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UNITED STATES NUCLEAR REGULATORY COMMISSION'S

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

DATE: THURSDAY, NOVEMBER 16, 1989

The contents of this transcript of the proceedings of the United States Nuclear Regulatory Commission's Advisory Committee on Reactor Safeguards, (date) Thursday, November 16, 1989, as reported herein, are a record of the discussions recorded at the meeting held on the above date.

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

355TH ACRS GENERAL MEETING

Nuclear Regulatory Commission

Room P-110

7920 Norfolk Avenue

Bethesda, Maryland

Thursday, November 16, 1989

The above-entitled proceedings commenced at 8:30 o'clock a.m., pursuant to notice, Forrest J. Remick, Committee Chairman, presiding.

PRESENT FOR THE ACRS SUBCOMMITTEE:

Carlyle Michelson, Vice Chairman

James. C. Carroll, Member

Ivan Catton, Member

William Kerr, Member

Harold W. Lewis, Member

Paul G. Shewmon, Member

Chester P. Siess, Member

David A. Ward, Member

PARTICIPANTS:

R. Fraley	R. Barrett
B. Sheron	R. Palla
T. Lee	W. Luckas
E. Igne	N. Lauben
L. Shotkin	W. Houston
C. Miller	L. Donatell
J. Stolz	L. Thonus
M. Masnik	

PROCEEDINGS

[8:30 a.m.]

MR. REMICK: Good morning, ladies and gentlemen. The meeting will now come to order. This is the first day of the 355th meeting of the Advisory Committee on Reactor Safeguards. During today's meeting, the Committee will discuss and hear reports on the following: nuclear power plant accident management; definition of adequate protection; review of standardized PWRs; Committee future activities; Three Mile Island Nuclear Station Unit 2 evaluation; integration of the regulatory process.

Items for tomorrow's discussion are posted at the back of the meeting room. The meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act the Government in the Sunshine Act.

Mr. Raymond F. Fraley is a designated Federal official for the initial portion of the meeting. A transcript of portions of the meeting is being kept and it is requested that each speaker identify himself or herself and speak with sufficient clarity and volume so that he or she can be readily heard.

We have received no written comments or requests to make all statements from members of the public regarding today's meeting.

I'd like to start out with a couple items of current

interest. One, Mr. Wylie, as you know, had an accident at home, but he is out of the hospital, back home, apparently recovering okay.

It is possible that he might be out for another month. He is still continuing to receive ACRS mail. It's possible that, if matters come up associated with the subcommittees that he is chairman of, that we'll need to appoint interim chairmen until he does return, but apparently he is progressing quite well.

MR. SHEWMON: How did it happen?

MR. REMICK: Apparently, he was twenty feet up on a step ladder, I'm told, with a chain saw.

MR. WARD: He is a victim of Hurricane Hugo, you realize.

MR. REMICK: An indirect victim, yes.

MR. CARROLL: He mis-cut one and swung around and it knocked him off the ladder.

MR. REMICK: You may have read that as part of a rate settlement case for the Pilgrim plant, that plant will be rewarded or penalized based in part on average SALP scores and relative performance indicators compared to other industry BWRs.

Future rate increases will be tied to such things as capacity factor, average SALP scores; for example, a penalty for each tenth of a point above an average of 1.8 on SALP

scores and will be rewarded for each one-tenth of a point below an average SALP score of 1.6.

It also will depend on their relative INPO performance indicator rating on such things as person rem exposure and maintenance backlog.

MR. LEWIS: Forrest, there really is, as you know perfectly well, a batch of extremely important safety issues here. Are we going to take any notice of them?

MR. REMICK: I think that's for the Committee to decide.

MR. LEWIS: Will it come up?

MR. REMICK: There is nothing on the agenda for this month on those subjects.

MR. LEWIS: You know the issues.

MR. REMICK: Absolutely. That's why I'm reporting it.

MR. LEWIS: It has come up once before in connection with not a rate settlement, but a PUC. I'm talking in connection with a PUC. I don't want to belabor the point, but it is important.

MR. REMICK: I think we all agree.

MR. SIESS: We have to do something.

MR. REMICK: The point is that local agencies are providing incentives which are, in some cases, anti-correlated with safety.

MR. SIESS: I know, but are we advising local agencies or are we advising the Commission?

MR. REMICK: We're advising the Commission.

MR. SIESS: Then I think the first thing to do is find out what they're doing.

MR. LEWIS: I don't agree that that's the first thing to do.

MR. SIESS: If they're doing something, what advice do they need from us?

MR. LEWIS: I don't agree that that's the first thing. I think if they're doing something, we can reenforce them. If they're not doing something, we can urge them.

MR. SHEWMON: Hal wants to spur them on in good deeds, whether they're doing them already or not.

MR. LEWIS: I'm sorry. I'm interested in the safety of the plants and people who are tinkering with it, and I think we have a responsibility there.

MR. CARROLL: Does it sound like we want to put that on the agenda for next month to find out more about it?

MR. REMICK: Why don't we take it up during the agenda planning. Another item of interest. You probably read that Atomic Safety and Licensing Board issued a decision on the remaining contested issues on emergency planning for Seabrook, and my understanding is that that initial decision was favorable to proceeding with full power licensing.

The Defense Nuclear Facility Safety Board, if that's the correct title, I'm just going on memory here, has been confirmed and I'm told that they have had at least one meeting of the full committee. That's the new what I refer to as a mini-NRC, but that's not exactly correct for their functions.

MR. SHEWMON: Who are the members of that? Do we have a list?

MR. REMICK: Yes. We've had a list in the past. Herb Koutz, Ed Case, John Conway, and Jack Crawford and a person from EG&G, and I always forget his name, and I want to say Agelbert, but that's not it. It's a person who apparently has seismic background from EG&G Idaho.

That's the Board that has a limit of 100 FTEs, if I recall, and also they have an arrangement where they can call upon the NRC, including ACRS, on reactor safety matters, if I recall from many months ago reading the bill.

MR. SIESS: Are these full time jobs?

MR. REMICK: Those are full time jobs Yes.

MR. SIESS: Herb Koutz is then retired?

MR. REMICK: I have no idea. There are staggered terms. The one I remember was Ed Case, I think, for a one year term. Recollection again.

MR. KERR: You say the panel is a full time job?

MR. REMICK: That's my impression, yes. The 100 FTE staff and so forth, I would sure think so.

MR. LEWIS: My memory, also from several months ago reading the bill, is that they are also empowered to hire large numbers of consultants so that they could, if they wished, set up a mini-ACRS, if they wanted to.

MR. REMICK: The limit is 100 FTEs, including consultants, I believe, and staff, is my recollection. That's the current limit.

You probably also read that Vic Stello's confirmation hearing started yesterday. It started yesterday morning, continued into yesterday afternoon, and is continuing into today. You probably read that five Senators have asked President Bush to withdraw his nomination.

Also, I'm told that Drew Persinko has been replaced as the NRR Coordinator with the ACRS and has been replaced by Helen Pastis. Is Helen here? Yes. Welcome, Helen. This will be a test of your endurance and probably the strength of the teeth. You have to grit them from time to time, I'm sure, but we welcome you.

MR. LEWIS: She's been to subcommittees and already testified and came back today.

MR. REMICK: There is something I'd like to read to you. Several members of the staff went out to California after the earthquake and I'd like to read to you just a little bit from the report you might find of interest. Some of it you know, some of it you don't.

They report that a lot of damage in the downtown San Francisco area, in the Marina district in particular, was due to soil liquefaction and the amplification of ground motion by soils. The damage from the earthquake seems to be related to site-specific conditions and directionality, rather than to just distance from the epicenter.

The elevated highway structure in Oakland suffered damage primarily due to lateral motion and the severity of damage can be attributed to poor design of the hinges at connections of the upper deck columns and corner reenforcement detailing of these columns.

Damage to the residential buildings in the Watsonville area was mainly in the un-reenforced masonry and foundations due to severe ground motion, which was estimated to be in the acceleration range of .4 to .5g. The Moss Landing Power Station suffered extensive damage to its 500 kilovolt switch yard, with broken bus and switch gear insulators.

However, the other two switch yards having equipment manufactured by different suppliers suffered little or no damage.

MR. CARROLL: That's very misleading because the other two switch yards are lower voltages and do not have as massive insulators.

MR. REMICK: There was no piping and mechanical equipment failure, except the raw water tank with 800,000

gallon capacity, which ruptured at the bottom and buckled at the top. Bolts behaved very well, even those anchoring tall stacks. The station was designed in the late 1950s and early 1960s for static lateral force of about .14g, and may have seen considerably higher values.

There were also some indications in other locations that equipment was anchored well, but it failed to function after the earthquake.

Their conclusion. The general indication is that the engineered industrial facilities survived quite well, but brittle ceramic insulators failed, as they have in previous events. The current NRC seismic design criteria should serve us well, provided we pay attention to equipment anchorage and perform plant walkdown to eliminate the observed potential weak spots.

MR. SIESS: Can we get a copy of that?

MR. REMICK: Absolutely.

MR. WARD: Chet, you looked askance at the hinged design. The fact that they were hinged was the problem.

MR. SIESS: It wouldn't have made any difference. The fact that they were hinges, no matter how they were designed. They could have been designed out of cast iron. It wouldn't have made any difference. If you hinge a column top and bottom, it can't take any lateral force. And these were pretty good hinges. They took practically no movement.

MR. WARD: But they had the problem.

MR. CARROLL: Again, reading the accounts in the Bay Area newspapers, the hinge theory is only one theory as to why that section of freeway came down.

MR. SIESS: I'd say it's quite sufficient.

MR. CARROLL: The trouble, Chet, is that there were a variety of designs along the length of that freeway. The hinged design was not universal.

MR. SHEWMON: They were present where they failed, weren't they?

MR. CARROLL: Not necessarily. I don't know.

MR. SHEWMON: There are currently three theories that are being looked at, and I can't tell you much more than that.

MR. SEISS: I also heard that the strengthening of the bridges after San Fernando involved tying everything together, and you could have tied enough deck together that 300 feet that was hinged managed to take down the whole thing. I won't know until I get some decent technical reports, and that obviously is not one of them.

MR. REMICK: I figured this would raise some comments from Member Seiss.

The next item, quoting from Tuesday's Energy daily, it appears that the UK has decided not to privatize their nuclear plants. It says, "In order to keep its plants and the electricity supply industry intact, the Government is keeping

all nuclear stations in the public sector. It plans to finish the only one under construction, the Sizewell B, but has shelf plans for replicating this design." It goes on to say that Lord Walter Marshall is therefore going to leave the industry. I assume he was highly in favor of privatization and further nuclear plants. This places a hold on any further nuclear plants.

One additional time. It's been reported that Combustion Engineering is to be taken over by the Swedish-Swiss firm of ASEA Brown Bovari.

Any other items that members have? Any other items from the committee members?

MR. IGNE: The ASLB has cleared the way for Seabrook to have their full power license.

MR. FRALEY: They have signed off on the emergency planning. The staff still has an outstanding issue with respect to the operator training and their attitude and what have you, which as to be resolved as a regulatory matter before they are considered presumably ready to operate, and that has to do with that test that they ran where they permitted the pressurizer levels to go below 40 percent, or whatever it was, without taking action. So they are not quite in the clear, yet.

MR. WARD: Is there a regulation on attitude now?

MR. FRALEY: They are supposed to follow their

procedures, and I gather they didn't while they were running this test.

MR. WARD: Okay.

MR. REMICK: Mr. Seiss?

MR. SEISS: An administrative matter, Mr. Chairman. I have a handout number 10 and a handout number 13. I appear to be missing one through nine, eleven and twelve, or have we got a new numbering system on handouts?

MR. REMICK: We must. Can you explain, Mr. Fraley?

MR. FRALEY: Well, we've been using this numbering system for several months now, but the numbers on the pink sheets are supposed to go along with the basic numbering in the agenda, and the handouts will be handed out as they are available for specific items of the agenda. But item eleven --

MR. SEISS: I think that's a poor procedure, but that's beside the point. I have another one that has no cover sheet on it at all.

MR. REMICK. ACRS Activities, right.

MR. FRALEY: That hasn't been passed out yet, so you have an advanced copy.

MR. SEISS: I have an advanced copy.

MR. REMICK: I have one, too.

MR. SEISS: That's because you won't feel badly because I have one.

MR. FRALEY: You all have advanced copies. I have

the official copies here, yet to be passed out.

MR. REMICK: Well, we don't want to take that away from Dr. Seiss.

[Laughter.]

MR. FRALEY: If you like, we will not give you advance copies in the future, if it is confusing.

MR. REMICK: Any further comments from members. Maybe I shouldn't ask?

[No response.]

MR. REMICK: All right. Let's then continue with the first major item on the agenda. That's the discussion of nuclear power plant accident management and accident management strategies. Mr. Kerr is our subcommittee chairman, so, Bill, I turn it over to you.

MR. KERR: Thank you, Mr. Chairman. You will find in Tab 2, appropriately, arranged index and titled information associated with the items to be discussed. You will recall from our previous discussions of accident management that the staff has had Brookhaven and Hanford Laboratories assisting them in collecting information from a number of sources which the staff believed might be helpful to licensees as they undertook their IPE, particularly that part of the IPE that had to do with developing accident management strategies.

The discussion this morning I think will be concentrated on a supplement to Generic Letter 88-20, which

will enclose a report that gives information on these potential management strategies, I think, and the staff, I hope, will comment on this. They're asking for our comments on this preparatory to sending it out to licensees.

I have no further comments on it at this point. Are there questions or comments from other members of the staff who may have had occasion to examine the material, other members of the committee?

[No response.]

MR. KERR: If not, I will turn things over to Mr. Shewmon.

MR. SHEWMON: One question I can bring up later, but I was interested in Ivan's trip report in which he mentioned the study that the Germans had done on accident management, and their PRA numbers were that there was between one and two orders of magnitude reduction in risk with management, as I recall.

MR. CATTON: That's right.

MR. SHEWMON: I would like to ask the staff before we get done whether there's any plans to do studies like that here, or if they have ever tried to quantify the benefits that might accrue from this.

MR. KERR: Other comments, or if not, I will turn things over to the cognizant NRC staff person.

MR. BARRETT: My name is Richard Barrett. I'm chief

of the Risk Applications Branch in NRR. I would like to give you a brief overview of past and current activities simply to put today's presentation into perspective.

As you know, accident management is one of the principal activities in the severe accident program for closure of the severe accident policy statement. We believe that accident management, of and by itself, can have a great -- has a great potential for controlling the risk of nuclear power reactor operation.

We are aware of the German risk study, and we've also seen other estimates that have been done, for instance in NUREG-1150, and I believe later on, in answer to the question that was raised by Mr. Shewmon, that we could possibly get some insights from the Office of Research on some ongoing work, I believe at Sandia? Is that correct?

[Slide.]

MR. BARRETT: The planning for accident management has been going on for well over a year now, and it has evolved a great deal as a result of comments that we've gotten from the ACRS and from the Commission. We have briefed the ACRS on a number of occasions, and we intend to keep the ACRS fully informed as we progress toward implementation of our accident management program.

We also briefed the Commission on January 23rd of this year, and we have gotten back from them a staff's

requirement memorandum, and we have adjusted the planning of this program accordingly.

I should also like to point out that we have had a very productive ongoing interaction with the industry, namely through the staff of NUMARC and EPRI, and that has also been very useful to us in defining what is possible in accident management and what will be useful.

Furthermore, we had an opportunity back in March to outline our accident management plan for the entire industry at the IPE workshop in Fort Worth. I believe it's fair to say that the plans were fairly well received by the industry at that time.

[Slide.]

MR. BARRETT: The program currently consists of two major efforts. First is an effort to define and demonstrate guidelines for what constitutes a successful accident management framework or program on the part of a utility. We have worked closely with NUMARC and EPRI to define these guidelines, and the subcommittee, in September, was briefed on the EPRI guidelines, the document, and also on a parallel independent effort on the part of INEL, sponsored by the Office of Research.

Our plan is to complete the demonstration of the framework guidelines during this fiscal year and to issue a generic letter to the industry next fall.

The Commission has asked that we touch base with them before issuing that letter and also, we plan to keep the ACRS fully informed at appropriate intervals. We do not plan to discuss the framework guidelines at this meeting today.

Today we will focus on the other major effort, namely the identification and evaluation of accident management strategies. Specifically, we will discuss a near-term milestone, namely, the issuance of a supplement to generic letter 8820, the IPE generic letter, in which we intend to give the industry our insights on the advantages and potential disadvantages of a specific set of strategies which we have identified based on past PRA results.

I would also mention that we have an ongoing effort, primarily in the Office of Research, to identify and evaluate additional strategies. These are primarily strategies such as primary system depressurization for a PWR, for which there are significant phenomenological uncertainties and for which we believe additional research is needed. We do not plan to discuss that effort today either.

MR. SHEWMON: Sir, will part of that effort be the performance of the relief valves under repeated operation or is it of a different sort?

MR. BARRETT: I think primarily that that effort is to understand whether primary system depressurization will be successful, under what circumstances it will be successful in

depressurizing.

MR. SHEWMON: If the valves don't operate, that would be part of the lack of success or no?

MR. BARRETT: The primary research question is one of phenomenological uncertainty rather than reliable -

MR. SHEWMON: Is valves not operating phenomenological, I guess is my question, then.

MR. BARRETT: Well, I don't think that would be a major focus of the research effort but it's certainly a very important aspect of whether or not primary system depressurization would be successful. I don't believe -- perhaps the Office of Research can clarify -- but I don't believe that is a major question associated with this research program.

He says I'm correct.

MR. KERR: Is that because we already know that the valves will operate satisfactory or just because that's not being explored at this point?

MR. BARRETT: It's because -- it's because -- the question of whether or not the valves will operate is really more a question of how well they're maintained, how often they're surveilled and tested rather than whether or not they have been designed properly to open under system pressure.

MR. SHEWMON: It's not a matter of whether they'll open or not. It's a matter of whether you score holes in the

faces that are supposed to meet with repeated use and I would suspect that that might have more to do with the design and the materials they put there than the maintenance.

MR. BARRETT: I understand now. I misunderstood your question.

MR. MICHELSON: There has been a history of them not functioning properly also because of the adjusting ring on them to do the original setting. That thing seems to rotate out and they stick open, for instance.

MR. BARRETT: Yes. Brian Sheron of the Office of Research would like to address this.

MR. SHERON: Let me clarify. We haven't ignored the whole question of valve operability. The way we're approaching the whole issue, which obviously you want to depressurize to avoid a direct containment heating situation -- the first thing we have to do is we have to decide whether or not if one in fact did have a high pressure melt ejection, that one indeed would get containment failure.

This gets into the business of how strong is the containment and what are the loads that are imposed on the containment. We have a research program right now hopefully that will shed light on that. We are also doing calculations, looking at whether depressurization will in fact get the pressure down to where one needs to have it if one is to avoid this DCH, presuming that if you've got a DCH, it would lead to

a containment failure.

The initial approach on that is to assume the valves operate as they are designed. If we conclude as a result of our studies that it is necessary to say require all PWRs to depressurize in order to avoid a DCH problem, then we would have -- we would address the question of, are the valves qualified. Do we have confidence that they'll work? If it comes down to the point that it is required in fact to avoid the early containment failures in the area, then my guess is we would probably have to address that and take some action.

But until we kind of reach that point, I think 1150 for example, took into account the possibility of PORVs failing when they did their studies of the deep depressurization. So, that was accounted for. There was some probability assigned that valves would fail.

[Slide.]

MR. BARRETT: THe NRC's accident management program has from the very outset been a closely coordinated effort on the part of Office of Research and NRR. The principal responsibility within NRR is within the Risk Applications Branch which is in turn within the Division of Radiation Protection and Emergency Preparedness. Frank Congel is the division director.

The research effort is in the reactor and plant systems branch. Lou Shotkin is the branch chief and in turn,

that is in the Division of System Research and Brian Sheron is the director of that division. The first presentation today concerning the nature and schedule and other matters for the generic letter, 8820 supplement, will be given by Bob Palla of NRR. His presentation will be followed by a description of the strategies themselves and the research work that has been done to outline the disadvantages and advantages of those strategies and that presentation will be given by Tim Lee of the Office of Research and his contractor from Brookhaven, Bill Luckas.

Are there any questions at this time before I turn the microphone over to Bob Palla?

MR. WARD: Richard, you said you're with -- are you with NRR?

MR. BARRETT: I am the chief of the Risk Applications Branch. My branch has principal responsibility within NRR for this program.

MR. KERR: I have a question, Mr. Barrett.

As I read the draft report, I guess it is from Brookhaven, I have difficulty knowing where emergency operating procedures end and risk management and accident management begins. Perhaps that dividing line is not important but it seems to me it is confusing since if we don't have a dividing line, since there already exists emergency operating procedure guidelines and emergency operating procedures and it appears to me that much of what is in this preliminary report could

readily if it does not almost automatically fall into that category.

On the one hand, there's a group within NRC that's investigating carefully emergency operating procedures. Now apparently there is another group that is investigating accident management strategies and it appears to me that there is a considerable overlap between these two. Is there some way that one can avoid what appears to me at least to be a possible area of considerable confusion?

MR. BARRETT: You are absolutely right. We have not defined any clear interface between where accident management starts and the EOPs end. With regard to these specific strategies that we'll discuss today, some of them will be perhaps in emergency operating procedures in the future in certain plants. In fact, many of them are already in the emergency operating procedures at some plants.

Others of these procedures will be implemented separately for a number of reasons, I can see. For instance, a procedure which overrides an interlock or which cross ties systems, you might want to reserve that procedure for your tech support center. You might want to have your engineering staff do an assessment on the spot before you implemented a procedure like that rather than putting it into the symptom-oriented procedures in the control room.

But you're absolutely right. There is no clear

boundary. Now, to avoid overlap, we have tried to involve the people in NRR who are involved with the EPGs, the emergency procedure guidelines, the emergency response guidelines. In the planning for the accident management program and also in the process by which we came up with these 20 strategies, at the time that we came up with the 20 strategies, we had a group of five people. One of them was Wayne Hodges who was the chief of the Reactor Safety Branch. That's the branch in NRR that has primary responsibility for the emergency procedure guidelines.

