talking about the potential, the bypass and reactor breakers, that is when we all agreed to take extreme measures to ensure that the valve remains closed.

MR. MICHELSON: Of course, the valve is open and must close.

Now, you can argue two ways: Either it sticks open, or alternatively, if it closes, make sure there are calculations or tests that would verify that it was in the closed position.

Generally you will find these valves are just in never-never land. There is nothing much said about them in terms of operability assurance or design requirements. We have a normal requirement to get a certain flow rate.

MR. TEDESCO: I think that's true.

MR. MICHELSON: Because they are nonsafety related. They are not on your list of so-called safety related components. And that is really the message that we are trying to convey here with a few specific examples.

DR. LIPINSKI: On Three Mile Island 2, the question came up, why did they have to have a test procedure? They defeated both the aux feed systems. They had a procedure early in plant life where they did not defeat both systems.

MR. TEDESCO: They rewrote those procedures so they could then test these check valves. That's in violation of the

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tech specs.

The tech specs said no. Procedures said yes.

DR. LIPINSKI: They never said they violated the tech specs. The question was, who checked it. Did the NRC?

MR. TEDESCO: The tech spec was never allowed.

DR. LIPINSKI: They rewrote the procedure in order to test these and check them.

DR. OKRENT: Let's see, do you have one more item that you want to call to their attention?

MR. MICHELSON: The last item would be No. 10. I did write a short note on that, which I assume you got a copy of.

MR. TEDESCO: I haven't, no.

MR. MICHELSON: The note referred to an LER which indicated that San Onofre was having trouble with straightening vanes coming loose inside the piping.

I was simply trying to point out that this leads me to believe that under blowdown conditions where the loadings are generally much more severe, I would become concerned about pieces breaking loose.

The key point, as we get back to the problem of the steam generator tube integrity, which we generally agreed this morning, I believe, or this afternoon, that we are not going to assume any steam generator tube failures. And if straightening vanes come out and fly into the steam generator

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and so forth, that kind of an assumption doesn't look too hot.

DR. MATTSON: I didn't say we aren't going to assume them. I said we don't assume them now.

MR. MICHELSON: They are failing now.

DR. MATTSON: North Anna had this kind of problem. where on North Anna II, they found a flow diverter.

MR. MICHELSON: This is under normal flow conditions that these things are happening, what would happen if we had a main steam line rupture and this blowdown flow was passing past the straightening vanes. If they are wiped out, that would be a real problem.

So another question you have to ask, is are they designed to begin with for the loadings of a blowdown flow?

DR. MATTSON: The answer is, they are supposed to be, and they are reviewed to that extent. The one that happened at North Anna was the discovery in the QA of the welds or something, they found cracking. They had to go back and provide assurance that they didn't have it on North Anna I, which was in operation. And analyses were done to say what would happen to it even if it did come loose during a blowdown.

So, yes, it is something that is required to be treated in the course of a loss of coolant accident.

The San Onofre LER, I don't know what the difficulty was.

MR. MICHELSON: They fixed it by putting in a better

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design, stronger supports. Which implied to me that the supports must have been a little on the weak side, and that blowdown flow was already included, and they were ripping loose under normal flow.

However, there is the possibility of fatigue.

DR. MATTSON: It is also true that this sort of requirement did not exist.

MR. MICHELSON: That is a possibility, too.

DR. OKRENT: In any event, it may be relevant to reexamine whether the necessary assurance exists, either that these can cause trouble if they do break loose in an accident, or they can cause trouble, that in fact, the quality both of the original design and the continuing inspection, however you want to put it, gives you enough assurance there is a real signal here.

MR. MICHELSON: I haven't seen good discussions anywhere on the fact that these kinds of pieces flying around can be terribly important relative to isolation valve closures and relative to any other mitigating equipment including tube boundaries that are essential for the proper termination of the event.

I think it ought to be very disturbing to find these kinds of pieces breaking loose in normal operation.