MR. KERR: In your view, do you think you were successful in avoiding this overlap?

MR. BARRETT: I think we have been successful to the extent that we can be. I think that to a certain extent, there is an overlap and it's somewhat unavoidable. I think that for instance, we'll find that when all of this is implemented at the utilities, some utilities will implement the given procedure in the ALPs. Others will implement it as a separate accident management procedure, depending on the way they do business.

We're trying to give them a lot of latitude.

MR. LEWIS: Can I ask a question?

MR. SHEWMON: Is it on the topic?

MR. LEWIS: Yes, it's on the topic.

MR. SHEWMON: Otherwise, I'd like to continue.

MR. LEWIS: Oh, it's not exactly on those topics, so maybe you should go first.

MR. SHEWMON: As I recall the regulations, there is a time when somebody declares an emergency and presumably that has some relationship to when the EOPs come into play.

MR. BARRETT: The entry into the EOPs --

MR. SHEWMON: Let me finish the question. I may be wrong on that. You can do that but from what I got from your answer to Kerr's question was that they sort of meld into each other and you don't even try to distinguish between when you have an emergency and when you have an accident.

I just wondered if there's anything else in the regulations that requires somebody to declare an accident and if they can be so co-mingled as you suggest -- or I understood you to suggest.

MR. BARRETT: Again, I think the question of declaring an accident, declaring so-called emergency action levels, as to whether you have an "alert," a "site emergency" or a "general emergency" is not completely coordinated. That decision is not completely coordinated with the decisions that are made. Those decisions are primarily regarding the off-site response. Those decisions are not completely coordinated with the decisions that are made as to how you respond to the emergency within the plant, whether you're -- whether or not you're in the emergency operating procedures, which emergency

operating procedure you're in.

So there is a fuzziness there but the question -- when we say "accident" as opposed to "emergency," we're not making a distinction that some circumstances are emergencies and some circumstances are accidents. That's just a terminology.

MR. KERR: Then why do we need to have the two separate terminologies if there's no distinction between then?

MR. BARRETT: I'm not saying there's no distinction. There could be a very big distinction.

MR. KERR: I thought you just said you made no distinction between them. Did I misunderstand you?

MR. BARRETT: We haven't clearly defined the limit where one ends and the other begins because that limit can be different.

MR. KERR: Then I misunderstood you. I thought you said you made no distinction between them.

MR. BARRETT: No, I think there's a strong distinction. Let me try and make that distinction.

The emergency operating procedure philosophy is to have a set of procedures that are completely pre-planned based on -- that a licensed operator can use -- based on his training and the symptoms that he observes, to take prescribed actions and I think that's the philosophy of the emergency operating procedures with some exceptions.

I think that some of these procedures that we're talking about, some of these strategies, may find their way into that framework but accident management goes beyond that.

Accident management program is intended to address the actions on the part of people who are not necessarily licensed operators but perhaps engineering people, people who have been trained in severe accidents, PRA, severe accident phenomenology, people who are in a position to step back from the emergency operating procedures and say that's fine. Operators continue working on those emergency operating procedures, but it is now time for us to begin to think about what's really happening here and to begin to sift priorities as to how the plant should respond. So accident management goes beyond emergency operating procedures.

MR. CATTON: That's right, but there's some -- there is a plant that has the accident management approach in place and they have the one system that's much like the procedures that we see today. Then they have a point that if they have to make a decision, the procedures are not achieving their intended function. They go down a different branch that's called accident management, and it's well defined. It's clear. You know when you achieve it, when you get to that decision point, and you can track it.

There's no confusion, no controversy, no conflict. I think that's what you've got to do.

MR. BARRETT: I don't know --

MR. CATTON: I would not want to be in a plant that follows the rules that you're sort of laying down.

MR. BARRETT: I do not know which plant you're referring to.

MR. CATTON: Well, it's Phillipsberg in Germany.

MR. CATTON: Oh, okay. I'm not familiar with that.

MR. BARRETT: I think that you ought to get familiar with it. The first paper in the NURETH conference in Karlsruhe describes some of this.

MR. CATTON: Well, we certainly will get familiar with it.

MR. CARROLL: An added complication you have to deal with, I guess, is that EOP's vary by vendor/owner group, also. My impression is GEs tend to go farther than the rest of them in terms of getting into the accident management area.

MR. BARRETT: Exactly.

MR. CARROLL: So you've got that whole tradition or structure that's in place to be concerned about when you start trying to draw lines.

MR. BARRETT: Yes. There's another important point, too, that I'd like to make, and that is that we're not starting from scratch on accident management. Accident management exists in every plant in this country to a greater or a lesser degree. Every plant has a tech support center; it has more --

some have very extensive sets of procedures and guidance for the tech support center for severe accident type conditions, others less so. What we're trying to do with this program is to get a set of guidelines to bring everybody up to a uniformly good set of accident management capabilities.

MR. WARD: You know, it sounds to me like you have made a pretty clear distinction between EOPs and accident management procedures. What I heard you say is that the EOPs are traditional procedures for the shift staff to use and to follow in the case of plant events. The accident management procedures are not really for the shift staff, but they're pre-thought-out guidelines for the plant management and technical support staff to use in the event of the rare accident that goes well beyond provisions that are detailed in the EOPs.

Now, the connection might be that as -- it seems to me there are two connections possible with the EOPs. As the accident management procedures or guidelines are developed, people may say, "Hey, there are some things in the EOPs that ought to be changed, or added to, or something."

The other thing is that as the accident is developing or emergency is developing, the tech support staff and plant management using these accident management guidelines will be developing ad hoc EOPs for the shift staff to use. But that's a pretty clear distinction to me, if that's what you mean.

MR. BARRETT: I think that is exactly the

distinction, but, as I pointed out, I could take a particular strategy, and I'd say, "I think this is an accident management strategy according to the definition you gave." But I know of plants today that have that strategy in their EOPs. And we don't want to say, "No, you've got to take that out of your EOPs and put it in your tech support center." We want people to work this problem within the structure of their own way of doing business. But you're absolutely right. That's a good definition.

MR. KERR: Mr. Lewis, you've been waiting. I started to say "patiently," but I'm not sure you have been waiting patiently.

MR. LEWIS: Oh, I have been waiting patiently. The problem I have is that my friends are way ahead of me. They're in the middle innings, and I'm still trying to buy a scorecard so I know who's planning, and I wonder if I could just -- I think it's on the same subject, as a matter of fact.

But as I read the front page of the handout, and read where you come from -- I'm not picking on you -- and I read from the bottom up, I find that you're from NRR, and I know what NRR is. Then I find that it's the division of radiation protection and emergency preparedness. I wonder if that means that emergency preparedness and radiation protection are not distinguished in NRR? I didn't previously realize that they were the same division in NRR, but they are? They must be.

MR. BARRETT: They are the same division. There are two separate branches.

MR. LEWIS: They're separate, but it's the same division.

MR. BARRETT: It's the same division.

MR. LEWIS: Okay. So the division contains two separate branches for emergency preparedness and radiation protection, you are telling me?

MR. BARRETT: Yes.

MR. LEWIS: Okay. Fine.

MR. BARRETT: And a third branch, which is the risk applications branch.

MR. LEWIS: Okay. Fine. But I just wanted to know about these. Okay. So it's that these branches are combined. I'm working my way up.

Then I find that within that division, there is a branch called risk applications. I didn't know there were applications of risk, but I'm willing to be educated. Could you, in one sentence, say what risk applications means?

MR. BARRETT: Yes. After the reorganization of NRC a few years back, the role of PRA was divided, and the traditional role of reviewing the utility PRAs and doing research on PRA methodologies went to the Office of Research. What remained in the Office of NRR was a small group, the risk applications branch, and the purpose of that group was to take

the results of past PRAs and try to apply them to NRR's activities.

I think the most outstanding example, for instance, is that we work a lot with inspectors in the regions to try to help them to prioritize what they're looking at in the plant to understand, you know, if you're going to, for instance, look at a valve, we tell them, "Look at this valve. This is a risk significant valve. This other one is a less significant valve." That's an over-simplified, but that's the applications of risk that we're talking about.

MR. LEWIS: Okay. Fine. It was seven sentences, but I won't quibble. So risk applications doesn't mean risk applications; it means applications of risk analysis.

MR. BARRETT: Exactly.

MR. LEWIS: Okay. Fine. I'm working my way up there. And finally, it says that you're a senior reliability and risk analysis. Is that because you have two separate skills, one in reliability and one in risk analysis, or is that the distinction is not clearly made within the branch? I'm not picking on you; I just want to know.

MR. BARRETT: Okay. First of all, that's Mr. Palla you're talking about. He'll be speaking next. I'm the branch chief. And we -- reliability and risk -- well, I guess the distinction there would be that we -- in the PRA business, as you well know, there tend to be people who are very good at

doing the so-called front end, the reliability aspect of equipment and human errors and that sort of thing, and we tend to think of them as reliability experts and front-enders. We also have people who are more adept at the phenomenology of source terms, containments, and off-site consequences, and we tend to think of them more as risk analysts.

MR. LEWIS: I see. And you are both?

MR. BARRETT: I'm the branch chief. I'm not sure I'm either.

MR. LEWIS: Well, no, it says here that you're a senior reliability --

MR. BARRETT: You have the wrong person. You have the wrong person.

MR. LEWIS: Oh, I'm sorry. Forgive me.

MR. BARRETT: That's Robert Palla.

MR. LEWIS: I'm not picking on you. I really missed that. Okay. I apologize for that. Okay. But there is a title called "reliability of risk analyst," and it is somebody who's expert in both --

MR. WARD: He's the next speaker.

MR. LEWIS: Forgive me. I lost the sequence of events. Okay. Fine.

MR. CARROLL: He is a manager.

MR. LEWIS: He's a manager. I understand. Managers, as you well know, have no expertise in anything. Okay. Fine.

I was just trying to find out who the players are because all of the conversation has been about the separation of risk management from other things, and I wanted to get it straight.

MR. BARRETT: Who's in charge of what. Okay. Very good. Thank you.

MR. KERR: Any other questions? One additional question. You commented early on that many of these examples that are given had come out of PRAs, and presumably, therefore, one has some indication from the PRAs as to the risk reduction that might be associated with the strategies. The report, however, does not mention this at all, and it would seem to me, if that information existed, it would be useful to the people who are planning to use these strategies to include it in the report.

MR. BARRETT: That's a useful suggestion, yes. I couldn't say off hand how much of an effort that would be to pull that together.

MR. KERR: It's not a question; it's just a comment.

MR. BARRETT: Yes.

MR. KERR: And finally, it strikes me, from some of the things I have read in other situations, that some of the suggested strategies would be illegal under existing NRC rules. Some of the cross connection, for example, would leave one in a situation of violating single-failure criteria. What is a licenses supposed to do about this? He does not receive any

guidance in the reports, as far as I can see, that says, "Wait. This may be illegal, so don't do it unless you are prepared to violate NRC rules, and if you do, you'll probably get cited for it."

MR. BARRETT: You are absolutely right. Many of them -- and that's primarily why we wanted to put together this report, to point out the disadvantages -- many of them are not only illegal, but they're illegal for good reason. They have potentially major downside effects. However, in a situation where you have gone beyond the design basis, and you're in a serious accident, then you do reach a point where you are authorized to say, "Well, I think I'm at the point now where I can deviate from emergency operating procedures. I can do extraordinary actions to try to save this plant."

MR. REMICK: There are provisions in the regulations for violating procedures, or tech specs, I believe, in case of emergency.

MR. PALLA: It's 50.54(x).

MR. CATTON: I believe that's why the Phillipsberg -- they have two stems on the procedure. When they reach the decision point, they go down this one where they can do these things.

MR. KERR: That's all well and good, but that says that you can't make any plant changes that are permanent that might be valuable in the case of an emergency. You have got to

wait until you or the NRC decides that an emergency exists before you can do these things. IT strikes me that some of these suggested strategies might profit from pre-connections and rearrangements. I don't believe, in terms of the report, I don't believe enough thought has been given to the possibility that some of the regulations may need to be revised if we are serious about accident management.

MR. BARRETT: I understand your point. We worried about that a lot.

MR. KERR: Well, it seems to me something other than worrying about it might be worthwhile.

MR. BARRETT: Let me give you an example. I think there are some cases, for instance, where we talk about cross-tying an electrical system. There's an obvious downside to doing that because if you have a fault in one, you can create a fault in the other.

So the wording has been changed in some of the suggested strategies so that the wording says that you should have available the capability to do so.

MR. KERR: That is precisely the point I was trying to make.

Now, we now have available tools, which presumably were in existence, but they were not well known when our current regulations were formulated. Wouldn't it make some sense, in those cases in which one is not sure about the

or downside, to do some risk analysis? And it may be that some of these rules that we have are obsclete because they don't take into account the risk reduction that might be achieved by cross-connections which are now illegal.

MR. BARRETT: You may well be right. It may well be a good time to start thinking about some of these things. But I think, in the cases we're talking about here, there are good reasons why these things are forbidden.

MR. KERR: And the good reasons are existing regulations, and my point is that these regulations were formulated without giving thought to risk analysis, and they may therefore be obsolete.

MR. BARRETT: You are right, there may be a lot of things like that that are obsolete. We'll take that as a suggestion. Do I understand you to suggest that that's something that should be done on a separate track?

MR. KERR: it seems to me that it ought to be done when one gets serious about accident management. If one is not serious about it, and is playing with it, then I suppose you don't need to do it, but if you're really serious about accident management strategies, it seems to me one ought to take into account the only tool I know of that we have to assess the risks associated with doing various things.

MR. BARRETT: Well, I guess I go back to another example. There is good reason for having the MSIV to shut

under certain circumstances, and there's good reason under many circumstances, perhaps most circumstances, to keep it shut.

The kind of circumstances we're talking about here are very remote and unlikely. Compared to the circumstances under which you would want to have it shut, the circumstances under which you would want to reopen it are much less likely.

MR. KERR: I would like to see the risk analysis that demonstrates this. Is there one?

MR. BARRETT: No. I don't know of a comparison risk analysis of that.

MR. KERR: It might be interesting to do one.

MR. BARRETT: You're right.

MR. KERR: Mr. Lewis?

MR. LEWIS: On the same related point, I recall that after Three Mile Island, there was an INE report -- I think it was 0600 or something like that -- that made a great to-do about the fact that the operators at TMI had not only done bad things, but had also violated regulations at the time, and that was never pressed very hard. But I remember, at the time, saying that the situation in aviation is entirely different in the sense that a pilot always has the authority to say, " I declare an emergency," in which case he is guarantied immunity from any subsequent punishment for violating any rules. He may be punished for bad judgement and things like that, but not for violating rules.

I remember raising the question after TMI and being told there was adequate provision in the regulations for the operators to do that, but it was never clear to me that there really was, and what I've heard this morning is that it is clear.

MR. REMICK: They were added later than TMI.

MR. LEWIS: And they are quite clear, and --

MR. REMICK: Well, that's always questioned. I don't know. I know they were added somewhere in the early '80s.

MR. LEWIS: I see. Okay. Fine.

MR. REMICK: Am I correct? Does the staff agree with that?

MR. KERR: Where would one find this?

MR. REMICK: We were told 50.54(x).

MR. LEWIS: Okay. It would be very nice to see what they say and learn whether operators are told during their training that they have that option, because that's at least as important.

MR. REMICK: Bill, going on with what you're talking about, one thing that the staff might do in the generic letter, you might encourage licensees, in developing the accident management strategies, if they encounter cases where the regulations are inhibiting them from an optimal solution and so forth, that they identify those to the Commission, since they're going to be developing their strategies, and if they

run across this type of thing, it would be good to identify it, and then, perhaps, those regulations could be looked at.

MR. KERR: That's a good suggestion.

MR. BARRETT: Good suggestion. Thank you.

MR. LAUBEN: Norman Lauben, Office of Research.

Do you want me to address risk reduction implications of what we're doing at this point, or should I wait until some later point?

MR. BARRETT: We'll leave it up to you.

MR. KERR: If there is a point at which this is going to be discussed, fine. I'm in no hurry.

MR. BARRETT: Is there a natural point at which to discuss this?

MR. LAUBEN: No, there's not, because that's not addressed in the document.

MR. KERR: My point was simply not a question but a suggestion that it might be useful to the people who would use this report if they had that information.

MR. LAUBEN: Okay. Let me just address it, then, briefly.

There is a Sandia report, the title of which is "The Risk Management Implications of NUREG-1150", where they attempted to address already-in-use action management schemes and some proposed ones and put those into the PRAs to determine what the risk reduction was, similar to, I think, what you're

talking about the Germans did.

Those kinds of things that they looked at in NUREG-1150, principally because they are the kinds of things that were being proposed by the plants after the 1150 work was done were in the area of what we call preventive measures, in the same way that the work that's going to be talked about today is preventive, and not surprisingly, since it really only dealt with preventive and not mitigative strategies, the risk reduction numbers didn't look quite as large as what the Germans have done.

The German program is pretty aggressive in terms of what they require the plants to do, and they've made a very aggressive move towards eliminating high-pressure risk and that sort of thing, and they also have fewer types of plants that they have to deal with, but our intention is -- in fact, we have a program -- a joint program with the Risk Applications branch in our division to look at mitigative strategies -- to have Sandia look at mitigative strategy in the same way they looked at preventive strategies for this previous report that I spoke of.

We plan to do that. It will get underway this year, but it hasn't started as of yet.

MR. CATTON: I kind of remember that the two orders of magnitude were in stopping the accident before they got into real trouble.

MR. LAUBEN: Well, some of it was their venting, as well. They have extra-large feedwater addition. They had aggressive depressurization and that sort of thing.

MR. CATTON: And aggressive ways of getting more water into the system.

MR. LAUBEN: Right, but it was also they gained a lot in time, too, to recover from the accident.

MR. LAUBEN: That's right.

MR. KERR: Mr. Carroll.

MR. CARROLL: Isn't this two orders of magnitude in the beholder's eye inasmuch as it really depends on what you define as accident management and what you define as emergency operating procedures? The two orders of magnitude are with and without "accident management".

MR. LAUBEN: I think that the two orders of magnitude would be in areas that we would consider still accident management, although we might consider them as much preventive as mitigative, but there also is the point that a lot of these -- and I think I implied it and maybe didn't state it directly. There are significant hardware changes that were installed to achieve this risk reduction.

MR. KERR: Mr. Lauben, I guess I would have to interpret your comments, if they were in response to my suggestion, to say that there really isn't much risk reduction associated with these measures in this report and so, you

didn't put them in.

MR. LAUBEN: No. The kinds of risk reductions that appear in this report are, indeed, the kind of risk reduction measures that are being discussed and that will be discussed in this report. Those are exactly the kind.

MR. KERR: I don't find them in the Brookhaven report. Where are they?

MR. LAUBEN: You don't find the measures or you don't find the numbers?

MR. KERR: I don't find the numbers.

MR. LAUBEN: Well, that's right. There was no attempt to make numerical estimates of risk reduction simply because, in a lot of cases, it's extremely plant-specific. In fact, in most cases, it is. So, we did not ask Brookhaven or PNL to attempt to quantify the risk reduction associated with those measures. However, the Sandia report would indicate what the approximately magnitude of those kinds of risk reduction measures would be.

MR. KERR: My impression, from reading the background material, is that Brookhaven did not do a lot of de novo work here. They were asked to look at existing reports, including the Sandia reports, and dig out this information from these voluminous reports and put it in a smaller report, and I applaud that. I'm simply saying that since the risk reduction must have been in the same reports, it therefore seems to me it

might have been useful to include that -- maybe I'm wrong -- because in the implementing strategy, whether you decide to do it or not, it seems to me, could depend on where you think it is likely to reduce risk and how much.

MR. BARRETT: I'd like to make a point here about that.

Remember, the process here is that we're putting out this information to the industry to be used in the process of performing their IPEs, which, based on the responses that we've gotten back from the utilities so far, those will all be PRAs. So, every utility will do a plant-specific PRA, and what our generic letter is asking them to do is to evaluate these in the context of their own PRAs. It's difficult to evaluate generically what the risk reduction of adding another water source is, unless you have a sense of how many water sources --

MR. KERR: Mr. Barrett, you refer to reports that dealt with five plants, I think. There are numbers in these reports, and I don't think anybody would necessarily think it applied to his plants, but since those numbers exist and are readily accessible, since you dug out all this other information, it isn't clear to me why you didn't dig out the numbers, as well, because I think the numbers are relevant.

MR. LAUBEN: That report is, I think, about 3 weeks old now -- the Sandia report. I imagine, if we wanted to, we include it by reference into the report and people could read

this and they could see what the risk reduction effect is for those five specific plants where the risk reduction measures were looked at.

I don't think, necessarily, that those risk reduction options that were locked at in that report were necessarily as comprehensive as what we're proposing our work. It can certainly be incorporated by reference now, if that appears to be a useful thing.

MR. KERR: I had understood, from Mr. Barrett's earlier statement, that these things that you have in this report were put there because they were PRA-based. That was, I believe, the statement he made.

Now, to me, that means that they came out of analyses that included the risk reduction associated with these. What you're telling me now, apparently, is that only three weeks ago was the risk reduction number available. To me, that doesn't sound like that these things were PRA-based.

MR. LAUBEN: No. The report was, generally, though, but the people who were familiar with that work that went into the report were -- at least two or three of them were familiar with that work in the guru group that we constituted to look at this stuff. So, they knew of that work. The final report wasn't necessarily available, but they were familiar with the work.

MR. KERR: Good enough.

I simply made a suggestion, and it may be a bad one, because it's sort of ad hoc.

MR. BARRETT: I think it would be useful for us to try to reference some of the risk analyses that have been done, including this Sandia effort to pull some of them together. It's a useful one.

MR. KERR: Thank you.

MR. BARRETT: I'd like to make one more comment.

There was a discussion a little earlier about the question of when you go from emergency operating procedures to accident management and the difficulty that might cause for the staff.

One of the elements that we are examining, as part of the framework study that's the part of this accident management that we're not talking about today, is to give guidance on this very process of decisionmaking. Who is authorized to make decisions at what point? Who within a utility, for instance, is authorized to make a decision to vent the containment?

So, that is an element that is the program that we believe is a very important part of an accident management program, is to think in advance of how you're going to make your decisions.

MR. KERR: By the way, having 50.54(x) and (y) in front of me, I do not consider what is here to be very clear as to when and what action needs to be taken, but that may be a

personal difficult and not a general one.

MR. CATTON: Is it the fine print?

MR. SIESS: The question is you darn well better be able to justify it after it's all over if it didn't work and maybe even if it did.

MR. CARROLL: Sure, but isn't that reasonable? How else would you write the regulation?

MR. SIESS: Well, if the object is to write regulations, this is the way to do it. If the object is to help protect the health and safety of the public, there may be a better way.

MR. REMICK: I assume we're on time, Mr. Chairman.

MR. KERR: I always make that assumption.

MR. REMICK: Good.

MR. KERR: Especially when I'm responsible for it.

Is your presentation complete?

MR. BARRETT: I'm finished, unless there are further questions.

MR. KERR: Thank you, Mr. Barrett.

Who is next?

MR. BARRETT: This is Mr. Bob Paula, who will discuss the generic letter 88-20 supplement.

[Slide.]

MR. PALLA: My name is Bob Palla. I'm with the Risk Applications Branch of NRR and I'm going to give you a

condensed version of what I plan to talk about today.

I'm going to just briefly touch on a little bit of background that has led up to the issuance of the strategies. I'll discuss the nature of the strategies briefly. Tim Lee will talk about them in more detail and Bill Luckas after that.

I'll briefly summarize what the generic letter does and doesn't do, what it will require and what it won't require of Licensees and then finally give you the summary of the status on the letter.

[Slide.]

MR. PALLA: Accident management strategies, while not the focus of previous documents related to IPE and severe accidents have been brought up in several places. I just wanted to flag a few places in which this was the case.

In Generic Letter 8820, which initiates the Individual Plant Examination, it is pointed out that in the course of doing an IPE Licensees may identify actions that can reduce risk and Generic Letter 8820 encourages Licensees to implement such measures in the form of EOPs.

In the IPE submittal guidance document, NUREG-1335, Licensees were requested to report in their documentation on the IPE study any strategies that they identified through the IPE and took credit for in the analysis.

[Slide.]

MR. PALLA: In our Commission paper on accident

management, SECY-89-012, which we presented in January of this year, we described accident management procedures as one element of five in an accident management framework and we stated that NRC would be providing to Licensees a set of accident management strategies for them to consider in their IPE.

Finally, in response to our meeting with the Commission in a Staff requirements memorandum the Commission directed the Staff to provide Licensees such strategies on a schedule consistent with the IPE so that the Licensees could consider these and implement them if appropriate in concert with doing that analysis.

They asked that the Staff look at potential drawbacks of the strategies that could result in a reduction in safety and they pointed out that, well, the Licensees are to be cautioned on the implementation of strategies that could be misapplied.

[Slide.]

MR. PALLA: In SECY-89-012 we provided a list of 20 or so accident management strategies. These could be categorized into three general categories, such as conserving or replenishing limited resources -- for example, load shedding to extend battery life or throttling of containment sprays to extend UST inventory.

The second category -- using existing systems for

innovative applications. For example, the use of fire pumps for core injection in BWRs.

Finally, the feeding interlocks or overriding trips in emergency situations, and I have provided an example there. This is a potentially hazardous situation and we recognize it but reopening MSIVs is a good example of the kinds of things that we're thinking in that area.

We have performed some work at Brookhaven and Pacific Northwest Labs have evaluated these strategies further and with the primary emphasis to further articulate what the strategies are and to highlight some potential drawbacks that utilities should be aware of when they look at the strategies.

We plan to provide this new NUREG/CR as an attachment to the generic letter supplement and that's really all I want to say about that.

[Slide.]

MR. PALLA: It is important to know what the letter is doing, what it is going to ask Licensees for and more importantly what it doesn't require of Licensees.

The letter will provide the list of strategies, the same list that was in SECY-89-012 and it will provide a NUREG/CR attachment with the description of the strategies.

It will be provided in the context that it is information for licensees to consider. Now we encourage them but we do not require them to consider this in conjunction with

their IPE. We recognize that the timing is -- there may be a mismatch there. We would encourage it to the extent possible.

[Soun g of alarm system.]

MR. I A: We do not require any reporting of what they do with these strategies beyond what was already stated in Generic Letter 8820, namely if you do an IPE, find a strategy that you would like to take credit for and do so, then we should hear about it in the documentation but there is nothing new in this generic letter supplement.

We have made a concerted effort to not imply that these things should be implemented so it's strictly a situation where we're providing it for Licensee's to consider information.

MR. REMICK: A question: Nowhere could I find in this Supplement 2 any reference to training as appropriate of personnel if you do develop new strategies. Is that because it is covered in the 88-20 letter or Supplement 1? But I don't find the words "accident management training" anywhere in the document.

MR. PALLA: It is silent on training. Our thinking is we're mainly trying to put these strategies on the table for Licensees to consider. If they find one that they think is suitable for their plant and choose to implement it, I believe that training should be a part of the implementation of any of those but we didn't try to speak to that here. The purpose

here is just to inform them of the strategy and not to set, not to prescribe or to say anything about training that should go along with them if implemented.

MR. REMICK: But am I correct that the Generic Letter 88-20 or the Supplement 1 does talk about training?

MR. PALLA: 88-20 does discussion training, in a general sense I believe.

I am saying Generic Letter 88-20 on the IPE does include some discussion of the value, the need for training as part of procedures and yes, next year, when we -- really the main task of the accident management effort -- when we develop an accident management framework, this is a key element of that framework.

We will devote a lot of attention to training at that point but in this generic letter supplement, just strategies.

MR. REMICK: Thank you.

MR. KERR: Please continue.

[Slide.]

MR. PALLA: Okay, let me give you a brief status of where the letter stands right now.

NRR and RES staff has looked at the NUREG/CR in an earlier state and provided numerous comments on it. These comments were incorporated into the October '89 draft which has just been distributed back to the reviewers and we expect some additional comments but I'd characterize them as -- we are

expecting minimum comments.

We have had the Office of General Counsel look at the letter. They have completed their review. They have recommended and we haven't seen them yet but they are going to be recommending some minor changes to the language. The essence of their comments are of a cautionary nature. They are pointing out to us that this letter does not provide any regulatory basis for requiring anything. If we should go down the road a year from now and come to a plant that doesn't have one of these strategies we can't point back to this letter and say why didn't you have it? We told you about it in 88-20, Supplement 2. OGC is going to make a point to tell us that.

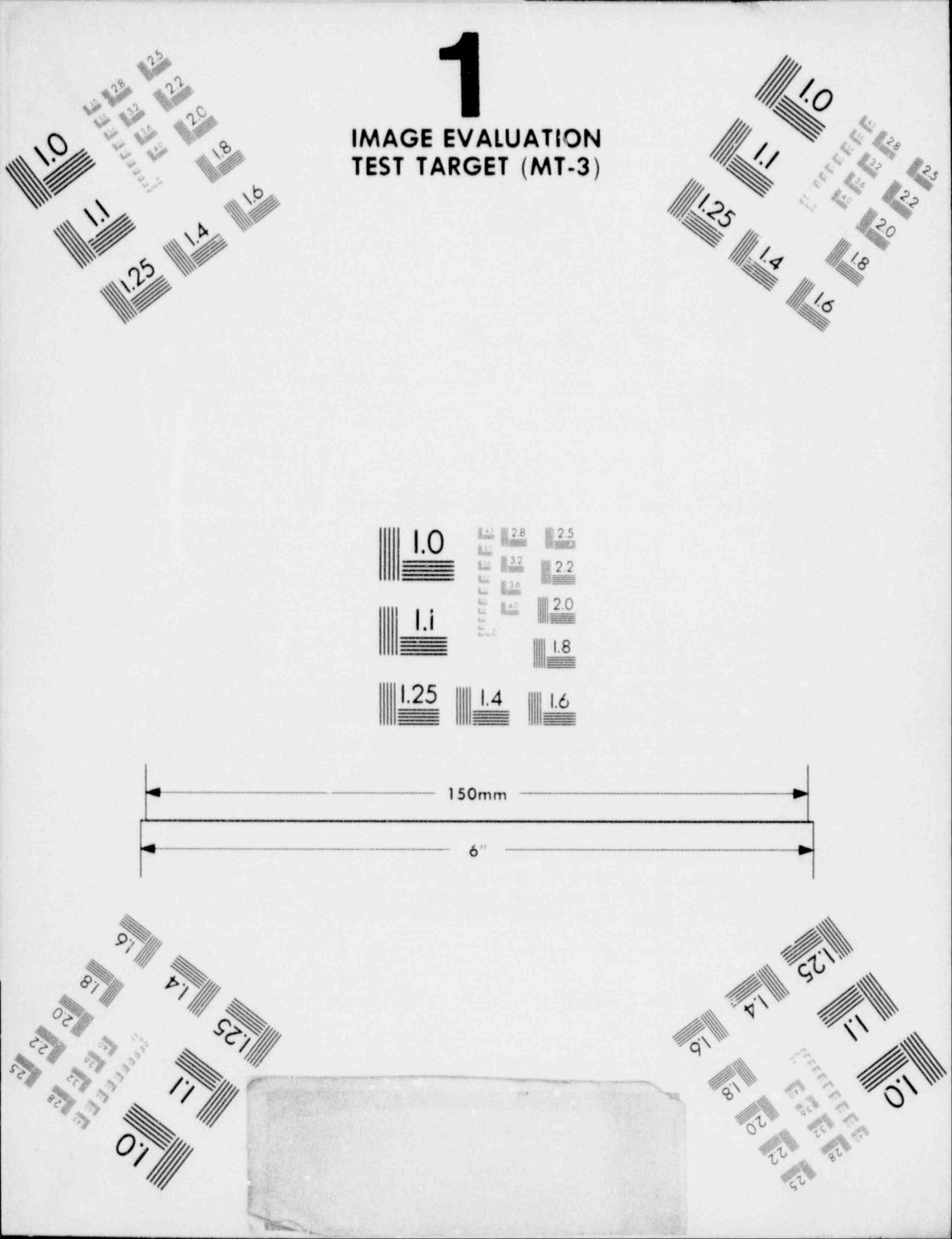
With regard to CRGR, I know when we talked with you last time we were planning to go to CRGR and have them review and approve this document before we issue it. The character of the letter has changed somewhat from the form it was in at that point. It is now much more clear that the information in there is to be provided for Licensees' information, no new requirements, and as a result, because it has no new requirements, we don't view CRGR approval as a requirement for issuing a letter.

We are providing it to them for their information with the request that if they feel it appropriate or if they feel additional action is needed to let us know and we'll discuss that further with them.

Finally, as recommended by ACRS in our previous meeting, I think ACRS was puzzled by the fact that we didn't have industry, direct industry input into this process. Now what I think what we didn't say at that time was that we do have industry input into the strategies in an indirect way because there many of them have been extracted from industry sponsored PRAs there was indirect input to it but beyond that, in follow-up to the ACRS comment, we have sent the document, the draft NUREG/CR to the NUMARC people with the request that they coordinate a review of the document with the owners' groups.

They have distributed to the owners' groups already and we have received some preliminary comments, feedback, verbal feedback from NUMARC and the indication is that the owners' group representatives don't have any problems with it. They think it looks pretty reasonable. They will be formally transmitting us a response on that by the end of November is their target, so we are trying to -- the point I want to make here also is that we want them mainly to look at the question of technical accuracy and inconsistencies with EPGs and EOPs, recognizing that these things might have come from people with different experience.

We don't want to take a strategy that maybe came out of a Westinghouse plant and give this thing out and then have it create a problem for someone with a CE plant so there is, I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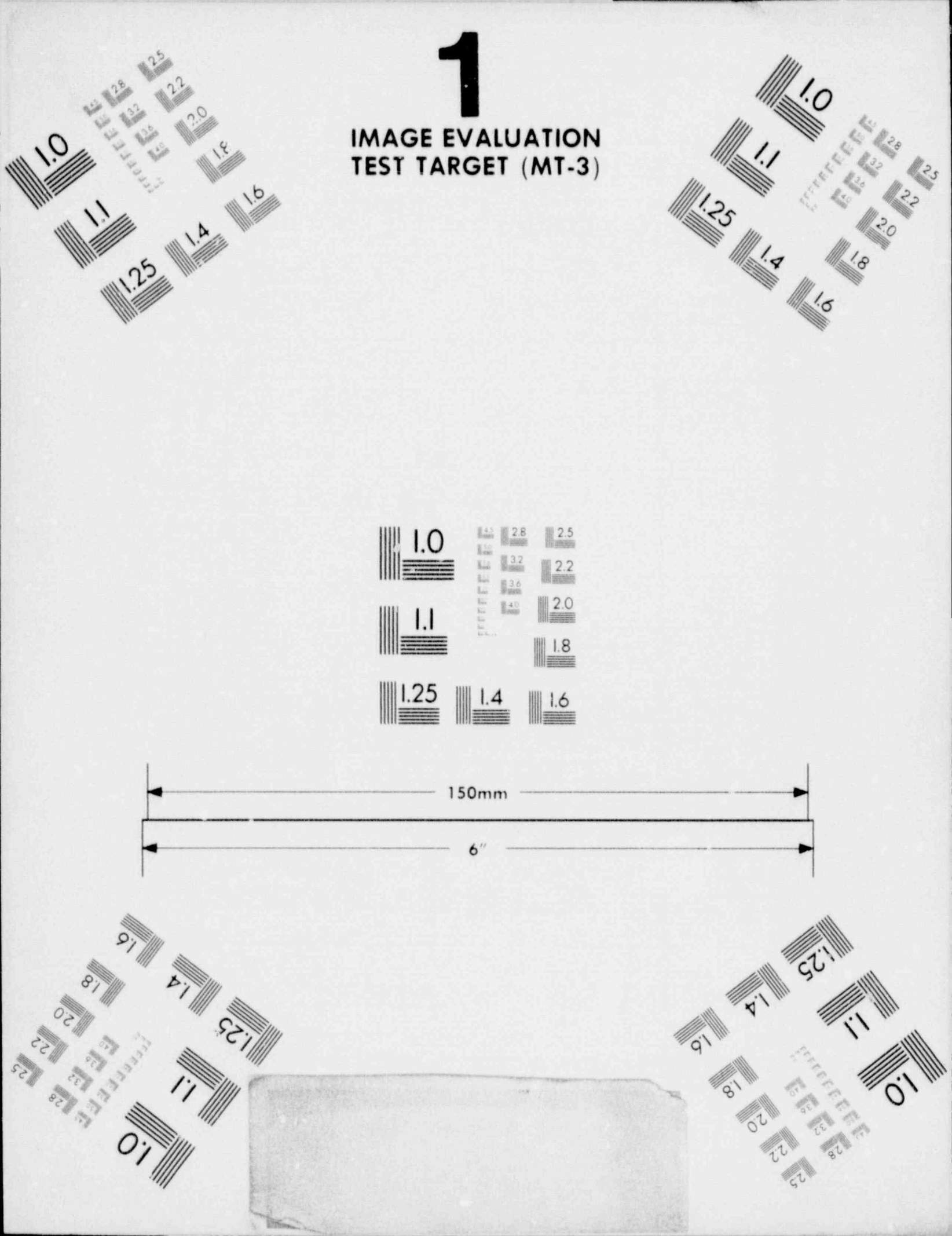
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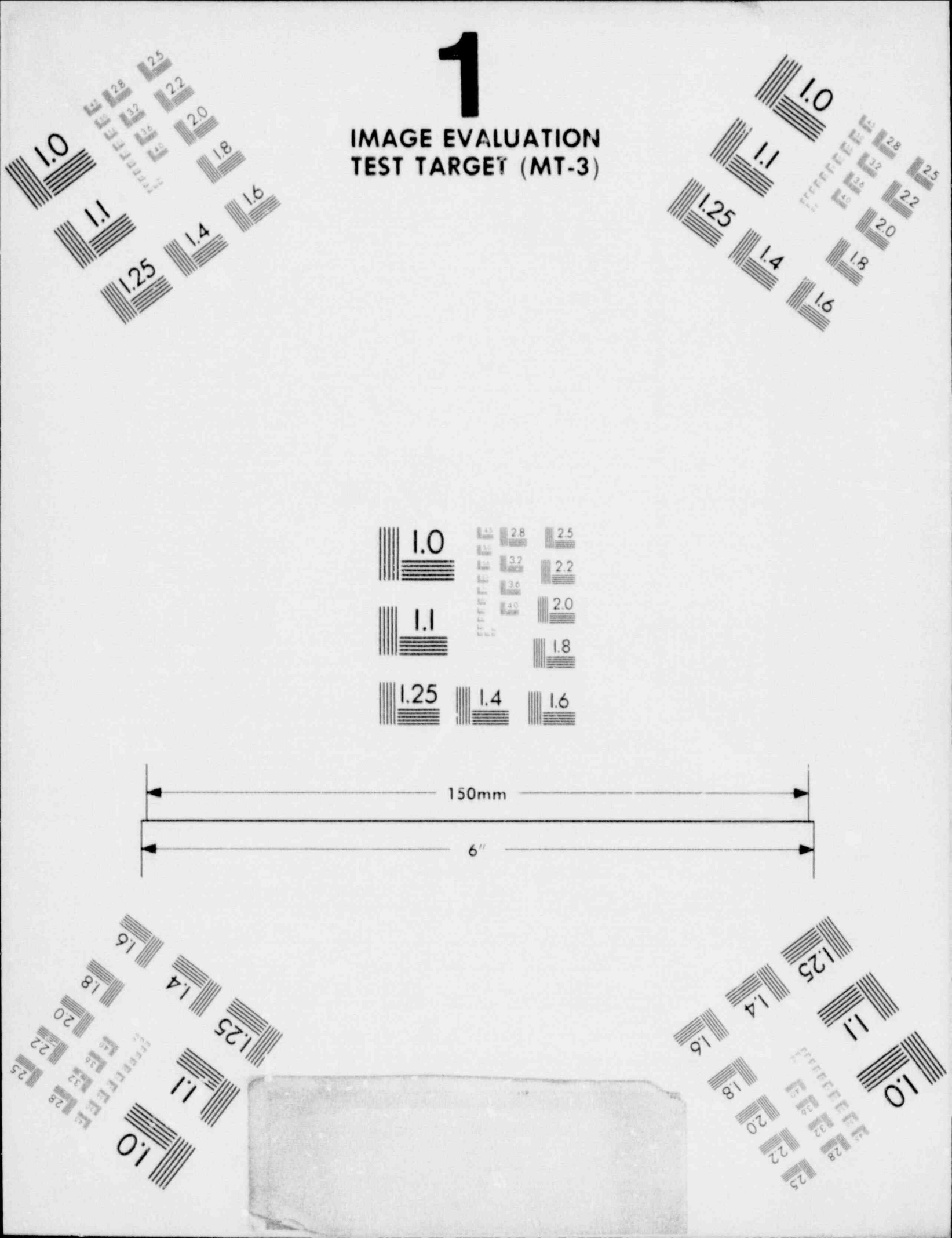
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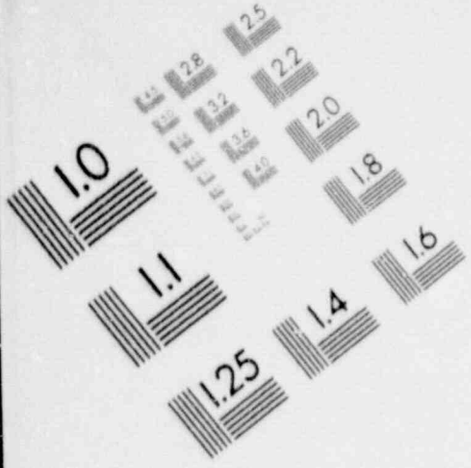
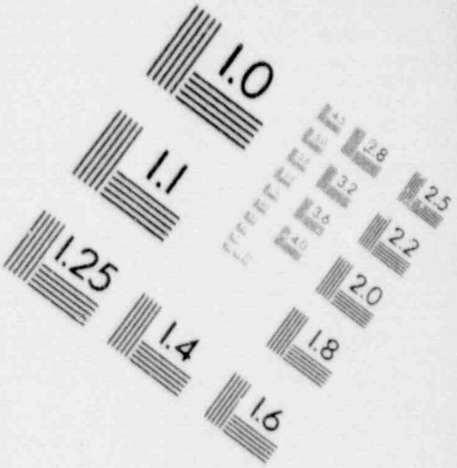
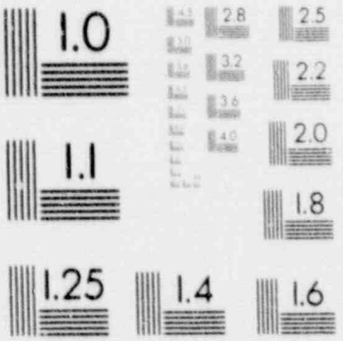
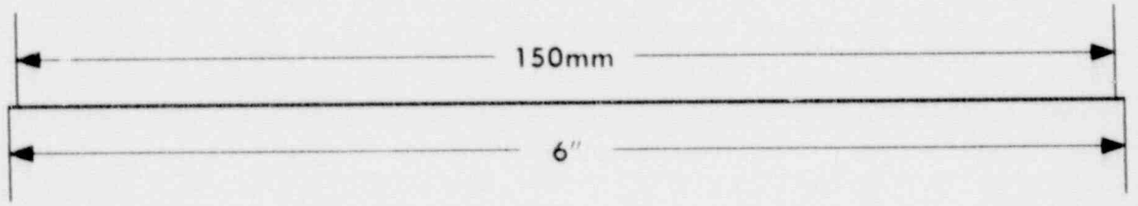
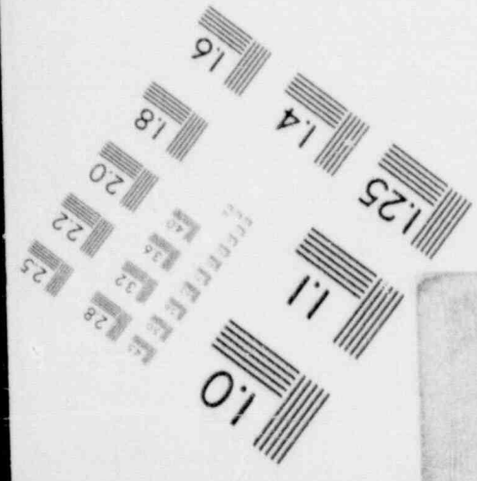
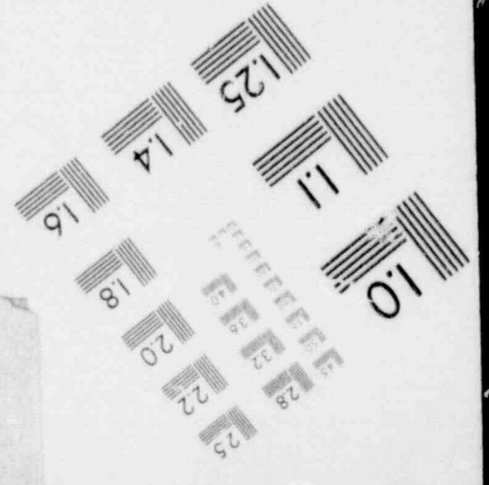












think it's beneficial to have them take a look at it and see if there is any rough edges on it.