DR. OKRENT: Well, I think since it has been fairly long day and we have got three long days ahead, I will

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propose that we in a minute close the meeting, and I will again repeat my request that members and consultants get me their suggestions for possible Committee comments this month, if the Committee writes a letter, on Three Mile Island.

Dr. Mattson.

DR. MATTSON: Tomorrow I intend to come down to the full Committee, and I think we have got 45 minutes to give a quick overview of not the same slides or detail we had today, although the slides we had today are available to the other Committee members.

Our plan for the short-term recommendations is to assign them as a task force to Mr. Denton Monday next. Simultaneously, we will provide you with copies -- the Commission, the public -- in a limited printing, simply limited by printing capabilities.

He is at the moment, or has, Mr. Denton has at the moment requested comment from his other line managers on the final draft of the report, said comments to be available to him late Monday for his consideration in how to go about implementing them.

It is my expectation that lacking any presently unsurfaced difficulties in that area, he will make a decision on implementation of the short-term recommendations by about Thursday.

About the same time, some 2000 copies of the thing

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become available for general distribution with the understanding that comments -- I should say one more thing.

It will be the recommendation of the task force and implementation being undertaken promptly on all of these recommendations without an opportunity for public comment.

Three of them will be subject -- of what we recommend to be immediately effective rulemaking: two dealing with hydrogen, and one dealing with shutdown requirements for human errors.

Those will necessarily lag the others, because of the necessity to prepare Commission papers and make the argument for immediate effectiveness ruling.

· We, as a Staff, need to understand -- and I think probably this is the way we should couch the discussion tomorrow -- where the ACRS comes out on the question of pending operating licenses.

Clearly, your comments are welcome at any time on the recommendations of the Task Force, and what Denton has done to implement them. If you think they are insufficient in light of your previous recommendation, you ought to say so as soon as you see what his actions are.

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If you think they're too much in light of your previous recommendations, you ought to say that. The question we ought to consider together is whether we handle these pending OLs case by case and come back to you for rereview for those you have already seen like Salem and North Anna, or whether you're willing to accept the generic answer to the effect that the new OLs will be required to meet all the short-term recommendations on the time scale provided in the report you'll see Monday and required to satisfy the bulletins and orders requirements -- actually just the bulletin requirements because there are no orders from Westinghouse plants, and that's all we're in the near term.

And that's the question I'll bring to the full committee tomorrow. The subcommittee has heard more details than anyone at this point about what the recommendations are because we're still meeting as a task force because there are continuing to be a number of Three Mile Island activities. I think you understand why I take the position that your formal comments and what have you on the recommendations can follow on.

If you feel otherwise as a committee, as a subcommittee, indicate at the time scale that we're pushing forward on. That gives you an idea of when you ought to as a subcommittee or committee interject yourselves if you feel that that's not right.

DR. OKRENT: I'm not clear what it is you're asking, Roger, with regard to the operating licenses. Is it that you expect the reaction from the committee at the July meeting?

DR. MATTSON: No. We have a letter from you that says, you're willing to consider the TMI 2 implications for the near-term OLs on a generic basis, but that you leave open the possibility that you might want to bring them back plant by plant.

We see that as an open question.

For efficiency reasons, we'd just as soon handle it generically. You'll see our requirements for the near-term OLs insofar as Three Mile Island is concerned and all of their detail on Monday, not in time for you to make that decision tomorrow.

From what you heard today, if you still have questions, and I doubt that you have a subcommittee or committee position on it, but the staff will need from the committee over the coming weeks some kind of indication --

DR. CARBON: Over when?

DR. MATTSON: Over the coming weeks -- what kind of review you want to do on plants like Salem, which are day-for-day slipping in their capabilities.

DR. OKRENT: I guess it would be helpful if tomorrow in that 45 minutes -- that 45 minutes, by the way, that we

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have for you was not readily obtained. And I don't want to go beyond the 45. I think you should state this and the committee then will just discuss it and decide how it is going to approach or try to approach it.

It may be able to treat some things generically but there are some things that are different in other plants. Some of them may have an ice condensor. It may not be the same.