[Slide.]

MR. PALLA: Just finally, the only point to show in the schedule here is to point out that we do still intend to go forward with this supplement to the generic letter in the December time frame. Again, it's subject to CRGR agreeing that this is not something that they need to look at very closely.

That's really all I wanted to tell you about the letter itself.

MR. REMICK: Question. If I recall -- and maybe I am getting mixed up on which IPE letter and supplement and so forth, but at one stage, and that I guess would be about a year ago, we had a presentation on this and if I recall, the Staff was proposing some immediate actions for Licensees, some kind of what they observed as good ideas and this is the proper letter that that was associated with and I assume that you have taken those out now, is that right?

There is nothing here that says we think you should immediately do this --

MR. PALLA: Yes. The original -- in our SECY paper, SECY-89-012, we had attached as an enclosure a draft of a generic letter and it did take a rather aggressive approach. I think it was before its time, in fact.

We have now taken a two-step approach. This

supplement that I am talking about will disseminate strategies.

MR. REMICK: Right.

MR. PALLA: The letter that will actually talk to the question of framework and accident management capabilities in a broader sense is the one that we're scheduling for next year and this will be after we have had a chance to review the NUMARC guidelines.

MR. KERR: Thank you.

MR. SHERON: Mr. Remick, let me just interject if I could. Brian Sheron from the Staff.

The Generic Letter 88-20 told the industry that, to use my boss, Denny Ross's phrase, "watch this space" in terms of accident management.

We did not provide them with any specific guidance other than to say that we did consider it part of the closure process. We did put in that letter a statement that said if you do come across as part of your IPE some strategy, some way, accident management that was very beneficial, please do not wait, hesitate to implement that at your plant in order for this, more structured -- do it now, don't wait.

The second thing which just may not have been pointed out here, keep in mind the NRC is in the unique position -- we are basically a clearinghouse for all PRA and risk assessment type of documents that are generated by the industry.

We get to see what all the industry does in the way

of PRAs and the like.

One of the concerns that the EDU had back when was that we were the repository and we were not disseminating the insights from these PRAs back to the industry. He was very concerned that we could be accused of sitting on information that would be of value of the industry.

One of the things he instructed the Staff to do was to gather these insights and particularly in the area of accident management. In other words, go back, look at the PRAs, find out the kind of things that the industry themselves had discovered and done, okay, to improve their plant as a result of their PRAs. Try and put them together into a general form, okay, and send them back out to the industry so that they had them and they could factor these in and that's what this letter tries to do. It tries to just codify all those insights that we got from the IPEs and put them in one place so that the industry can take advantage of them.

We were a little cautious because we didn't want to just put out everything so we devised what we call the A and B strategies.

The A strategies are the ones we're very comfortable with, that everybody says yes, we think these are a net benefit and that maybe the answer to Dr. Kerr's question -- a lot of it may not have had a big risk reduction but the risk reduction was balanced by the costs you might say. In other words, it

was not an expensive fix and they did see some reduction in risk.

These are the things that are in that letter and it's merely to inform the industry and get them up to speed with what we know.

MR. REMICK: I think that's good, and I think that and I believe I remember our comments from back then. It's easy to get these things mixed up from time to time. One is that in the original draft we say, apparently with the SECY document, it says develop accident management programs. Incidentally, here are some things that you should do now.

Our argument was, well, you ought to provide that information to them, but don't prejudge whether they should do it now. I think that's what you're doing. You're providing them with the insights, but you're not mandating date that at this time -- one of the things, I think, was the BWR owner -- the Rev. 4 of their -- I forget what those are -- guidance, EPGS. There are some things like that.

Our feeling at the time was, why are you telling people to do these things at this point, rather than giving them the information and allowing them to incorporate that into the development of their accident management plan. I think you're saying that that's the process or the procedure you're following now?

MR. SHERON: Yes, sir.

MR. WARD: Brian, I was interested in your comment about the NRC being the repository or the center of information on PRAs. I thought there were some PRAs that have been held by the industry and haven't been released to the NRC; is that right?

MR. SHERON: Yes, there are some that the industry has done which they haven't submitted to the staff, but I'm saying that when Utility X sends in a PRA and we see also the PRA from Utility Y and Utility Z and we look them, we're the only ones that can see whether, for example, Utility X missed a vulnerability that Utility Y found for their plant.

MR. WARD: And there is no comparable activity sponsored by the industry going on in this process?

MR. SHERON: I'm not aware of any. We actually --

MR. WARD: That's interesting.

MR. SHERON: We were a little bit concerned about that when we were developing the IPE letter. One of the things we told the Commission in the IPE Commission paper, was that we would perform this function when we reviewed the IPEs.

We were very afraid, -- let's, for example, take a generic -- like a plant with a Mark I containment. Suppose that we received 17 IPEs from owners with Mark 1 containments and the 18th one that came in uncovered some vulnerability that the other 17 forgot about of didn't catch?

We felt that that would be a function of the NRC to

go back to those other 17 utilities and advise them of what this 18th utility found. We're the only one that can do that right now.

MR. REMICK: Dr. Kerr, we're scheduled for a break at 10:00. Should we take it at this time?

MR. KERR: Let's do.

MR. REMICK: Okay, let's take a break and return at 10:15.

[Brief recess.]

MR. REMICK: Dr. Kerr, do you want to pick up where we left off?

MR. KERR: Yes. Dr. Lee, are you ready?

MR. LEE: Yes.

[Slide.]

MR. LEE: My name is Tim Lee, and I'm a staff engineer with the Office of Research, which is responsible for the NRC program to assess the Candidate Accident Management Strategies. We will just make a brief introduction of the program and then turn it over to Bill Luckas from Brookhaven to discuss in detail the results of their assessment work.

[Slide.]

MR. LEE: As has already been indicated, the purpose of this program is to point out the positive and negative aspects of features of strategies and disseminate the insight for possible use by the licensees in their conduct of IPEs.

We started with this document and identified strategies which were later reviewed by the group of NRC PRA experts and they selected about 20 strategies for further assessment. I would like to point out, in particular, that included in those surveys are the industry documents.

They include not only those from Seabrook, Vermont Yankee, and a publication by EPRI. The task of assessing the strategies are divided between the Brookhaven and PNL because of the time constraints. Brookhaven is responsible for putting together results form the two laboratories and to draft a final report.

The initial draft of the report was extensively reviewed by the staff, including instructors from the technical training center who has broad experience in the nuclear plant operations. The revised draft was issued in mid-October. That included all the comments that we received from this review.

This is a copy that we have submitted to you for your review and comment or approval and this is the subject that Bill Luckas will be discussing.

MR. KERR: What is an NRC expert group?

MR. LEE: Okay, just to name those; we have Matt Taylor from EDO, Cunningham from the Research Office, William Hodges, Bob Jones and Rich Barrett from NRR. We have people from AEOD, -- from the CTC later on.

MR. KERR: Thank you.

MR. LEE: We still plan to publish the final report by the end of this year.

MR. MICHELSON: Just to get some idea of how you do a PRA for some of these severe accident situations, for instance, in the case of post-accident response, you may wish to manipulate some air operated valves in the plant, particularly on PWRs.

Does your analysis go to the depth of taking into consideration whether or not there are accumulators on the valves so that they could be operated? Whether the check valves on the accumulators would expect to work after sitting in the plant for forty years? Do you include considerations of whether the air system is even lost to begin with, what it's probability of failure for the particular severe accident situation that exists?

This would be very important in the case of relief valves, for instance, that are often air operated and which you might want to maneuver during a severe accident. Do you know you've got air with which to maneuver them?

MR. LEE: Yes, we considered those situations, and actually, one of the strategies which you will see later, addresses that aspect.

MR. MICHELSON: All right, so if I go to a PRA, I can expect to see how those events were analyzed in terms of likelihood of happening and so forth?

MR. LEE: I cannot assure that you can find a number, but when these strategies are implemented, what will be the change in the resources of the plant.

MR. MICHELSON: At least they're being thought about and discussed in the procedures?

MR. LEE: Yes, we have considered those.

MR. MICHELSON: Thank you.

[Slide.]

MR. LEE: One of their recommendation we received form their expert groups during their review of the initial draft, -- maybe you should add -- I apologize for putting up this busy slide to cause eye strain, but one of the recommendations that we received from the expert groups is that maybe we should ask for some kind of a road map which can provide a clearer picture of the safety objectives of each individual strategy.

In response to this request, we have developed this logic diagram which, I believe, shows in a better perspective, the relationship between the safety functions to be preserved and applicable strategies under various accident conditions.

This diagram also shows the interrelations among the different strategies. The report you have is structured in accordance with this logical diagram. The numbers listed here are the Section Numbers in the report you have received.

With that, I will turn this over to Bill Luckas and

discuss each of the strategy in more detail, unless you have any general question beforehand.

MR. KERR: Thank you, Mr. Lee.

MR. CARROLL: What was your screening strategy to eliminate a number of candidate strategies? You indicated --

MR. LEE: A lot of the strategies were eliminated because they are largely uncertainties as to its usefulness or there is a potential for advanced defect. I didn't mention it, but we divided the strategies identified initially into two categories, A strategies and B strategies.

The A strategies are the strategies we believe are better understood and we can present to licensees' consideration immediately. The B strategies are those strategies with more questions which we will require more research to determine the uncertainties.

MR. CARROLL: So you may add to your list of 20 candidate strategies at some time in the future after you evaluate these?

MR. LEE: Yes, that was our intention. As a matter of fact, as Mr. Palla indicated earlier, we are planning a workshop on accident management and we hope to add some more strategies to the list.

MR. MICHELSON: Thank you.

MR. CATTON: Is the steam to bleed steam generators during secondary side bleed and feed so far down on the list

that it only deserves an asterisk or is it somewhere else?

MR. LEE: Mr. Luckas will discuss this.

[Slide.]

MR. CATTON: I see it down in the corner with an asterisk.

MR. LUCKAS: The strategies that Brookhaven and Pacific Northwest Lab are involved with are the ones that you see here. This was just to complete the idea of looking loss of a function; in this case, heat sink. That's already there. That's not a strategy to be looked at. That's there. It's in the plants right now.

So we're not looking at it. That's not anything additional. That's one that definitely is in the emergency procedures.

MR. CATTON: But there are strategies to make sure that you can maintain the secondary side feed and bleed when things happen.

MR. KERR: Ivan, I think his point is that he believes that this is already covered in the emergency operating procedures, so they didn't cover it here. Isn't that correct?

MR. LUCKAS: That's correct. It's already covered. We were just completing a process so if someone would have asked that question. In fact, by trying to explain it, we've made it more complicated. But now let me make it very --

MR. CATTON: I was told to refer to Section 3, and I looked at Section 3 and I didn't see anything.

MR. LUCKAS: This is a simplified diagram of what you just saw in this logic. My name is Bill Luckas, I'm a technical advisor, Brookhaven National Laboratories. My forte is an operational background, the same as the people from the TTC.

Our role in this was to assess whether any of these things really could be done. What I mean by really could be done is that they were feasible, within some sort of constraint as to being relative, that they weren't off the wall in terms of what it would cost to do.

I think, as Dr. Remick had mentioned earlier, one of the things that is implicit behind there is if they ever choose to implement any of these things, there's going to be a long hard look as far as what's required for the trading and the people, because in most cases this is a minimal impact on hardware and some great impact, or not so great impact on the personnel involved.

MR. KERR: Mr. Luckas, you said you had an operational background.

MR. LUCKAS: Yes.

MR. KERR: What does that mean?

MR. LUCKAS: I held, it's now expired, an SRO license on boiler water reactor, and also certified as an operator on a

pressurized water reactor.

MR. KERR: Thank you.

MR. LUCKAS: And the plants, as it if didn't matter, were Millstone & Zion.

[Slide.]

MR. LUCKAS: Now, what I would like to do -- bear with me, because there are 20 of these. We have one half hour to roam, if you will, through them. This is the first challenge.

MR. KERR: As a matter of fact, I would say that I don't think you should try to roam through all of them, but try to pick some representative ones.

MR. LUCKAS: No. I didn't mean that. I mean in the sense that I'm going to pick some. I'm going to take the strategies within a given challenge. These are those five boxes that I just showed you. We'll go down part way and then hopefully stop, unless there's one you want to see, but then that will jeopardize whether I'll get through any of the other ones.

We started this with the Subcommittee and we got so far. Anyway, this was the first one, this first challenge, having to do with insufficient coolant. There are a number of strategies that are implied, this idea of reducing sprays and interfacing system LOCA and so forth. You can read, as I was told last time.

In any event, let's go on and take a quick look at some of these.

[Slide.]

MR. LUCKAS: One of the things that they do in a plant -- now we're talking about -- and we have to look at these things and keep them separated between the two.

What we're talking about here is containment spray, really in a PWR, because what we're concerned about is keeping enough water for the injections of the core. Some would say that you -- I hold everything to the core and then I'd go worry about the containment. But the way our plants are set up right now, our Westinghouse, CE and B&W, there's a set point at which, at certain pressure in the containment, at which these things are going to fire off.

And if you look at what's being done right now, some of them address that if the pressure comes down, then you could cut down the spray; therefore, providing more water to the core. This is an example of what I was saying before. This is something that's actually being done and, therefore, when you look at this as an overall strategy, it certainly, at least in the context of some generic PWR, can be handled.

There are some concerns, if I had gotten to a point where I already core damage, where I'd be losing the ability for fission scrubbing, fission product scrubbing. There are other concerns. All of these have to be looked at from the

standpoint of the benefits and the downsides.

Again, as Tim Lee had mentioned, what we did was to identify the strategy, decide whether we've seen it's done or we think it can be done, looking through procedures, plant PNIDs, any number of things, look at whether the -- in this case it says it does, and then what else some of the concerns that may be associated.

Some of those may be extraordinary. They may be such that the utility decides I'm not going to try that, I really don't want to try to take advantage of that; in this case, providing water to the core in difference of taking some away because of some other concerns; namely, the containment itself.

So that's just one. I would like to just introduce you to a bunch of these.

MR. MICHELSON: Let me just ask a question, just to get a feel for the level at which these are explored. You say you're going to throttle the core spray discharge valves. I assume that in a particular plant, you check to see if you can even throttle the core spray discharge.

MR. LUCKAS: That's up to the plant. They've got the option to look at -- we're suggesting that they might -- they may decrease the flow. They may have the ability to do it this way, this way, this way, or they may say I can't do it all.

MR. MICHELSON: But these are just kind of guidelines of things to look at.

MR. LUCKAS: These are ways that we think that it's possible, and we've seen being done. I wouldn't suggest that somebody takes a gate valve, like we see, and start throttling with the thing.

MR. MICHELSON: You may not even be able to throttle a gate because the control system generally is full-open full-close and not intermediate throttling. So it's not even possible.

MR. LUCKAS: That may be so, but it also -- the other part of it is you may be getting yourself to a point in an accident where you don't care whether you can throttle it very well or not. You want to be able to perform that function that's necessary to be performed under those extraordinary circumstances.

MR. MICHELSON: The only caution, of course, is don't start misusing equipment that you might have to later adjust as well.

MR. LUCKAS: That's correct.

MR. MICHELSON: You might have to later close that valve, and if it won't close anymore, you may have done more harm than good.

MR. LUCKAS: That's correct. Again, from the standpoint of addressing the IPE, these are suggestions which they might consider based upon what we've seen done. If you take, for instance, as a -- we don't -- the intention was never

to identify this plant does this or that, but if you take a class most of the B&W plants do, in fact, throttle down. They maintain as the pressure comes down in the -- as the pressure comes down, they'll throttle back on these systems and hold a certain flow. They won't hold a certain -- they just won't let these things run out.

MR. MICHELSON: They were designed for maneuvering PWRs or not necessarily designed for maneuvering. They had different reasons on the BWR.

MR. LUCKAS: I said B&W.

MR. MICHELSON: Well, that's a PWR.

MR. LUCKAS: Yes. It's a PWR.

[Slide.]

MR. LUCKAS: Here is the one that we're all -- this is the one that I don't really enjoy talking about very much, because this is really -- I can remember when we -- let me just give you -- when we were up looking at -- it was an assessment a few years back of whether Seabrook could handle an interfacing system LOCA. We went through the details of the plant and we found certain things they could do and they couldn't do, and they would demonstrate that they had done it. They could demonstrate it on a simulator or they couldn't.

This is, again, just simply what would almost be -- I don't mean to say intuitively obvious, but there are some things which are not being done -- maybe not being done in

certain plants. They are or they're not. Which we found have been done in other plants by virtue of several research studies that might be of interest to help out.

Of course, this is the situation -- really, in the interfacing system LOCA we're really concerned about just bypassing the containment so we don't get any water back on the blowdown on the primary system.

Again, I'm not going to go through the level of detail, but there are real concerns about it. You've got to remember; you start playing some of these games. The best example of changing something and it almost got worse is what happened at Davis-Besse. There was a situation where they installed some new -- they installed this new logic and it got them into more trouble than it wound up being worth, at least from an operational standpoint.

[Slide.]

MR. LUCKAS: There are two parallel ones. Refilling the condensate storage tank in a BWR, and the next one is a -- you fill in the refueling water storage tank in a PWR. Again, there are many --

MR. KERR: From your operational experience, do you think this sort of thing would be almost intuitively obvious to the typical operator or is he likely not to have thought of it?

MR. LUCKAS: Dr. Kerr, I think I said when I mentioned -- I'm going to answer this. When we -- and I had

never experienced this before in all -- whatever operational background. I'd never been part of an emergency response drill in terms of watching it.

I just came back from one on the west coast and one on the east coast. We'll just leave the plants out of it for the time being. What it finally came down to, they challenged the operators to the point that they can get beyond the control room and they get their release and so forth.

Well, to do that is really extraordinary as far as humans are trained to mitigate and to prevent the consequences. They finally, in both cases, gave up and told them you're going to have to accept this as life. This is the way it is. I failed this, this, this and this, and there's nothing you can do about it.

Because what they do is right on the spot, sit down -- in the case of this one utility, I'll give them credit because the credit is due. It was Peach Bottom. They sat right down there and they wrote their change in the technical support center and it was a violation of the existing procedures, but their procedures call for them to write a change on the spot which then was not a violation of the procedure.

They did all of this. Having gone through this whole operator training in the 1970s as opposed to now, I was unaware of what support that the technical support center and the

emergency operating facility and all the rest of these could bring to bear to a situation to help the operator so he could just safely shut down the plant, and that was the whole idea of these organizations.

MR. REMICK: That is not the first case I've heard recently. The same thing. It's very difficult to outsmart the operators in the tech support, so eventually you have to tell them, look, you can't fix it so we can proceed with the emergency --

MR. LUCKAS: When it's a full blown accident and gets FEMA and the NRC off-site, it frustrates the operators because they really would like -- because -- well, of course, there's no consequence to this, but they're going to show what they can do, and they do it very well.

[Slide.]

MR. LUCKAS: This one is a little -- I didn't even really talk about the last one, per se. Both of them are the same. The idea is I want to get water back into the core, in a condensate storage tank in a BWR, or the refueling water storage tank in a PWR. The issue here is, though, I can always get condensate water back. I can get some water. It may not even be the greatest water, but I can get it back in the tank by gravity, by pumping it, whatever.

But when you want to put a little boron in this stuff, like to the tune of about 2,000 parts per million, this

gets a little bit more complicated. The normal makeup for the plants are such that they don't even bother worrying about it. However, the normal procedures say if the level gets low, make up at 100 to 150 gallons a minute, but when the accident goes, they say it's gone.

Now, it's very interesting that the 1150 analyzed plants made the changes so that they could take advantage of whatever they had at the plant at the time very comfortably. In other words, they said during an accident, they had somebody start to refill it. Even it would be inadequate, it was something.

So at least it shows that when you address it with a level at a given point and they want to take advantage of it, they put it right in the procedures, and there they were in the 1988 and 1989 versions of their procedures. Whatever they could do. I'm not saying that you can put mega thousands of gallons a minute back into this tank. I'm not saying that.

What I'm saying is there is some limited capability, but maybe that will help them. They have to look at that. Again, a concern is if I don't have borated water and I just put pure water in, well, then it could be a reactivity problem if I start shoving that into the core.

MR. LEWIS: I wonder if I could just raise a procedural question. I understand that these are just things for the plants to think about, but as I read the 50.54

paragraphs that allow a licensee to depart from tech specs and such things, they say a licensee may take reasonable action that departs from a license condition.

Now, reasonable is in the eye of the beholder. I wonder if by supplying this list, you're providing a definition of what is reasonable that will hold up in later post-accident reviews.

MR. CATTON: After an accident?

MR. LEWIS: That is inevitable after an accident.

MR. KERR: I think that needs to be addressed in the Staff, because he is Brookhaven.

MR. LEWIS: I see. Okay. Fine. I will address it.

MR. LUCKAS: Again, not having been that route, and the question being asked earlier, and it was asked at a subcommittee meeting, I would think that one of the ways that the utility deals with this is exactly what I said. They have their own internal procedures, which allows them to make changes with a quorum of people, engineering, operation or whatever, on the spot, and will do so. I am talking about paper, even if it is handwritten. Because in many cases, setting up for these types of changes is not something that can be done instantaneously, anyway. So they get five minutes and they all decide, they get a quorum.

I'm in there in the simulated control room, which happened to be the simulator room. And the word came down,

yes, they agreed with the operation staff, and they were going to go ahead and they were going to jury-rig one high pressure service water pump to another. And off they went. And I'm sure that was not in any procedure, the way it existed then. But more than likely, I suspect if I went up to TSC, I would have seen it, if I were concerned about that.

MR. PALLA: I would like to just take a second to say that no, that is not the intention, that this list of 20 is not meant to mean these are the reasonable ones, and anything else is not reasonable. And also, for many plants, these would not be reasonable ones. So that was not the intent.

[Slide.]

MR. LUCKAS: This is one which is almost intuitively obvious, and is in fact probably being done. And I fail to, I personally fail to understand what the concern is, except maybe it is the manual intervention. If it actually does not work from the control room, you need this source of water on the switchover when the water gets into the containment sump in the PWR. And maybe you ought to think ahead of time, as Dr. Kerr was mentioning before, what it is that you should need, such that you will be able to go into that area and manually open those valves, if that as all possible. But think about these things ahead of time, not at a time when all of a sudden it fails, and you say, oh-oh. Because we are beyond the space of allowing these single failures. We're beyond that.

So all of a sudden you've got all this water sitting in the base of the containment, you are almost out of this refueling water storage tank, or you can't make up to it -- that was one of the other strategies was how well you could make up to it -- and you need it, badly.

So a little bit of taking advantage of that. In this case, they do it. But this came out of the concern, out of I think in the Zion 1150. They kept saying the probability that it wouldn't work, that the switchover wouldn't. Well, you don't have just what is in the control room to make that happen, on either manual or automatic. You do have the ability, as big as those valves are, you do have the ability to think about whether you can or cannot get them open in the sump.

[Slide.]

MR. LUCKAS: This is the last of that group of insufficient coolant.

Now, this, when it was presented to us, and if you looked in some of the past records, was actually like two substrategies. And this really should be the last one that anyone should ever want to see, because if it has been portrayed as the way we understand it here, it says this is the ultimate cooling source. Some plants actually have lock-closed valves, keylock-closed valves, that could in fact take saltwater and put it right into a reactor. Obviously, that

means it is on the sea and it also a boiling water reactor.

If we are talking about a PWR, the same type of thing, only going to a steam generator. But if I can't get it any other way, that is the way I am going to get it.

But this is something that is coming out as a real possibility. Sure, there are tremendous downsides to this. But when you are out of water, as I say, that is why some plants have it actually, either there are spool pieces and there is nothing between the two, and all they do, it is all made up, though, and all you have to do is pull the blank and put a spool piece in place, and you can cross-connect seawater to the reactor in a boiler.

Others actually have the lock-closed valve. And others haven't thought about it. Is that important? It may well be. It is just a matter of the plant-specific design. Some may be physically very difficult to do, because of where these lines are.

What is very interesting, when we went back to the plants and asked them, the ones who were gracious enough to talk to us, they said oh, yes. You get somebody who is there a long time. Well, they have this cross-connection that was set up originally from the startup of the plant, back in 1973. And yes, they can do it. They showed me, and they were proud as heck to show me they could show me how you could do this thing. And no one else ever knew anything about it, except in that

case, usually what they were smart enough to do was to have between the two valves a tell-tale drain so that you could never let the one go back into the other and so forth and so on.

MR. MICHELSON: Has the Staff ever looked into the long-term post-accident consequences of using saltwater in the reactor and so forth? Is that worse than doing nothing at all? I don't know. I just wondered. Before I would push it as being a good idea, I would certainly at least make sure that you don't foresee problems. You are keeping in mind, I assume, post-accident means tens of days or maybe 100 days of operation. And I'm not sure I'd ever want to put saltwater in. But I hadn't really thought about it, and I was hoping somebody had.

MR. LUCKAS: But isn't it interesting, Mr. Michelson, that there are in fact plants that physically do? I can tell you by name

MR. MICHELSON: There are plants that do it, but have the plants analyzed whether or not it is a good idea to do it, or have they just said oh, I can get water that way if I need it?

MR. LUCKAS: I think that is all part of this IPE process. Do they need it? If they don't, I think the downside is for them to decide.

MR. MICHELSON: Has the Staff ever addressed this

question? Because if it is a bad idea, the Staff ought to bring it to the attention of the licensees.

MR. KERR: You are addressing that question to the Staff, I presume?

MR. MICHELSON: Yes.

MR. KERR: Is there somebody on the Staff who can respond to that? Mr. Barrett or Mr. Palla?

MR. SHOTKIN: This is Lou Shotkin, the Office of Research.

The question of saltwater, maybe you have in mind an economic question.

MR. MICHELSON: I can't hear you too well.

MR. SHOTKIN: The Staff will not look, does not look at the question of the economics of doing something.

MR. MICHELSON: It is only the safety that I was concerned with, not the economics.

MR. SHOTKIN: Yes. We do have, as part of our accident management program, looking into the effectiveness of long-term cooling after an accident. And this has not been addressed up until now. But we do plan to address it.

MR. MICHELSON: So you will lock at whether saltwater is a good idea or a bad idea?

MR. SHOTKIN: Yes.

MR. MICHELSON: From the safety viewpoint, of course?

MR. SHOTKIN: Just from the safety viewpoint.

MR. MICHELSON: Yes. That's the only one I was concerned about.

MR. LUCKAS: Actually, with a smile on my face, in 1972, in September, when they blew the tubes at the Millstone-1 plant, and we put saltwater into the reactor. So I mean, it has been done.

MR. MICHELSON: Oh, yes. But that was not a wholesale usage of saltwater, which I think you are proposing in this case. They didn't keep it there for 100 days, either.

MR. LUCKAS: Agreed. Absolutely.

MR. MICHELSON: They worked real fast at getting it out again.

MR. LUCKAS: Absolutely.

MR. MICHELSON: I just, I'm not quarrelling with it, but I sure hope the Staff looks carefully before we encourage it.

MR. LUCKAS: Again, from my perspective, if I were to do this in the order which I wanted, this would be the last thing I would have put down just in terms of try this one.

[Slide.]

MR. LUCKAS: Okay. That was insufficient coolant. And this is do I have the injection system unavailable.

And again, for each of these strategies, and the way it is in the document, there really is a sort of a priority associated with this. And what we are trying to do is make

better what is already there and then if it doesn't work, the alternate. So that is sort of, if you will, a prevention and mitigation if you will, or an alternate. And so that the order in which you see these things, they get more and more difficult to think about. Such as the last one that you just saw, from an operational perspective.

MR. REMICK: I have to remind you, Mr. Luckas, we have about ten more minutes on this agenda item. So you'll have to keep that in mind.

MR. LUCKAS: Okay. Fine.

So these are the types of things here. I think what I will do right now is just simply to pick out one out of this group, because there are some others that I do wish to address.

[Slide.]

MR. LUCKAS: This one here on protective trips, which would be, I guess if you bear with me, if you go through one, two, it says provide emergency bypass for injection pump.

Again, this again has the aspects of, I need this thing so bad that I don't want it to trip. But if it doesn't trip, I want it to keep going. Because if it doesn't, it is going to fail. That is what the trip was probably there for.

So this is again a challenge. We have this again later on the diesel generators, the same type of thing. There are right now on the diesel generators trips which are bypassed on an emergency start. There is the low-boil temperature and

the pressure in the crankcase, and also that's bypassed, because it is an emergency start. They want this thing to start. They don't want it to be taken out by something which, if you had the time, it was nice, and you wanted to protect everything and you wanted to make sure everything was hunky-dory like during the test, like a regular load test on it, you let it run. But there are things that are already done this way. I'm not proposing anything or leaving it to them. If there is something that they would want to pull off of theirs, that they would like to think about, if it is a matter of I'm going to lose it, or I'm going to lose it anyway, but I want to at least have it available during that time.

[Slide.]

MR. LUCKAS: Then if I go, and I am going to go all the way back a little ways to the next group, if you don't mind. And this is if I've lost, power loss. And this is sort of an arbitrary lumping, because we are talking about conserving power, non-essential loads. We are talking about resupplying with portable battery chargers and replenishing pneumatic supplies. And here is the one I was talking about, bypassing or changing the diesel trips.

Okay. And then there is a whole series of crossties. And these came out at a very specific analysis in 1150 where there were individual plants that just happened to have, for instance, a gas turbine, on top of a plant, the Surry plant,

which is the one that has two gas turbines. They are there. Does anybody think ahead of time whether you might be able to use them? We're not talking about qualifying them like they are safety-related. But they're there. But finding out that you just needed one little piece of something or other when you have the blackout and you need a source of power is not the time to start looking for it. And that what that means.

So again, when they do the individual IP, they can say, can I think advantage of that and what is the downside.

There is none in here that I would like. I would like to go to the -- and again, my apologies for jumping -- but we are going to go down to what is called "Challenges, Heat Sink Lost."

[Slide.]

MR. LUCKAS: And this is the next to last category of challenges.

The one that we have here, this is already done. This is already here. It is to re-establish the main condenser. And that is the only one that is really in that category that we have out of the 20. But it is important to note. And in having with Bob Palla just yesterday, that it looks like part of this is to be able to, the idea is, if the main steam isolation valves go closed, in some plants they will say it takes 50 to 100 pounds or 200 pounds pressure DP across the valves to get the valves open, depending on the plant. I

wouldn't even try. It is in violation. The valves shut for a good reason.

Now, can we go around the valves on the bypasses, which are on the order of decay heat capability? As long as we have the main condenser, as long as we have power to the circulating water pump -- this won't work in a station blackout -- then let's go ahead ans suggest it to them, see if they want to take advantage of that. Or, try to open those valves again.

But the big thing is you have to get the condenser vacuum back again, or you will literally take the main condenser and a few pounds of pressure and blow it apart.

MR. MICHELSON: No you won't.

MR. CATTON: Rupture discs.

MR. MICHELSON: Sure. That's what I was going to ask.

MR. LUCKAS: I'm sorry to sound dramatic. But the fact of the matter is what you are going to do is blow the steam into the turbine.

MR. MICHELSON: That you will do.

MR. LUCKAS: Okay. And the idea is not to do that.

MR. MICHELSON: Well, in this dire emergency which has led you to all these dire things, what is wrong with blowing the condenser diaphragm?

MR. LUCKAS: That is up to them to see what the consequences of that might be, if they thought so.

MR. MICHELSON: What I was going to ask is, is there an emergency procedure analysis that is gone through and decided under what circumstances it would be all right to use the main condenser even without vacuum?

MR. LUCKAS: Right.

Right now we are not proposing that. You will not get the bypass valves open right now, because they went shut.

MR. MICHELSON: Like a lot of other bypasses, you've got a fix for a lot of your other procedures, too, that you didn't even mention. Now you've got to go in and jerry-rig stuff to get this things open. But is that considered viable, then, to use the main condenser, even if you've got cooling water, but you just don't have your hogging pumps?

MR. LUCKAS: Is it viable? Sure, we could add that. I mean we could add it in the sense of do they want to try it. But they are going to have to analyze what the consequence of that is. That's what I meant by the fact that your -- the condenser will no longer be intact.

MR. MICHELSON: I assume they wouldn't try it if it isn't a part of their emergency procedure. If they don't have a procedure to do it, they probably won't try it.

MR. LUCKAS: No, there was no emergency procedure to do that.

MR. MICHELSON: Is it all right, though, to try things that aren't covered by an emergency procedure? Or is

that against regulation?

MR. LUCKAS: I think, at least from my neophyte perspective, that's what we're doing in many of these cases.

MR. MICHELSON: Well, you are leaving out a few things that you might be able to do. This is not ever thought to be a comprehensive list of every possibility, I'm sure. It's not so plant-specific, to begin with.

MR. LUCKAS: That's correct.

MR. MICHELSON: So I just wondered on the question, though, do the operators understand that they can try other things, even if they don't have an emergency procedure for it?

MR. LUCKAS: They can't do that now.

MR. MICHELSON: So you can only do things covered by your emergency procedures?

MR. LUCKAS: Emergency procedures, changes to those procedures, as determined by the plant staff and the technical staff supporting them during the emergency.

MR. MICHELSON: So they can conjure up a procedure, in other words, during an emergency?

MR. LUCKAS: I would suspect on the spur of the moment, with not having thought of this ahead of time, I don't think anybody would do that. The chance --

MR. MICHELSON: I thought you convinced me a little earlier that these guys would sit right down and write one if they --

MR. LUCKAS: I didn't say they would write one for anything and everything. I told you what they did write it for.

MR. KERR: We're running out of time.

MR. SHOTKIN: Mr. Luckas, could we interrupt? We would like Brian Sheron to wrap this up with what the staff is expecting or would like to ask from the ACRS. If you can spend the last five minutes on that.

MR. KERR: You won't feel hurt, will you, Mr. Luckas?

MR. LUCKAS: Excuse me?

MR. KERR: You won't feel hurt if we --

MR. LUCKAS: Not at all.

MR. KERR: Thank you very much.

Mr. Sheron?

MR. SHERON: I am Brian Sheron with the staff. Let me just wrap up quickly, if I could.

One is what you have heard, I hope, is that we have produced a document on strategies which were derived from the various spectrum of sources, which we believe is consistent with and in accordance with the direction we got from both the EDO and the Commission.

We think it is a pretty good document. It was developed and evaluated by PRA experts. It drew its information from just a wide spectrum of sources, both from within the staff as well as the industry. Basically we think

it is a pretty valuable technical document that the industry should get right away, and at least so they have it and can start using it to whatever degree they would like.

Also I would just point out, it is going out for comment from the industry. I think this is good. It's going to force them to read it. When you ask them to comment on something, it means they have to read it and provide you with comments as opposed to just putting it on a shelf. So I think we will get some good feedback from the industry on that.

Remember, it is just information, it is not a requirement to the industry at all. I think that the overall accident management framework development is still ongoing, so in other words, this is not the final word on accident management.

We are doing a lot more work on this. There is another generic letter, as you saw, that is planned for next year, and I am sure you will be seeing much more of what's down here, telling you about that.

I want to say I think we got some good comments from the committee today. For example, the statement that utilities should identify any regulations that they think are hampering them from optimally implementing the strategies I think is a good one. Because we are worried about that, too.

With regard to identifying the actual risk reduction of some of these strategies, I think what we are going to try

and do is see how best we can do that, whether it is by referencing documents from which the strategies were derived, or the like, and so the utilities can go back and look up exactly what the risk reduction was for that particular plant. I think we can handle that one,

I guess the real question is with regard to a letter, I guess I always have an opinion that if it's a good letter, we can always use it, we'll take all the help we can get. I guess we don't feel that it is absolutely mandatory, since this is a letter that's going out for just information purposes to the industry, and it's certainly not something we are asking for Commission approval on.

But, nevertheless, I think that if the committee feels that we are approaching this in a responsible manner, consistent with the guidance we have gotten, and if you basically concur in our approach, like I said, we would certainly appreciate a letter. It would always help us with regard to dealing with the Commission.

Likewise, I haven't heard any basic objections, but again, if there are any that the committee has, we certainly would need to know that before we went out with such a letter. And if there are any additional suggestions or so forth, again we would like to hear about those, to see if we can incorporate them.

So with that, that's the end of our presentation.

MR. CARROLL: Is there any intention, Brian, of asking industry to look at the ten or so strategies that you have put in the other pile and maybe argue that this one ought to be included, or that one ought to be included? Do they know what those ten are?

MR. SHERON: Lou, can you answer that?

MR. SHOTKIN: The B strategies are ones that involve a lot of uncertainty and phenomenology, might have some questions of cost effectiveness, and right now the staff is concentrating their efforts on looking at the B strategies.

If we come up with a B strategy that looks like it is worthwhile to give to the industry for their use, we certainly will.

MR. CARROLL: My question was, though, have you provided that list to NUMARC?

MR. SHOTKIN: Yes, I believe they have informally that list.

MR. KERR: Other questions of Mr. Sherpon?

Thank you, Brian.

One additional comment. There is in the publication from the office -- well, I guess this is a weekly news item, but this is from the Office of Nuclear Reactor Regulation for the week ending October 27th, and it has to do with an audit of the Turkey Point and St. Lucie Station blackout responses, and in their blackout response, they have devised an alternate AC

source existing diesel generators which will be available within 10 minutes for each plant. They have done this by a tie, this is a single tie between units. This tie is subject to a single failure and was rejected by the NRC staff as not meeting the single failure criteria.

Now I don't know any details other than that, but it occurs to me that it might be well for the group that is developing these procedures to keep in touch with NRR enforcement people to get some idea of what is the boundary between those things that can be done and those things that can't be done under existing rules.

Any further comments or questions?

MR. REMICK: Does the subcommittee have a recommendation about a letter?

MR. KERR: My own recommendation would be that we write a letter. I think the document is a worthwhile document. It would propose to say so. I have some comments, and if there are other comments that you would like me to add to a draft letter, I would welcome them; in writing, preferably, but I will take them orally.

MR. REMICK: Okay, any further comments?

MR. CARROLL: Just one other point that always has intrigued me in thinking about accident management. One resource all utilities have, or most utilities have, are either their own gas department or a local gas department, and these

guys have some amazing tools that I don't think many of us ever thought about in the nuclear industry. When a high pressure gas line breaks, they know how to come out with a magic hydraulic machine and crimp that sucker off and stop flow immediately. I think that is a resource that ought to be considered in your accident management strategies.

MR. KERR: Any further comments?

I turn it back to you, Mr. Chairman.

MR. REMICK: Thank you, and I thank the staff and their consultants for the presentation. We will go to our next topic, which is a discussion of adequate protection. Once again, attempting to understand the staff views and the ACRS views on adequate protection. Mr. Ward is our subcommittee chairman in this case, so, Dave, are the staff people here?

MR. WARD: Yes. We haven't asked for a presentation from the staff. We have some written material that we want to look at, and I will try to describe what it is we need to do.

If you look in tab 3, there is a letter to Mr. Fraley, beginning on page 6, but then the document that we want to consider is a draft document from the EDO prepared, I think, by Mr. Houston from the EDO to the Commissioners. It begins on page 7, and there are some aspects of exactly what this memorandum or SECY paper, whatever it would be, says that we want to consider.

I think we have got a little bit of a tricky problem

today in dealing with this, and let me provide a little bit of background.

You recall, of course, that the ACRS has commented fairly extensively on the staff plan to implement the safety goal policy. We have written several fairly lengthy, comprehensive letters, and I think we have influenced the staff to make a number of changes in the plan over the course of the last probably two years or so. The plan now is quite a bit different than the original proposal.

But we have not quite reached closure. There are still some points in the letter, some issues -- I mean in the plan, where we have -- there are some disagreements.

Our final letter, what I will call our final letter, at least our last major letter on the topic, was in February of this year, February 16th, and it described these several points in which we have not yet come together, and we were in essence -- the staff didn't offer any further reaction to that, and so in essence it was up to the Commission to decide which position it wanted to take where there was a disagreement.

The Commission has not yet done that. They haven't moved to the point where they would be doing that, but they have asked for clarification on one of the points of disagreement.

Apparently they understand all of the points of disagreement except for this one particular one which concerns

what the term "adequate protection" means, or at least how that term or that concept relates to the safety goal and concepts in the safety goal policy.

So they asked the ACRS and the staff to get together and for the staff to issue a paper that made the ACRS staff difference on adequate protection understandable to the Commission.

Now the ACRS, I believe, doesn't think this particular issue, the definition of adequate protection, is the most important of the several differences that remain, but it is the one which the Commission has requested this clarification on.

As an aside, I am personally concerned that the emphasis on this, worrying about the definition of "adequate protection" may be obscuring some more important problems with the safety goal policy implementation, some of which, I think, are really quite substantive.

We have some indication from the Commission staff that the Commission, or the Commission staff, at least, is aware of the differences and before doing whatever it is they're going to do with these differences, they want to have a better understanding of this particular one on adequate protection.

Okay, the staff has a way of trying to reach closure on this, at least clarifying what our differences are on this

one particular issue. The staff, Mr. Houston, I believe, has prepared this draft paper which begins on page 7 in tab 3, which attempts to explain the ACRS staff differences, I think without prejudice, so that the Commission can understand and make a choice between the two or pick a third choice or something.

I think the draft is quite good but in two or three places, it doesn't quite accurately represent the ACRS thinking. At least, I don't think it does, and I'll go over that in a minute.

The somewhat tricky part here is how we are to reach closure with the staff on what their paper is to say about what we mean.

MR. SIESS: Say that again?

MR. WARD: The Commission has asked the staff and we're expecting the staff to say in this paper what the ACRS means by something the ACRS already, you know, discoursed lucidly in its letter and obviously it wasn't understood.

MR. SIESS: Perhaps the letter is supposed to tell the staff what they thought the ACRS means. That's different.

MR. WARD: Perhaps, but I guess I'd like it to say what we really mean, if we could --

MR. LEWIS: We shouldn't say it through a staff letter to the Commission.

MR. WARD: Okay, well that's the point I want to

raise.

MR. SIESS: I think it would be nice if we could say what we mean.

MR. WARD: We thought we did but it wasn't clear.

MR. LEWIS: Really, there's a serious point here. We can't be in a position of essentially certifying a staff letter as saying what we mean.

MR. WARD: That's the tricky point I'm raising. How do you want to do this? We could for example, write a letter at this meeting which quotes the pertinent paragraphs in this draft staff paper and then says, that's not quite right. This is what we really mean. Or, we could today tell the staff what we really mean and ask them to get the appropriate words in their paper and give us a chance to review it before it goes on to the Commission. I don't know.