DR. MATTSON: Ice condensor with upper head injection.

DR. OKRENT: So let's assume that's not going to be an important part of the presentation. You'll mention that this is a need for the committee to think about and then the chairman will have to make time available during the three days to at least decide on the course of action, which will probably be a subcommittee meeting as the next step, if you want me to guess.

But with regard to your own presentation, I suggest you plan on taking not more than 25 of the 45 minutes, not more than to leave time for discussion, and that you concentrate on the short-term -- what did you call them? Recommendations. Leave out the introductory part. Leave out what you're going to look at, and as much as possible emphasize the ones that seems to be a little sticky in the discussion.

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DR. MATTSON: This also would be by the sense of the subcommittee -- the ones that are the most troublesome are the ones that are most judgmental having to do with operations.

DR. OKRENT: Let's see if I remember correctly. There was some question about this rule-making for shutting down if they violated a certain criterion -- there are one concerning the --

DR. MATTSON: Technical advisors.

DR. OKRENT: Yes, just what he was, and so forth. Was there a third area particularly that stuck out? The hydrogen one is not now really being addressed in a broad way. I think it would have a limited approach at the moment.

So I think that probably -- anyway, we're going to have to look at an ice condensor as part of the review, and if we think there's something there, we'll think about it.

DR. MATTSON: That's what I'm saying. There are opportunities for you to interject, and that's why we're encouraging Mr. Denton to go ahead and make a decision on each of the recommendations.

If people object or have comments on them, there are still people working on it.

DR. OKRENT: In any event, I'm serious when I say that maybe what you'd better do is instead of doing it in some logical order, take the things that are most important among

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the recommendations and present them first because you know how the committee works. Before you've summarized the first one, there will be questions if they're upset, and you won't get beyond two.

So let the first one be the most important.

DR. MATTSON: I didn't think that I was going to make it today.

(Laughter.)

DR. OKRENT: Okay. Anything else for now?

(No response.)

DR. OKRENT: Thank you all. This meeting is adjourned.

(Whereupon, at 7:10 p.m., the hearing was adjourned.)

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TMI-2 LESSONS LEARNED TASK FORCE

- BEGAN WORK IN LATE MAY
- 22 PEOPLE - WIDE TECHNICAL EXPERTISE
- GENERAL SCOPE IS REACTOR LICENSING
- COORDINATING WITH OTHERS

LESSONS LEARNED APPROACH

- STARTED WITH MANY ISSUES
- CATEGORIZING IMPORTANT LESSONS
- INTEND TF COMPLETION SEPTEMBER 1

BASIC PREMISES

- CURRENTLY UNDERSTAND 4 CONTRIBUTORS
  - DESIGN
  - EQUIPMENT MALFUNCTION
  - HUMAN ERRORS
  - REGULATORY

SCOPE

- LESSONS LEARNED TF WILL SPEAK TO:

  REACTOR OPERATIONS

  LICENSEE TECHNICAL QUALIFICATIONS

  ONSITE EMERGENCY PREPAREDNESS

  DESIGN CRITERIA FOR SAFETY AND PROCESS EQUIPMENT

  TRANSIENT AND ACCIDENT ANALYSIS

  EVALUATION OF OPERATING EXPERIENCE

  NRR EMERGENCY PREPAREDNESS

INTERIM CONCLUSIONS

- WORK OF B&O TASK FORCE JUDGED ADEQUATE TO ASSURE SAFETY OF PRESENT OPERATIONS, WITH SOME PROMPT ADDITIONS FROM LESSONS LEARNED

- OTHER SHORT TERM LESSONS LEARNED SHOULD BE IMPLEMENTED AS SOON AS PRACTICAL

INTERIM CONCLUSIONS, CONT'D

- SHORT TERM LESSONS PLUS BULLETINS SUFFICIENT FOR NEAR TERM CP&OL.
- CONTINUING EVALUATION WILL YIELD MORE ITEMS FOR EARLY IMPLEMENTATION AND SOME FUNDAMENTAL ISSUES FOR LONG TERM STUDY AND RULEMAKING