MR. REMICK: Dave, could I suggest a possibility?

MR. WARD: Sure.

MR. REMICK: I think you've covered it but I think you know, I differ with how the staff is characterizing what we wrote but maybe we could convince the staff to change their interpretation to something that's acceptable and then we could write a letter saying we agree with the staff assuming that we do, but then go on and remind the Commission that there are other things that we differed with and draw their attention to those without going into considerable detail, but just remind

them that we had other differences that we viewed as being more important.

So we would be writing a letter and hopefully might be in a position of saying we agree with the staff's characterization.

MR. WARD: Okay. That might be a good way to do it.

MR. LEWIS: I have a problem with that, Forrest.

It might work this time, but it's a bad habit to get into because meaning is conveyed not by isolated paragraphs but by context and take in this particular case in the staff draft thing, they've taken a paragraph that we wrote about our adequate protection and quoted it to the Commission and omitted the previous paragraph from our letter which provided the entre to the paragraph that they then quoted.

It's easy to do that and to lose the thread of an argument. The meaning of words have to be construed in the whole document. So I'm a little unhappy about our essentially providing approval of any staff interpretation of our views. I think they have a right to send it to the Commission and in general, we won't disagree if they've got it about right but I hate to give them a sort of gold star stamp of approval.

MR. SIESS: Maybe I'm just confused but it seems to me there are two different areas of agreement-disagreement.

MR. WARD: Could we get to that a little later?

MR. SIESS: No, I'm not -- I don't know what you

don't want me to say.

MR. WARD: Well, go ahead and say it. I'll turn off your microphone.

MR. SIESS: The Commission and staff requirements' memo presumably assumed that there is a difference between the staff's concept and our concept and they asked us to clearly identify the differing positions.

MR. WARD: Yeah.

MR. SIESS: They didn't ask us to agree with anybody -- just to identify the different positions.

MR. WARD: That's right.

MR. SIESS: Now one thing we can talk about is agreeing with the staff on a position. We may do that. That would be nice. Then we wouldn't have a differing position. We might convince the staff we're right. The other thing though is agreeing that the staff has properly identified our position.

MR. WARD: That's right. That's what we're talking about.

MR. SIESS: Now, why can't the staff state their position and we state our position and the Commission read the two statements and understand the differences?

MR. WARD: We've already done that.

MR. SIESS: Is there something that they're not doing it right or we're not doing it right?

MR. WARD: No, we've already done that and we did that in February. There were, you know, a number of issues covered in which there are differences. On this one, the Commission thought --

MR. SIESS: Adequate protection is all I'm talking about.

MR. WARD: Oh, okay.

MR. SIESS: The Commission cannot --

MR. WARD: They didn't understand from the two pieces of paper how this business works. It's all right. I don't understand it either.

MR. SIESS: So we're trying to explain the difference between the staff's position and ours.

MR. WARD: Yeah.

MR. SIESS: Somebody's trying to explain it.

MR. WARD: Actually the staff is trying to explain it.

MR. SIESS: And to explain it, first they have to know what their position is and second, they've got to know what our position is. Now presumably they know what their position is although I don't think I do and we don't think they know what our position is, assuming that we know what it is.

MR. LEWIS: I don't know what the issue is.

[Laughter.]

MR. SIESS: And I'm not sure how adequate protection

got into this thing in the first place because it wasn't in our letter.

MR. WARD: Yeah it was. It sure was.

MR. SIESS: It was very peripheral. The words were in there but the concept was secondary to everything else.

MR. WARD: No, that's right. We didn't see it as a major issue in the implementation plan for the safety goal but the staff did. It's their plan.

MR. KERR: One way of dealing with this is to say that we don't have a position on adequate protection because I don't have a position on adequate protection as it is legally used by the NRC. I'm not even sure I know what it means.

MR. LEWIS: In fact, I would go a little further than you. I wish I cared, because it's only a legal issue.

MR. WARD: I'm not sure it's quite that -- it's tempting to just wash our hands of it and say dismiss it and let the staff worry about it but I'm not sure that's --

MR. KERR: The issue is not adequate; the issue is backfit.

MR. LEWIS: You will tell us why we should care.

MR. SIESS: The staff's issue is backfit. That's always a staff concern and the backfit issue is where the adequate protection comes in.

MR. LEWIS: But that's through the legal issues.

MR. SIESS: I know.

MR. KERR: Dave, I don't think it's washing one's hands of something to say that one does not have a position on it if one does not.

MR. REMICK: But we do and I think we stated our position.

MR. LEWIS: Not for the legal issue. It comes in in the backfit rule because the courts rejected the backfit rule at the beginning because they said it's not legal to take into account costs and benefits if you're doing something that brings the plants up to an adequate protection standard but it is legal to consider costs and benefits for improvements that go beyond the adequate protection standard. The court established the words "adequate protection" as the line between which you have to do cost-benefit analysis or you don't have to do cost-benefit analysis.

I find I don't give a damn where the courts drew that line.

MR. WARD: You might not, but the Commission staff have to worry about it.

MR. KERR: I think the Commission made a mistake in not challenging that because to say that cost doesn't enter is absolute nonsense. Of course it enters. If you want to reduce the risk to zero, you shut down all the plants but the cost right now is too great so we don't do that.

Cost does enter into determining -- and indeed in

existing regulation, cost enters in Appendix I of 10 CFR 50. It enters very specifically and that's not a backfit, far as I know.

MR. REMICK: What we did in our previous letter indicate how we thought the safety goal should or should not be used with relation to adequate protection. We've made that statement. They've asked the staff to try to find out where do you and the ACRS differ on that point.

MR. KERR: If you're referring to the paragraph on page 2 of the staff's -- it certainly doesn't seem to me that defines what we mean by adequate protection. It simply says we believe that safety goals should play an important but indirect role.

MR. REMICK: Right. It's a relationship between safety goal and adequate protection.

MR. WARD: Go back to page 14, at the bottom right corner.

MR. SIESS: I think maybe they're misleading.

MR. LEWIS: The previous paragraph says that the term "adequate protection" is important in the legal areas. It's used with precision in legal instruments.

MR. KERR: If that's opposition, it seems to me that's clear, that first sentence.

MR. LEWIS: That's the only reason --

MR. REMICK: I spoke on how the safety goals should

be used in defining adequate protection.

MR. KERR: No, we did not. Where?

MR. REMICK: Let me read you the sentence. "We believe that the safety goals should play an important but indirect role in defining adequate protection." We addressed the question of how the safety goals should be used.

MR. LEWIS: That's in the context of the previous paragraph.

MR. REMICK: Of course. I'm aware of that.

MR. LEWIS: Which the staff omitted.

MR. KERR: But Forrest, to say it is an important but indirect role is so ambiguous as to be meaningless.

MR. REMICK: But then read the rest of the paragraph.

MR. KERR: I did.

MR. SIESS: Now read the third paragraph. That's the one that brings in the backfit rule.

MR. LEWIS: We're acting like scholars here.

MR. SIESS: That's where the staff came back and said we don't agree with it. That's where we said we don't agree with the staff.

MR. KERR: Well, again, to me that doesn't establish a position on our part. It says some of the things we don't believe, but it doesn't say what we do.

MR. SIESS: You have to get to the next page for that.

MR. WARD: That's cutting it pretty thin. I guess I'm a little puzzled by -- we wrote rather extensively on that in February.

MR. LEWIS: My memory is that we came very, very close to omitting those paragraphs about adequate protection because it was a legal issue, and we really weren't writing about legal issues, and we put it in, and it may have been a mistake.

MR. REMICK: We were commenting on the staff's implementation plan. They took up adequate protection in relation to the safety goal, and we felt compelled to respond to that.

MR. LEWIS: I guess that's why we did it. But it's a red herring.

MR. WARD: You would like it to be a red herring, I guess, but I don't think it is. It's there.

MR. LEWIS: No, no, no, lots of hounds follow the scent of red herrings, but that doesn't change their color.

MR. CARROLL: Well, what does the paragraph beginning on page 4 say about adequate protection? I don't think it says anything.

MR. REMICK: It's not defining adequate protection, it's addressing whether the safety goals should be used to define. We are addressing safety goal implementation plan, how should the safety goals be used.

MR. KERR: They should be used indirectly.

MR. REMICK: Is that what it says?

MR. WARD: That's right.

MR. LEWIS: It doesn't really say it. It says the safety goal should play an important but indirect role, and then it doesn't say what that role is.

MR. WARD: Well, that's what the next paragraphs say.

MR. LEWIS: No. It doesn't.

MR. KERR: The next paragraph discusses adequate safety.

MR. LEWIS: They are using the excluded middle.

MR. REMICK: Basically what we said in that paragraph was that adequate protection, we believe, should be meeting the Commission's regulations.

MR. KERR: Where is that, which paragraph?

MR. LEWIS: We say a suitable surrogate. That's a really important distinction. And the staff has ignored those distinctions.

MR. REMICK: "Ideally, compliance with the Commission's regulations is a suitable surrogate for defining adequate protection of the public. However, we believe that the adequacy of the regulation should be judged from the viewpoint of whether nuclear power plants, as a class, licensed under those regulations meet the safety goals."

MR. LEWIS: That does not mean that we equate safety

goals with adequate protection.

MR. REMICK: Absolutely, that's right, but the staff says we are, and that's where they're wrong.

MR. LEWIS: They are wrong, and we should say they're wrong.

MR. REMICK: I agree. But they are trying to understand. Wayne is here to try to understand what our position is.

MR. LEWIS: Well, let's explain that it is a syllogism.

MR. REMICK: And when they say "equates," I think they are mischaracterizing what that paragraph says, but they are here to hear that.

MR. LEWIS: Okay, but it is simply the laws of syllogism. We have a syllogism here with three items, and it doesn't equate the beginning or the end. That's trivial.

MR. REMICK: But maybe they are willing to characterize their understanding of our position differently; I don't know. I think they are wrong in how they have done it, but that doesn't say we shouldn't address it. Or that it's a legal issue.

MR. WARD: Wayne, do we have your figure anywhere?

MR. HOUSTON: It's at the back, the very last page.

MR. LEWIS: But the figure doesn't actually show any difference between them.

MR. WARD: Oh, I think it does.

MR. LEWIS: It has differences below the point at which adequate protection appears.

MR. WARD: Look at page 17. I think page 17 is an accurate representation of --

MR. LEWIS: Oh, I'm sorry, I got the boxes mixed up. There is a difference.

The staff simply doesn't understand what we said.

MR. WARD: Well, the staff drew this picture, and I think the picture explains what we said.

MR. REMICK: I don't, because they say we are equating safety goals with adequate protection, because he has adequate protection right underneath safety goals there.

MR. WARD: Well, what we have said is that adequate protection is a term which is applied to -- its usage is for individual plants. And in that usage, the compliance, full compliance with the Commission's regulations is a surrogate.

We have said that a test of the regulations, whether the body of regulations is adequate, is whether it's providing a population of plants that is in conformance with the safety goal.

MR. LEWIS: But that has nothing to do with that.

MR. REMICK: Well, it is saying how we think the safety goal should be used.

MR. LEWIS: But it has nothing to do with adequate

protection.

MR. WARD: I don't understand how you say it has nothing to do with that. There is a linkage there; right?

MR. LEWIS: The linkage is between the safety of the body of plants and the safety goals. That's a clear linkage. We have made it many, many times, and you are absolutely right. Adequate protection is an issue which applies with respect to individual plants.

MR. WARD: Exactly.

MR. LEWIS: And we say the safety goals have nothing to do with that.

MR. WARD: No, no, no, but the linkage is through the regulations, because --

MR. SIESS: Is there any significance to the fact that "safe enough" is below "adequate protection" on the right? Are those intended to be at the same level?

MR. WARD: I am sorry, Chet, I didn't hear what you said.

MR. SIESS: On the right hand side is "adequate protection" underneath the hatched area, and then underneath "adequate protection" is "safe enough." Is there any significance to the fact that one is below the other, or are those supposed to be all at the same level?

MR. WARD: I don't know. Wayne, do you make any significance out of it?

MR. HOUSTON: Wayne Houston from the staff.

They are intended to represent the same level.

MR. SIESS: Okay. So the big difference is that you put "adequate protection" well below, somewhere below "safe enough," and you think we put it at the same level?

MR. REMICK: That's correct.

MR. SIESS: And where are the regulations?

MR. HOUSTON: Well, they are not reflected on this pictorial.

MR. REMICK: Wayne, I have tried to understand that pictorial. I don't think it helps, personally; I really don't.

MR. HOUSTON: Well, that's what we're here for.

I would like to add a comment, if I may. I believe that the issue of adequate protection arose in the middle of this process. There is no evidence to suggest that actually either that the -- well, that the ACRS had in mind any kind of an association of safety goals with what I will call the statutory standard of adequate protection. It is in the statutes, it's not just in a court decision. It goes back to 1954, in the Atomic Energy Act.

It is true that as a matter of historical fact, that the findings that the Commission has made with the issuance of license has been done on a case-by-case basis, and one can judgmentally assert that adequate protection for one plant doesn't necessarily mean it's the same precise level of safety

as it is for another plant.

Even if we had a way of measuring it, such measurements probably would show that there would probably be differences.

It is kind of a difficult thing to come to grips with.

The conclusions that are represented in this draft paper are inferences drawn from what the ACRS has said. Now we have not excised particular paragraphs, but we did cite certain paragraphs that seemed to me, at any rate, to shed some light on the question that the Commission was asking, to try to be clear in trying to explain differences between the staff's view and the ACRS view.

I suppose it is possible that what the ACRS has in mind maybe cannot be represented pictorially in the fashion that I have tried here.

It could be, however, that given that the primary emphasis of the ACRS was with the concept of how safe is safe enough, which is not a term of art or usage in the regulatory process, whereas the adequate protection term is a term of usage in the regulatory process.

But it is conceivable that we could simply leave out the issue of adequate protection as far as ACRS is concerned, and simply represent it as you have, that it's your determination of what the safety goals should be associated

with the concept of how safe is safe enough, and then let the Commission ponder what that means in terms of the regulatory process.

What we have tried to do here is to sort of bring it into the process as it exists. Now maybe we can't do that. Maybe you have something more grandiose in mind, or something different in mind. But if you do have something different in mind, then it does create a problem, I think, with respect to trying to implement safety goals, although maybe I am mistaken on that point.

It certainly would be possible to pursue an implementation plan dealing with safety goals, perhaps find areas in which the regulations should be modified, and not use any cost or cost-benefit arguments in creating new regulations.

When new regulations are put on the books, however, it is necessary for the Commission to address the question as to whether they apply to existing plants or to future plants or both.

And if the answer to the question, if the staff believes and the Commission believes that they should apply to present plants, then we have to invoke the backfit rule. And by the backfit rule, if we do, we have to invoke cost-benefit arguments.

So we reach an impasse at that point. And what the staff is trying to do is interpret what we think the ACRS is

saying in such a way as to sort of make it more compatible with the regulatory process as it exists.

MR. KERR: When you say you have to invoke the backfit rule, that is not statute, but rather NRC regulation, isn't it?

MR. HOUSTON: I'm sorry, I didn't hear that.

MR. KERR: When you say that we have to invoke the backfit rule if we use it for existing plants, that's not a statutory requirement, is it?

MR. HOUSTON: That is correct, it's a rule.

MR. KERR: Thank you.

MR. CARROLL: Let me ask this question:

Does Wayne's picture, in terms of the "staff" position, represent what we also believe? Does that --

MR. WARD: I am not sure what the committee believes. It's not what I believe.

MR. SIESS: It's for the staff side, I think, only.

MR. WARD: Oh, is that what you mean? I guess I don't know whether -- I guess I'm not sure whether there's another indication of what they believe. So I don't know what to compare this with.

MR. SIESS: The staff has got a definition of "safe enough" in terms of the backfit rule, and I get lost on that, for some reason.

MR. CARROLL: Now they have got a definition, as I'm

reading this, that the safety goals define what is safe enough. Is that what you intended?

MR. SIESS: I am reading the bottom of page 8. "With respect to the concept of safe enough, the staff interprets this to mean a level of safety such that no further improvements in safety would be justifiable on cost benefit grounds for regulatory action."

MR. HOUSTON: That's correct.

MR. CARROLL: That's what this says.

MR. KERR: This stops at "safe enough," but indicating that it's a fixed position. A cost-benefit basis is not a fixed position necessarily.

MR. SIESS: But, you see --

MR. KERR: The cost-benefit region is between "safe enough" and "adequate protection."

MR. SIESS: "Safe enough" is keep making it safer until you can't afford it, and now the staff equates that to the safety goal. And I don't see how you can do that.

MR. WARD: See, in a sense, I think we said the regulations aren't shown on here. But in a sense, they are, because if we accept this what we call a surrogate definition of "adequate protection" as being in compliance with the safety goal, if we just reverse that, then that would seem to say that the line or the shaded line labeled "adequate protection" represents the level of safety achieved with the body of

regulations. And what the staff seems to be -- no?

MR. SIESS: Go ahead.

MR. WARD: Well, why not? I mean I'm showing where the logic is wrong. And what the staff is saying is that the safety goal represents a level of safety which is beyond what the regulations provide, and you used cost-benefit arguments in pushing plants to get to that level. That's what the staff is saying.

MR. HOUSTON: No. I think there is another problem here which the ACRS has represented the intent that, if I can say it properly, of creating a body of regulations which presumably does not now exist as such, that acts as a surrogate -- and I will modify that by saying apparently a total surrogate for adequate protection.

Am I correct so far?

MR. CARROLL: No. I don't think so.

MR. HOUSTON: As a surrogate. You have used the word surrogate and that is what I want to focus on.

MR. CARROLL: But I think what we were saying was the existing regulations are quite adequate.

MR. HOUSTON: I understand.

MR. WARD: I think that's our position now, for what we know now, the existing regulations are doing the job.

MR. HOUSTON: Now reading between the lines, I understand that one can draw that inference. I think not so

much from what you have written, but from conversations which we have had.

The difference that I would like to point to, which may be considered to be subtle, is that the staff refers to the regulations with respect to the concept of adequate protection in the following fashion:

That is, if the regulations are met by a licensee that presumptively assures what I will call a state of adequate protection for that licensee.

Now that is a different statement than calling them a surrogate for it, and one reason that I say that is that some of the regulations we now have on the books could not legally be used as part or as a surrogate for a definition of adequate protection.

Professor Kerr has pointed out one Appendix I, there are a couple of others, the ATWS rule, the station blackout rule. They have all been put on the books taking into consideration cost. So they cannot legally be part of a surrogate for adequation protection because costs have been considering in putting them on the books.

MR. WARD: You're turning it upside down.

MR. HOUSTON: I don't believe so.

MR. WARD: It seems to me the process for rulemaking uses whatever information is appropriate and it's always used costs and benefits. Once a rule is on the books, that

contributes to -- and a plant is complying with the rule, the regulation, then that is providing some of this presumptive evidence that the plant is meeting the standards of adequate protection.

I agree. That way of expressing a presumptive evidence of adequate protection is probably better than the surrogate term, but, to me, there isn't any real difference in the mean.

MR. KERR: But, Dave, I think what he's saying is the Courts have ruled that one cannot use cost considerations in determining adequate protection. Therefore, the Courts have made it illegal for these regulations that include consideration of cost to be used in determining adequate protection.

MR. HOUSTON: That's correct.

MR. CARROLL: What did the Courts say about the timing, though? If Appendix I existed before the Courts ruled --

MR. HOUSTON: We'd have to have somebody from OGC here, I think, to really get into that detail. My perception is that prospectively we need to pay attention to this. If you look back through the statements of considerations for existing rules, you'll find that for the most part there is no reference made to cost considerations for most of the rules that have gone on the books.

For example, the general design criteria. Now, arguably, there may have been somewhere in the whole judgmental process that created them some though given to costs associated with them.

MR. WARD: Absolutely. In fact, you can't --

MR. HOUSTON: The question is what the record shows.

MR. WARD: When there's a single failure criteria in the GDC, that's an important part of it, that could have been made a double failure criterion or a triple failure criterion. Why wasn't it?

MR. HOUSTON: I agree. A lot of these were written by people who are engineers and, by the very nature of the profession, cost tends to be a factor. I'm talking about what the record shows.

MR. WARD: So to differentiate a rule where cost was explicitly considered and one where it's only implicitly considered, which is all of the others, I think is specious.

MR. HOUSTON: It would be very difficult to establish, if one were to ask the question with regard to existing regulations, which ones are on the books that were put there without any consideration of cost and shown by the record, and the record is not clear on that. You need to look at this prospectively rather than retrospectively.

MR. SIESS: That's what I'm trying to understand now. 50.109 originally did not have this cost benefit thing, did it?

MR. HOUSTON: That's correct.

MR. SIESS: So by your reasoning, any new rules that were established by the Commission before the current version of 50.109 was enacted could be considered as raising the level of adequate protection. Presumably, we change the rules to increase safety, but since 50.109 has been put in, any new rule that had a cost benefit basis, you would say, did not raise the level of adequate protection because if it had raised the level of adequate protection, it wouldn't have needed the cost benefit basis. Right?

MR. HOUSTON: It could not have been justified on a cost benefit basis is what I said.

MR. SIESS: But it wouldn't have needed it. If it was required for adequate protection, you don't need cost benefit if somebody makes that ruling.

MR. HOUSTON: That's correct.

MR. SIESS: And I don't know how you do that, but I think the Committee is saying that if a rule change is required in order to make this whole body of plants meet the safety goal, the rule change ought to be done. Right? Who decides whether something meets the requirement for adequate protection?

MR. HOUSTON: Up to this point in time, there is no definition of the term as a standard in any quantitative sense, or even anything more than the words themselves. I've often

referred to as a --

MR. SIESS: So if somebody comes in and wants to change the rule, say to require something on accident management, first there has to be a decision made as to whether the rule change is required in order to provide adequate protection. If that decision is made, then it doesn't have to be justified on cost benefit. If that decision is not made, it does have to be justified on cost benefit. Right?

MR. HOUSTON: I believe that's a fair characterization.

MR. SIESS: But who is empowered under the law to decide whether a rule change is needed to provide adequate protection?

MR. HOUSTON: The Commission.

MR. SIESS: The Commission can just say that.

MR. HOUSTON: Yes.

MR. SIESS: And we're saying that they should use the safety goal as a guide to do that.

MR. WARD: Right. That's what we've said.

MR. HOUSTON: That's what I thought I had characterized on this pictorial.

MR. MICHELSON: Then the picture is correct.

MR. WARD: But in your picture, you can go above adequate protection --

MR. HOUSTON: In safety, yes. More safe.

MR. SIESS: If you can justify it by cost benefit.

MR. HOUSTON: Correct. The staff has no intention, at this point --

MR. SIESS: Up to the safety goal.

MR. HOUSTON: That's correct.

MR. SIESS: But the safety goal may not be up there. It may be down below.

MR. REMICK: Could be.

MR. HOUSTON: It could be, yes.

MR. SIESS: I think should condition your argument by showing adequate protection different than the safety goal and below it.

MR. HOUSTON: The staff has not made any recommendation to the Commission with regard to a proposed definition of what adequate protection means. It seems to us that the ACRS is doing that.

MR. SIESS: That's exactly what we've tried to do, because it seems to me somebody needs that definition if every time there's a rule change the Commission has got to decide whether it's needed to provide adequate protection.

MR. WARD: I know some of the members want to avoid this, but I think that's really at the heart of what the ACRS has been proposing as the central idea of the safety goal.

MR. REMICK: Dave, this is just my own personal view of what the staff had characterized our viewpoint, how I think

I could have agreed with it if you had characterized it this way.

I believe Hal had a good point that you probably should put that first paragraph in, as well as the paragraph you have quoted, because it sets the stage. But then if you had said something like the ACRS only indirectly relates, rather than equates, how safe is safe enough with adequate protection, they indicate that the safety goals are to be used to judge the adequacy of the regulations in producing a population of plants that meet the safety goals.

However, they indicate that the safety goals should not be used to determine whether an individual plant provides adequate protection to the public. Adequate protection does relate to individual plant determinations, I believe.

MR. HOUSTON: In effect, yes.

MR. REMICK: In my mind, you would have been characterizing our position, as I understand it, if you had words like that. I don't think a diagram helps. I really don't. I think it's impossible to put our position in a diagram.

MR. HOUSTON: That may be.

MR. CARROLL: Or yours.

MR. HOUSTON: I think ours can be, but I can't --

MR. SIESS: If I move these two boxes, put this one down here and that one up there, you can't make this work.

MR. HOUSTON: That wouldn't represent what we're saying, so I wouldn't do that.

MR. SIESS: Are you saying that adequate protection is always less safe than the safety goal?

MR. HOUSTON: It's what we would think of as a basic or minimum level of protection, yes.

MR. MICHELSON: That's a different definition.

MR. CARROLL: The problem you get into, Wayne, is if some issue comes along that says we're no longer meeting adequate protection and we're no longer meeting the safety goal, you could have a situation where your two boxes are reversed.

MR. HOUSTON: Conceptually, yes, that's possible. That's not --

MR. CARROLL: There isn't a cost benefit region for that situation.

MR. HOUSTON: Again, on an individual plant basis, the term adequate protection tends to mean the following. If a circumstance is found where the staff of the Commission may judge that there is a real question as to whether or not the level of protection currently being provided at a plant, for whatever reason, a change from something or a situation that had previously existed, the real question would arise as to whether the plant should be shut down or not.

So in principle, it's a level which really raises a

serious question for the plant, whereas the staff's perception of the safety goal level is not of that nature. It's one that one is striving for, but not one which, if it failed to be met, would trigger the question of whether or not the plant should be shut down.

MR. KERR: Wayne, if 1150, I believe, finds that practically -- I think all of the plants are better than the safety goal?

MR. HOUSTON: All six of the ones that we've seen, by a substantial margin, yes.

MR. KERR: Why would the staff then conclude that the safety goal is considerably less in risk than adequate protection?

MR. HOUSTON: That's what this is representing.

MR. WARD: No, I don't think so, Wayne.

MR. SIESS: How do you define adequate protection?

MR. HOUSTON: We don't.

MR. SIESS: How would you recommend --

MR. HOUSTON: But it's a minimum level. It's a minimal level of safety.

MR. SIESS: I know, but somebody has got to go out there and decide whether a plant is providing adequate protection or, if not, they should shut them down.

MR. SHEWMON: Wouldn't compliance with the regulations be taken as evidence that there is adequate

protection?

MR. SIESS: No, because they shut down --

MR. WARD: That provides evidence that the plant meets at least the standard of adequate protection, but it might be much better than that. That's Wayne's point. That's the difference. That's why he didn't like us using the term surrogate, because he's just saying it's a boundary with which the plant is within, but not necessarily at it.

MR. SHEWMON: Conservatism.

MR. WARD: To me, just in plain English, and I know this can be deceptive, but engineering English, I guess, the terms safe enough, adequately protected, and no undue risks can very easily be taken to all mean the same thing. I guess they --

MR. HOUSTON: I would agree with that preamble, yes.

MR. WARD: They do, to me. I guess the problem is that the particular term -- and that's what we're trying to see with the safety goal, is that the level -- the standard established by the safety goal should be defined as to what all of those three things are.

The problem, I guess, is that the particular term adequate protection with capital letters, let's say, has a specialized meaning in the law and in Court cases, anyway. So that's the problem we're faced with.

MR. HOUSTON: A year ago, when some of the initial

drafts of the staff's plan or further plans or revised plans, if you will, for implementing safety goals; there was no mention of adequate protection. That, however, was a contributing factor of a delay of quite a number of months, about year ago, because of a concern being expressed by attorneys in the OGC, which in turn, related to the court case on the backfit rule, because one of the points that was being made by the Union of Concerned Scientists was that they wanted the court to require the NRC to define what it meant by adequate protection, because it was a term of used in the backfit rules.

They properly pointed out that there is no definition, so how can the Commission use a rule containing a term which has no definition? The court chose not to address that particular issue, and the court did not order the NRC to define it.

MR. SIESS: I don't know why we should step in where the courts wouldn't, but let me point out --

MR. HOUSTON: That's our position.

MR. SIESS: Let me point out something that's giving me difficulty here and maybe giving others difficulty. The term, "adequate protection," appears in 50.109 and it's been used here with respect to particular plants -- shall I shut down this plant because it doesn't provide adequate protection.

Now, that's a plant-specific thing. We've also

talked about adequate protection as being reflected by some kind of a level, but if it's regulations, that again applies to specific plants. You can measure a plant against the regulations.

The other thing is that we talk about some of these other terms we use are the aggregate, right? As whole, plants meet the safety goals. So, when I asked the question about a backfit, when the backfit had to be applied, they said somebody has to make a ruling that it's required for adequate protection.

Now, for the ATWS rule, that was decided for all plants; wasn't it? It was not just for one. It's a change in the rule.

MR. HOUSTON: There were classes which were treated differently, yes, but, in toto, it applies to all plants.

MR. SIESS: So what you are saying is then it was decided that those plants should be shut down if they didn't fix this?

MR. HOUSTON: Not at all. Cost was a consideration in the ATWS rulemaking process.

MR. SIESS: Oh, that's right, they already provided adequate protection and we were going beyond it?

MR. HOUSTON: That's correct.

MR. SIESS: Okay. Now, anybody who meets those new rules is beyond adequate protection?

MR. HOUSTON: Correct.

MR. CARROLL: For ATWS?

MR. HOUSTON: Station blackouts, the same situation.

MR. SIESS: So you now have no measure of adequate protection?

MR. HOUSTON: We never have had, and we do not now have a measure of it in risk space, yes.

MR. SIESS: Presumably you could find some point at which the rules represented adequate protection and every change in the rules since that time go above adequate protection.

MR. KERR: It seems to me that the letter is easy then. We say that the staff has no position on adequate protection. We don't have any position on adequate protection and there is no disagreement.

MR. HOUSTON: There is a certain grain of truth in that.

MR. SIESS: The point is that we brought in another term about safe was safe enough that you have equated to adequate protection, orally.

MR. WARD: Yes.

MR. SIESS: But nowhere else.

MR. HOUSTON: Actually, we do have a position. We don't have a definition of adequate protection.

MR. KERR: Our position is the same. Neither of us

has a definition.

MR. SIESS: Well, it's a definition of how safe is safe enough. Anywhere in our letter, do we equate how safe is safe enough to adequate protection, or no undue risk? Not in our letter, I don't think. Dave did it a few minutes ago.

MR. WARD: I am saying that to me, those terms -- it makes sense to equate them. I don't think we've really taken a position.

MR. KERR: But the term, as it is used by the courts, Dave, is just -- it has, I think, no particular meaning as far as we're concerned.

MR. REMICK: We say the safety goals should be used to judge the adequacy of the regulations. Now, we do offer that the regulations are an adequate surrogate for adequate protection, or a surrogate, but we don't say the safety goals are.

MR. SIESS: We did say that, but now Wayne has got an argument that that's not true. The regulations are a surrogate for adequate protection. We could show that by logic and by law.

MR. REMICK: We might be wrong and he might be right, but what he's trying to do is to understand our position.

MR. KERR: We don't have to be bound by the court decision.

MR. HOUSTON: That's true, but what the --

MR. KERR: We can be wrong and the Commission could ignore advice because OGC gives them better advice.

MR. HOUSTON: What you have said, however, and this was part of the inference that the staff drew, is that when the regulations are modified for the purpose of complying with safety goals, cost/benefit should not be used.

MR. REMICK: Yes, we've said that.

MR. HOUSTON: You've said that in a letter.

MR. REMICK: That's right.

MR. HOUSTON: That was part of our trying to piece it together to see how it fits the process or how it relates to the process.

MR. REMICK: It is possible that we might have been inconsistent? To me, it is inconsistent.

MR. HOUSTON: Actually, the problem is that you didn't start out, as we didn't start out, recognizing that adequate protection had anything to do with safety goals; that is, the statutory standard, the legal standard -- had anything to do with safety goals.

I think we've both been drawn into it.

MR. WARD: We haven't brought -- is anyone from OGC here?

[No response.]

MR. WARD: I guess not.

MR. SHEWMON: So we can say anything we want.

MR. WARD: No, but the problem is, in the past, we could say that's legal and we'll let the lawyers worry about the term, "adequate protection," but in the past when we've discussed it with them and they've said, well, what do you mean by "adequate protection?" They say, that's up to you technical people to define what that means.

MR. REMICK: Right, they have said that.

MR. FRALEY: But when they're pressed -- and this may not be absolutely correct in all cases, they say, as I have said before, adequate protection is whatever regulation is applied to that plant when it was licensed.

MR. SIESS: But that is not true anymore.

MR. HOUSTON: That's not a correct characterization.

MR. SIESS: We've got regulations that were invoked to go beyond adequate protection.

MR. FRALEY: Since TMI, the regulations have been changed because adequate protection was redefined. Basically, it is those regulations that apply to that plant. That is what is adequate.

MR. MICHELSON: Wayne shakes his head. Why do you shake your head?

MR. HOUSTON: What they said, and I said it a little while ago, and I'll say it again, compliance with the regulations on the part of a particular plant, presumptively assures adequate protection. That's not the same thing as you

just said.

It bypasses the question as to whether all of the regulations needed to be complied with, because it's not uncommon in the issuance of a license that some exemptions are granted, for instance, on a plant-specific basis.

MR. FRALEY: When an exemption is granted, then that regulation does not apply to that plant, and that is part of the regulations that apply to that plant and that one doesn't.

MR. HOUSTON: That's true, and then the issue becomes whether they might have been exempted from other regulations and still meet adequate protection.

MR. SIESS: It's the body of regulations as applied and interpreted by the Staff. Obviously, the body of regulations, in themselves, don't do anything for anybody, but once the staff applies them to a plant then it's presumptive that that plant, designed and accepted by the staff according to their interpretation of the regulations, does provide adequate protection, or it wouldn't have been given a license.

That's the legal presumption. It might be better than adequate.

MR. WARD: Then you might question what business the staff had requiring it to be?

MR. SIESS: Well, they did it on a cost/benefit basis under a rule, 50.109. It told them that if they wanted more than adequate protection, they had to justify it on a

cost/benefit basis and they did.

But the question is, where do you stop? When it is it safe enough?

MR. WARD: That is the whole idea of the safety goal, and that we agree on. This is where you stop.

MR. REMICK: I'm sure Dr. Houston completely understands our position now and you have adequate guidance on what we are supposed to do; is that correct, since it is now 12:00?

MR. KERR: If the Commission asks us to prepare a joint letter, have we deserted that possibility or abandoned that possibility?

MR. REMICK: Dave raised several alternatives at the beginning of different ways to approach it.

MR. WARD: We did start a little bit late. Could we have an extra five minutes for the procedural part.

MR. SIESS: The equating of adequate protection to safe enough on Wayne's diagram; where do we say that?

MR. WARD: I don't think we do, or that we ever have.

MR. WARD: Maybe that's just my interpretation and the Committee really hasn't taken a position on that.

MR. HOUSTON: That's an inference. You don't say that; that's correct.

MR. WARD: It's very logical to me.

MR. SIESS: That's where I have the problem. We equated safety goal to safe enough; that's clear. But then sticking adequate protection in there is a red herring.

MR. WARD: Maybe so, but without this legal definition, if someone asks you, does that mean the plants are adequately safe; that the public is adequately protected? I mean, would you -- could these have meant some different things, or do they all mean the same thing?

MR. SIESS: I'd want to look at the PRA for that plant.

MR. REMICK: Can we discuss the procedural aspects of how we're going to handle this?

MR. WARD: I guess it's probably -- I'd suggest thing, probably the most appropriate thing to do is for us to take this draft as writ in stone for the moment and to comment on the draft, so there's something fixed to compare and say, you know, we're in agreement with the draft of such and such a date, except for this paragraph which, what we really mean is loddy, blah, blah.

MR. HOUSTON: That would be very helpful if you could do that.

MR. CARROLL: Who are you commenting to now?

MR. WARD: The Commissioners.

MR. HOUSTON: You would comment to the Commission?

MR. WARD: Yes.

MR. HOUSTON: The Commission hasn't seen this.

MR. WARD: Yes, but you could make it available to them. This is your position.

MR. REMICK: Are you saying that if we did that, you might consider your -- reconsider your characterization?

MR. HOUSTON: Yes. That's what I thought you were implying. My next question was going to be; how soon can you do that?

MR. CARROLL: What we've been asked to do is jointly prepare a position. Now, have we decided?

MR. HOUSTON: I think procedurally that is probably a little difficult to do.

MR. CARROLL: I think we decided that a couple of months ago that we couldn't really do that.

MR. WARD: One way to make it effectively the same thing would be to quote their paragraph and the paragraph as we would revise it.

But if you're going to make another version in the meantime, that kind of gets into another --

MR. HOUSTON: I wouldn't. In the meantime, before the week is out, if you could have something -- and it could take the form of a memorandum to the EDO or to Mr. Beckjord, since he requested it, with like a marked up copy or something of that nature.

Maybe you might want to supplement that with another

full memorandum to the EDO, for example. The other alternative we have is that that we would proceed with -- I think that on the basis of our discussion today, I would modify some things that are currently in this draft, and I'd simply send it to the Commission and this is what we think the ACRS is saying.

Then you have a subsequent opportunity to write a letter on it and say, no, it isn't, and this is what we meant. I'm not sure that's as helpful to the Commission.

MR. WARD: I think that's the option. I'm sure the letter would get to EDO, or instead of air inspector or something, instead of the Commission.

MR. MICHELSON: And then write another letter after they send their formal statement to the Commission.

MR. WARD: Then they would say, by god, they haven't gotten it right yet.

MR. SIESS: This thing is not complete. This refers back to SECY 89-102 and I guess I'd have to get a copy of that to understand this last round. It seems to me, if it's going to take three pages, they could make it four pages and be complete.

MR. REMICK: All right.

MR. SIESS: I'd also suggest -- the staff is trying to interpret what the Commission said, and is there anything wrong with anybody asking the Commission what they meant? I mean, they're asking us what we meant.

MR. WARD: No, you don't get to ask them anything.

MR. SIESS: I could do it nicely.

MR. REMICK: Not those high levels, Chet. Gentlemen, I suggest we take a recess for lunch, returning at 1:00 p.m.

[Whereupon, at 12:10 p.m., the workshop was recessed, to reconvene this same date at 1:00 p.m.]

AFTERNOON SESSION

[1:04 p.m.]

MR. REMICK: Maybe we should get started. Jay can offer any background he wishes when he arrives. I refer the committee members to handout No. 4 which is a background paper for the discussion. Charles Miller from the staff is going to lead us through a status report on standardized pressurized water reactors. So, I'll turn it over to you, Mr. Miller.

MR. MILLER: Thank you, Mr. Chairman.

What I'd like to do today is give the committee a brief overview of where we are on the review of the pressurized water reactors that we're pursuing in our standard plant program.

[Slide.]

MR. MILLER: I guess I'd like to mention to the committee first off that I think you have in your package a copy of SECY-89-334 which is a paper that's before the Commission right now for a vote. In that paper, the staff as requested by the Commission forwarded our review priorities or at least the priorities as we saw them as how we would like to proceed from this point.

The Chairman has been asking the staff to do that and the Commission has been trying to come to grips with where we are with the programs and with the resource constraints in trying to establish some overall priorities at how we are going

to proceed.

The information that's in there at this point is pre-decisional and I wanted to just remind everyone that at this point in time, we're awaiting Commission vote on the subject. Some of the information that's presented in my presentation today should be taken within that context. It's the staff's best estimates at this point in time as to how we're going to proceed.

With that, I'd like to go into a little about how all the programs with regard to pressurized water reactors fit together. In the various subcommittees, we've been addressing this.

We're currently working on a PDA type review for the Westinghouse SP-90. Westinghouse has recently informed both the staff and the ACRS subcommittee, that at this point in time, they are not going to seek an FDA until such a time as they have a customer. So what we're trying to do is to basically wrap up the review that's been in house here for several years and in doing that, we're going to recognize that there may be some open items that we're going to have to defer to such a time that we proceed with an FDA application.

I wanted to say a little bit about the EPRI review because the other reviews fit within the EPRI context.

MR. REMICK: Excuse me. Before we leave the SP-90, could you remind me what power level is that? What power level

is the SP-90?

MR. MILLER: It's a large evolution area plant.

MR. REMICK: It's the standard evolution, okay.

MR. DONATELL: It's 1,300 electrical.

MR. MILLER: The EPRI requirements document which is also under active review has basically two phases to it -- those for the large evolutionary plants and those for the passive plants and I've tried to put our estimates as to how we're going to proceed and to try to wrap those up.

I think the dates that I've tried to portray here include the times that we try to hit our milestones for completing the reviews of those projects. The Combustion Engineering system, 80 plus -- I'll be going into each of these in more detail -- I think our nearest term milestone is to try to get a licensing review document issued to Combustion Engineering.

At this point in time, we really haven't established any formal dealings with the subcommittee on the Combustion Engineering project but we're going to be asking for ACRS input in the coming months on this project. So it's something we're going to have to be visiting very soon.

The Westinghouse AP-600 is the smaller, passive plant, that we're going to be seeing coming before us. Westinghouse is one of the successful bidders in the development contract with the Department of Energy. They

inform us that they would like to submit an LRB in about the middle of 1990 but it's still going to be a couple of years before we get into the actual active review of that but we're going to be doing some preliminary assessments which I'll get into in a little bit and we're going to be asking for the committee's input in that regard.

[Slide.]

MR. MILLER: I'd like to go into a little bit more detail on each of these now. Basically, this is a little bit of history with what's gone on with the System 80 Plus. In 1987, Combustion Engineering started a process on their System 80 Plus by issuing a series of amendments to the System 80 application. We issued an FDA on the System 80 several years ago and they started the process out by actually submitting amendments to that which incorporate some of the features of the System 80 Plus.

They actually made their formal application in March of this year at which point they asked for design certification. The initial step in the process, the licensing review basis, was something that was done for the General Electric ABWR a couple of years ago. This has got a lot of attention recently with the committee and the Commission and I'm anticipating that the Commission is going to ask to be formally involved in the issuance of this document in the future and I'm anticipating that they're going to ask the ACRS

to get involved formally in commenting on it before it proceeds with the Commission.

So with that in mind, this is anticipated based upon discussions that I have been involved in. It has not been formally decided yet, but in the context of that, the staff review of a draft document on a licensing review basis with combustion is in process and I think in about February of this year, we're going to be seeking the ACRS's active review and input on that with Commission review following that and hopefully by the spring of this year, we'll be able to issue it. This will get us on the formal process of trying to proceed actively with the Combustion System 80 Plus application in a more formal manner with the goal of trying to issue a final design approval approximately 2 years after the issuance of the LRB.

MR. REMICK: Was their formal application that you show in March of '89 complete -- fairly complete?

MR. MILLER: The information, no, is not yet complete. What we saw in the application, the idea was to completely resubmit what they had in the System 80 documentation and put it in what they call their CESSAR-DC application.

So they're going to resubmit the documentation. A lot of it has been received but there's still quite a bit to come. I can show you a little bit here. I don't want to go

into this in detail but I thought I put these bullets down so you would have some information regarding the kinds of information that we received over the last couple of years.

In my next slide, I can show some of the near-term things that they still have to submit.

[Slide.]

MR. MILLER: To answer your question more directly, Mr. Chairman, what we got was pretty much a letter committing to submit detailed information for an essentially complete plant in the detail. At the time they submitted their application, it was a month or two before 10 CFR 52 got promulgated but it was close enough to the promulgation that they -- we pretty much had complete information as to what was going to be in the rule. The draft rule had been out for comment and the comment period had expired in the back and the Commission had had its formal meeting.

What combustion did was at that point in time asked for design certification anticipating that 10 CFR 52 would get promulgated. So they have committed to essentially complete information under Part 52 and that information is required by the regulation in order to proceed.

In the near term, this shows how the information will be received. It has not yet been received. We're anticipating in December of this year to getting a proposed resolution to USIs and GSIs and getting more on the PRA methodology. Right

down through the coming year, you can see some of the information that they have yet to submit.