SHORT-TERM RECOMMENDATIONS--OPERATIONS

- REACTOR OPERATIONS MANAGEMENT
  - Define And Implement Command And Control Function
  - Add A Shift Safety Engineer
  - Define And Implement Shift Turnover Procedure
- IN-PLANT EMERGENCY PREPARATIONS
  - Limit Control Room Access--Operations Command
  - Establish Onsite Emergency Operations Center
  - Assemble As-Built Drawings And Records
- OPERATIONAL RELIABILITY AND QUALITY ASSURANCE
  - Establish Clear Criterion For Minimum Quality
  - Require Shutdown If Violated
  - Require Thorough Inquiry Before Restart

SHORT-TERM RECOMMENDATIONS--DESIGN AND ANALYSIS

- PROVIDE EMERGENCY POWER FOR "PROCESS" EQUIPMENT
  - Pressurizer Heaters
  - PORV And Block Valves
  - Pressurizer Level Indicator
- PERFORMANCE TESTING OF RELIEF AND SAFETY VALVES
- INFORMATION TO AID OPERATOR IN ACCIDENT
  - Direct Indication Of Relief And Safety Valve Position
  - Instrumentation For Detection Of Inadequate Core Cooling

SHORT-TERM DESIGN AND ANALYSIS, CONT.

- CONTAINMENT ISOLATION
  - Backfit Diverse Actuation Required By SRP 6.2.4
  - Rethink Essential And Non-Essential Systems
- POST-ACCIDENT CONTAINMENT HYDROGEN CONTROL
  - Provide Reliable And Dedicated Penetrations For Purge And Recombiner Systems
  - Inert All MARK I and II Containments
  - Provide Capability To Use Recombiners At All Plants (Minority View)
- RADIATION CONTROL FOR SYSTEMS OUTSIDE CONTAINMENT
  - Perform Leak Test For Safety And Process Systems
  - Perform Shielding Review For Safety And Process Systems

SHORT-TERM DESIGN AND ANALYSIS, CONT.

- AUXILIARY FEEDWATER SYSTEM RELIABILITY
  - Require Automatic Actuation
  - Require Direct Flow Indication
- INSTRUMENTS TO FOLLOW ACCIDENT
  - Improve Post-Accident Sampling
  - Increase Range Of Effluent Monitors
  - Provide Hi-Range Containment Monitor
  - Improve In-Plant And Effluent Iodine Measurement
- ANALYSIS OF DESIGN AND OFF-DESIGN EVENTS FOR IMPROVED TRANING AND PROCEDURES
  - Small Break LOCA
  - Core Uncovering
  - Multiple Failure Events

FURTHER LESSONS TO BE LEARNED

- RELIABILITY GOALS
  - System And Component Reliability
  - Frequency Of Challenge To Safety Systems
- DEGRADED COOLING
  - Prevention - Design And Training
  - Mitigation - Design And Training
  - Core Cooling Systems
  - Containment Systems
  - Radwaste And Effluent Systems
- SAFETY AND PROCESS SYSTEM DESIGN CLASSIFICATIONS
  - Reliability
  - Environmental Qualification
  - Power Supply

FURTHER LESSONS TO BE LEARNED, CONT.

- OPERATIONAL SAFETY
  - Operator Traning And Licensing
  - Operations Training
  - Technical Qualifications
  - Role Of Simulators
  - Control Room Displays
  - Computer Aided Fault Diagnosis
  - Human Engineering
  - Equipment Status Monitoring
- EMERGENCY PREPAREDNESS
  - NRR Technical And Management Roles
  - Crisis Management Preparations
  - NRR Data Needs And Communication
  - Interface Of On-Site And Off-Site

FURTHER LESSONS TO BE LEARNED, CONT.

- TRANSIENT AND ACCIDENT ANALYSIS
  - Roles Of Realistic And Conservative Analysis
  - Analysis Requirements For Training
  - NRC Code Development
  - Code Verification