Just in summary, over the course of the time, we have been trying to get input back to them with regard to questions and requests for more information and to date, the staff has issued about 277 questions. We have received responses to 186 questions and we have 91 questions which CE is working on. Now this is by no means a complete list. I'm sure there's going to be a lot more to come.

[Slide.]

MR. MILLER: With regard to the SP-90 review, this has been under fairly active review lately by both the staff and the ACRS subcommittee and a quick history here. Between '88 and '89, we've had a fair amount of activity with the front end of the PRA draft safety evaluation having been issued.

There's been a series of subcommittee meetings over the last year with two very recently in September and earlier this month. We've recently received the -- what we call Module II from Westinghouse which is the amended USIs and GSIs and this is under active staff review now.

One of the things that we're going to have to do in order to get this done in the time frame that we talked about was to try to really nail down a near term schedule. In order to be able to keep the schedule that I've put up here on the board, the staff is going to have to break from some of our

traditional question and answers and Westinghouse has asked us and we've agreed to try to just sit down and resolve a lot of these issues in a more expeditious manner.

In order to reach the end, it's going to require a fair amount of input from the committee to get your views, since you can reach to such a point that you would be able to write a letter on the subject. We are trying to wrap up this review by the middle of 1990. I think it's incumbent on all parties that we have a fairly rigorous schedule here and it's going to require a fairly active commitment. Westinghouse is anxious to wrap up the review and so is the staff, especially knowing at this time they're not going to pursue an FDA.

We really would like to get this one off the table for a while and kind of wrap a ribbon around it and put it on the shelf til such a time that they want to proceed.

MR. WARD: Charlie, what you seem to be doing is asking the committee to not worry about every little point in this --

MR. MILLER: Yes, that's a good point. Maybe I should mention that. Yes.

MR. WARD: Because we're going to get a crack at it again.

MR. MILLER: Right.

MR. WARD: And kind of get on with our review of it.

MR. MILLER: Yes. I guess I should make clear that

it's the staff's intention that whenever we issue the PDA, we want to make it clear that all parties will have another crack at it at the FDA stage and we don't want to nail it down in such a manner that decisions have been made that are irreversible. It's really a snapshot in time of our thinking at this point.

Westinghouse is agreeable to that so they can basically get the benefit of the staff's thinking at this point in time and the agency's thinking when it's actually issued. The point is that when we get to the FDA stage, everything will get revisited in full scale. So, it will not be a case that we won't be able to go back and -- if new information is available, we get more detailed information on the design, we're obviously going to be pursuing it.

[Slide.]

MR. MILLER: Just a little bit of summary about where we are in the review of the SP/90. We have issued three draft safety evaluations thus far, and currently, with the draft safety evaluations that have been issued, we have broken down the items into basically three categories: those which we feel need to be resolved before a PDA is issued; those which we feel that can be deferred to the FDA, and we have the 99 issues that need to be resolved before the FDA is issued or may need to wait for plant specific application to come in.

I should mention that the resolution of many of these

issues may not be an actual technical resolution, but may require deferral of decisions until a later date.

We anticipate that we'll probably issue two more additional draft safety evaluations before a final integrated safety evaluation is put together, and we'll have to reflect on what we're going to do to actually resolve the USIs and GSIs at this stage.

We're going to have, I think, a couple rounds of ACRS meetings, I think, before we finally reach the end of the process, of course which is to issue a final safety evaluation and convert that to a preliminary design approval.

MR. CARROLL: Just a comment. The 107 open items before PDA that you mentioned, I got the sense earlier this month that although you hadn't formally resolved them paperwork wise, many of them were --

MR. MILLER: Yeah. I think there are many of them. Let me ask the project manager to comment on those. You know, some of these issues are what I would call relatively minor issues, and for things that are minor issues, we like to get them nailed down rather than just leave them open. In some cases, we actually have examined what's been presented to us, and I think that list will drop dramatically over the coming month if we were to put it into a documented format.

MR. DONATELL: As the project manager, I probably received draft forms from our reviewers related to the

responses, and the numbers are about 70 to 80 at this point in time. The majority of those, probably 60 percent of those, are acceptable on the responses. The majority of the remainder should just take some minor clarification.

There will be a handful, and I'm not sure what that number is yet, that are going to be hard spots where a decision will have to be made as to what we do with it at this point in time.

[Slide.]

MR. MILLER: I'd like to shift gears and talk a little bit about what we call the early review of the passive plants.

One of the things that Dr. Murley wants to achieve in NRR is the ability to be able to give the designers as much early information as to what our thinking is concerning, if you will, the design philosophy that's being used.

What we are going to try to do is take the information that we have at hand -- we have an early conceptual design document from Westinghouse on the AP-600, and we're going to be receiving some briefings from General Electric on their what they call SPWR, and EPRI is in the process of developing a requirements document for the passive plants which we are going to be receiving over the course of 1990.

What we'd like to do is be able to do an early conceptual -- it's not going to be a detailed review, but

basically try to do an overview review of the information that we have at haydn concerning how the designers are proceeding so that we can get early input back to the designers should there be any show-stoppers out there, or if they're proceeding with some philosophy that the agency as a whole just is not willing to accept. And if I can use some examples.

If, for example, a designer wanted to remove the emergency diesels because they feel that with gravity driven systems, etcetera, that they were not needed anymore, we consider that to be a major, if you will, philosophical type decision. I'm not saying that they are; I'm just using that as an example. But if they were to do such a thing, I think we'd have to search our souls as to whether the agency really wanted to proceed on that line.

There's a myriad of issues that we need to look at with regard to passive plants, because with some of the systems that will be included in those plants, they may not fall within the current GDCs, the regulations, the SRPs. If there's something that I think that the agency will philosophically be against, one train versus train of certain types of systems, we'd like to get that information out to them as early as possible so that they don't go through and do a complete design, present an application, and it would just be totally unacceptable to what the agency's thinking is.

So in that regard, we're trying to take the

information that we have in hand, and try to get some early input back to them.

MR. CARROLL: Do you see an ACRS role in this phase?

MR. MILLER: Yes, sir. I'll get to that.

MR. CARROLL: Okay.

MR. MILLER: Very definitely. I not only see an ACRS role, but I'm anticipating that the Commission is going to want to be involved, and that the Commission is going to want to ask the ACRS to be involved.

MR. PALLA: In the document, you said that before the Commission there is a discussion of PIUS. Is there an actual request to review PIUS?

MR. MILLER: Yes. ABB has submitted a request asking the staff to do what they would call a license-ability review.

MR. SHEWMON: Who is asking the staff?

MR. MILLER: ABB. The vendors for PIUS. In that request, they ask that once the license-ability review is complete, they do plan on proceeding towards an FDA and design certification of the PIUS design.

At this time, I think the license-ability review will probably be performed, but I think it's being determined as to who actually will perform that review, and if the review will be somewhat like the review that was done for the MHTGR and the LMRs at the first stage, versus an actual staff review in NRR. But the paper itself, I think, addresses what the staff's

thinking at this point in time is concerning how to proceed in the immediate future with PIUS.

MR. SHEWMON: Thank you.

[Slide.]

MR. MILLER: Mr. Carroll, a request you had was, was ACRS going to be involved, and I think I can address that in the next slide.

Here's kind of the near-term review schedule. What we're trying to do is put together a work plan, and then try to stick to it, which requires a series of activities in order to be able to try to commit some kind of early information back to the vendors in the early guidance.

Westinghouse gave the staff a presentation on their AP-600 in August. In December, General Electric is going to come in and brief the staff on the SBWR design. We also anticipate having a meeting with EPRI regarding their requirements document on the passive plants. We have not received any of that yet, and we've asked EPRI to try to get together and find a mutually agreeable date where they can come in and make a presentation to the staff.

With that information, as we've built on it over time, between February and 1990, the staff is going to try to do an evaluation to try to come up with what, you know, we call the show-stoppers, if there are any, or some basic questions that we need to proceed and possibly get policy guidance on how

to proceed.

I anticipate that in about April of this year, we're going to be asking the ACRS to get actively involved. At that point in time, I think the staff will have put together some kind of report based upon our findings. I'm going to ask the committee to look at that and basically comment on our findings.

I also anticipate that the Commission is going to want to get actively involved, so although this hasn't been arranged yet, I would imagine, at some time after we've had an opportunity meet with the ACRS and the ACRS has had an opportunity to pass judgment, we will meet wiht the Commission concerning our findings. And after the whole process is completed, we anticipate trying to get the guidance out to the designers some time next summer, probably in about July.

I think that completes the general overview I had planned on giving today. I'd like to open the floor to any further questions.

MR. SHEWMON: Let me ask one which may be too detailed, but what's this plant down in Arizona that ships his power off to the West Coast?

MR. CARROLL: Palo Verde.

MR. SHEWMON: When Palo Verde came up, it seems to me they cheerfully said that the radiation in their core belt line vended life would be something like four times ten to the 19th

fast neutrons, which is getting to be less and less satisfactory with time. Could you tell me whether CESSAR 90 has a different diameter vessel than Palo Verde, or whether they've --

MR. MILLER: It's a slightly larger plant.

MR. SHEWMON: More power.

MR. MILLER: Yes, more power. I don't have the dimensions. Bobby, do you know, off the top of your head?

MR. SHEWMON: And you haven't heard anything about what they expect to have --

MR. MILLER: I haven't personally really focused on any types of fluids calculations or anything like that.

MR. SINGH: We do not have that information right now, but the vessel is larger than the Palo Verde is.

MR. SHEWMON: Do you know whether they've increased the core to fill all that space?

MR. SINGH: I do not know that.

MR. MILLER: Let us go back and see what we can find out.

MR. CARROLL: The SP-90, Paul, looks pretty good in that regard. Westinghouse has done some things to cut fluence down.

MR. SHEWMON: GE has their ABWR apparently way down ont hat regard, too.

MR. MICHELSON: Did they tell us how they got the

fluence down? Was that some outboard reflectors, or something, wasn't it? Is that correct?

MR. DONATELL: That's the scheme that Westinghouse uses. They've got a reflector region; the core is larger; it's a little bit different fuel management scheme and load pattern. I forget what the fluence level is at this point in time.

MR. MICHELSON: Are those reflectors showing up the first time on the APWR, or have they been used on other plants?

MR. DONATELL: Reflector regions, to my knowledge, have not been used in commercial plants before.

MR. MICHELSON: Well, maybe that's one of the ways they're getting it down.

MR. DONATELL: Absolutely.

MR. MICHELSON: Okay.

MR. DONATELL: Absolutely. I think the design is up to, I think a 60-year life, if I recall, with no fluence problems.

MR. MILLER: Most of the designers have indicated that they'd like to have the plants reviewed for a 60-year life, and off the top of my head, I would guess, if that's their indication, they're going to have to get it down because if they get the kinds of numbers that you talked about at a 40-year life, they're certainly not going to make it to 60 years.

MR. SHEWMON: Yes. And Reg. Guide 1.99 REV 2 has tended to move more people into trouble than were there before.

So if they're smart, they will have done it. But one of the frustrations, I guess, on some of these things is they say, you know, "Well, we'll put it inside of a pressure vessel. Trust us," in effect.

MR. MICHELSON: The APRR, as I recall, is only being proposed presently for 40-year, and that 20-year is something that'll come later at the FSAR stage.

MR. MILLER: Right. When they get to the FDA stage, they may change.

MR. CARROLL: Legally, today, there's no way the Commission can issue a license for more than 40 years.

MR. MILLER: Yes. And that's an issue -- I mean, that's an issue where our hands are tied: The Commission can't issue a liconse for more than 40 years. We're bound by legislation.

MR. DONATELL: There are two issues related to the time frame. One is the license-ability term, and the other one would be a design lifetime, and, as I said, I believe the design lifetime is the 60-year period.

MR. MICHELSON: That part I misunderstand. I thought they were only designing for at this PDA stage. When I asked the question, I thought that was the answer.

MR. CARROLL: You're talking SP-90, Carl?

MR. MICHELSON: Yes.

MR. CARROLL: I got the clear impression that they

felt they had a vessel that would be okay for 60 years.

MR. MICHELSON: But they were only proposing it for 40.

MR. CARROLL: That's all they could get approval for at this time.

MR. MICHELSON: They didn't say that was the reason, but that's all they said they were planning on at this stage. If they go FDA, then they would have to extend it or would extend it to 60.

MR. CARROLL: Not unless the Commission gets a change in their regulations.

MR. SHEWMON: I'd like to have him tell me what he told me again. As I understood it, you said that one can carry out the design for 60 years and you can review that, but that the Commission can't license for more than 40 years. Is that right?

MR. DONATELL: That's my understanding.

MR. MILLER: That's correct.

MR. SHEWMON: So when you write your SER or something, you say, yes, we think this design is good for 60 years?

MR. DONATELL: Well, we haven't gotten to that stage yet, and I won't commit to whether we would write it that way or not. My guess is it would be written around the term that is currently licensable. Whether it would extend that to a 60

year lifetime, I can't answer that.

MR. MILLER: I think for those who have specifically asked for review for a 60 year lifetime, we probably would address those aspects of the review where we feel that the design is adequate for that.

MR. MICHELSON: The ABWR is a 60 year proposed design and the DSER talks about 60 years.

MR. MILLER: That's correct, and we'll address that. Now, that doesn't necessarily mean that every component in the plant is going to last for 60 years, because I think as part of the -- obviously, components like the reactor vessel have to, but I think when they say 60 years, some of them have even planned for when the lifetime of a particular component would end and when it would have to be changed out and they're designing that into the plant so that that's a feasible thing to do.

So it doesn't necessarily mean that every component has to last for 60 years.

MR. REMICK: Any comments from the Subcommittee?

MR. CARROLL: No. I guess one procedural matter. I assume the same subcommittees would work with the staff on the passive plants that are working with them on the present things that are being reviewed.

MR. REMICK: If you're talking about BWR and PWR when it comes to things like PIUS, I think we certainly might want

to consider that.

MR. MICHELSON: We have an Advanced Reactor Subcommittee which deals with PIUS and the others. Is that right?

MR. REMICK: Whether PIUS is in that --

MR. WARD: I'm not sure it's clear.

MR. MICHELSON: APWR is another one of those that I thought was going to be Advanced Reactor versus Improved or Enhanced. I thought it was. That's my own opinion only.

MR. WARD: We can make it whatever we want.

MR. MICHELSON: Right. That's why I think Jay was asking the question.

MR. MILLER: Mr. Chairman, if I could bring up a procedural point.

MR. REMICK: Sure.

MR. MILLER: From the System 80-plus, especially in the near term, over the coming months, we're going to be asking the Committee to review the licensing review basis. There is no, to my understanding, correct me if I'm wrong, but we have had no activity since I've been involved here. I don't think there is a standing subcommittee for the System 80-plus.

We do. It's the same one as for the SP-90, so we will deal with that one. That will help us with regard to getting information.

MR. WARD: It seems to me that 600 megawatt plants

ought to go with the same subcommittee. That would be my suggestion.

MR. CARROLL: If they can handle it. If they get the load too great.

MR. REMICK: Anything further?

[No response.]

MR. REMICK: If not, we thank you very much, Mr. Miller. Mr. Fraley, ACS future activities. Off the record.

[Discussion off the record.]

MR. REMICK: Back on the record.

And Ivan, if you would give us the subject, please.

MR. CATTON: While I was at the meeting in Karlsruhe, I went to visit the Siemens MOV test site, where they are testing a series of, NRC is testing a series of valves through a contract with EG&G and Siemens. The valve that I was there to see tested was a six-inch valve, and they tried to close it against a full head of steam.

The valve closed. But to close it, it required that the force be 50 percent above the design specifications for the valve. It was an Anchor Darling valve. And the conclusion is that the valve would not have closed if called upon to do so in the plant configuration, because of the excess load that was required.

What happens is that under full load, the valve disc tilts, and the edge of it starts to gouge into the seat. And

it just takes one hell of a force to shove it shut.

MR. KERR: They tried to close it under what circumstances?

MR. CATTON: Full steam flow.

MR. KERR: What does "full steam flow" mean?

MR. CATTON: I don't recollect what the pressure is. But whatever you would expect in a nuclear power station.

Carl, do you know what the pressure was they tested that at?

MR. MICHELSON: I'm sorry?

MR. CATTON: Do you know what the pressure was they tested that against?

MR. MICHELSON: Which tests? The Wylie tests?

MR. CATTON: The six-inch valve at Siemens.

MR. MICHELSON: No, I don't know.

MR. CARROLL: I think it was simulating that HPCI steam-line isolation valve.

MR. MICHELSON: I would guess it was a thousand pounds.

MR. CATTON: A thousand pounds.

MR. MICHELSON: Gas only.

MR. CATTON: Okay.

MR. WARD: Pressure. You were talking about flow, though.

MR. CATTON: Well, it is whatever the design

conditions were. So I don't recollect, I don't know what the flow rate is.

MR. SHEWMON: Is most of the problem pulling it shut against the flow?

MR. CATTON: Yes.

MR. SHEWMON: Or holding it against the pressure that is there when the flow -

MR. CATTON: No, no, no. The problem is getting it shut

MR. CARROLL: Fully shut.

MR. CATTON: Fully shut.

MR. KERR: So it is a differential pressure of about 1,000?

MR. CATTON: Right.

MR. KERR: Is that right?

MR. CATTON: Right. And the problem is, it tilts and gouges. So the friction factor gets kind of high.

And once they had it closed -- Actually, I missed the excitement, because the day I was supposed to go there, the local radio station signals were being picked up in the instrumentation. So they cancelled the test.

But the day that I was there, they opened the valve. And it turned out it took almost as much force to open it as it did to close it. So whatever happens, it really gets wedged in.

MR. MICHELSON: That was after being damaged on closure, though, wasn't it?

MR. CATTON: Yes. Yes. It was the following day. And the valve was cold, and they couldn't get it open, until they had reached about the same force pulling it as they did pushing it.

MR. CARROLL: Now, in this test, the valve had an oversized operator on it, I gather.

MR. CATTON: Yes. They wanted to be sure that they closed it, and then they would look at whatever the load was that it took to do that.

MR. CARROLL: And had it followed the pattern in previous tests, the load was okay until you got very close to closed, and galling started to occur?

MR. CATTON: All the data wasn't reduced when I was there, but the valve was not fully closed when the galling started. Now, I don't know if it started at the same place that the other valves did or not. But I looked at the other valves that they had tested, and they all had damaged seats as well. And there was even one, I don't recollect the name of it, that looked like it behaved reasonably well, but the seat was still damaged.

MR. SHEWMON: What kind of a valve was it?

MR. CATTON: This was an Anchor Darling. I'm not sure I know one valve from another. These are massive devices.

MR. SHEWMON: I'm almost sure it was a butterfly ball valve.

MR. CATTON: This was a wedge gate valve. Right.

While I was there, it was interesting that both Westinghouse and a small company that is a spinoff from Glen Reed's place were there testing valve diagnostics, and the -- I'm not sure which one -- oh, the fellow from Westinghouse, they actually have a sensing device that they put on the valve stem. And they measure its change in diameter. And they relate the change in diameter of the stem to the load.

I would have thought that that is an awful small amount of motion. But they were able to correlate their results very well with the results that were obtained by NRC.

The NRC test was extremely well-instrumented. They had Pitot tubes upstream, downstream. They had strain gauges all over the thing, temperatures. They even measured pressures inside the bonnet of the valve to make sure that everything was recorded.

And this simple instrument of Westinghouse was able to hit right on the load, almost as well as the more exotic instrumentation that NRC has.

MR. MICHELSON: Was it actually able to measure load or just tell you when the loading was significantly increased?

MR. CATTON: It measured the load.

MR. MICHELSON: Somehow the conversion factor between

stem diameter and thrust?

MR. CATTON: That is correct. That is correct.

Now, the other people had a little different approach. What they did was they prestressed the bolts that hold the top of this thing down, and then when the valve is opened you unload those bolts. So they essentially measured the unloading of these bolts and related that to the load.

MR. MICHELSON: Those are load washers, I assume.

MR. CATTON: Yes.

MR. MICHELSON: The load washers on the bolts.

MR. CATTON: Yes. Now, the Westinghouse system would be put on the valve and left on the valve, and would record anytime that valve was used.

The other system was only when the had the valve down for maintenance or were doing maintenance-type testing.

Yes.

MR. SHEWMON: Change in diameter is on the order of a tenth of a percent, depending on how big it is. So it is ten to the minus three strain.

MR. CATTON: That is do-able?

MR. SHEWMON: It is do-able, that magnitude.

MR. CATTON: I guess I know it is do-able, because I saw it.

MR. CARROLL: What do they do about stem deflection and so forth that is occurring which might affect the diameter

and ovality of the stem?

MR. CATTON: I think this mounts directly on the stem itself, so if there is a little bit of deflection side to side it doesn't matter.

MR. CARROLL: No. But if you have a long stem, and the thrust is out at the end, it bows a wee bit and that affects the ovality.

MR. CATTON: But they are measuring the diameter of the stem.

MR. CARROLL: What is the diameter now that they are measuring?

MR. CATTON: I guess I don't know what happens to the diameter when you bow. I guess if you bowed far enough to affect the measurements, they would be in trouble.

MR. SHEWMON: Maybe they measure it twice and measure it.

MR. MICHELSON: That may be what they do. You would have to do something.

MR. CATTON: It looked like a very nice system.

MR. IGNE: They could balance that strain out by when it bowed you could have positive and compression on the other side, that could be balanced out, in the bridge.

MR. CATTON: He told me what they measured is actual change in diameter across the stem.

MR. MICHELSON: But in an ellipse, that is different

than on a circle.

MR. CATTON: That's true. That's true.

MR. MICHELSON: So you would have to know which diameter you are measuring.

MR. CATTON: I think if you start bending the stem that much, you are in trouble.

MR. REMICK: Is that the end of your subcommittee report, or your visit report? Any questions?

MR. CATTON: If you want to hear about the rest of the visit, I'd be delighted to tell you.

MR. MICHELSON: Before you go to the rest of the visit, could you tell us what else they are planning on doing?

MR. CATTON: There was one more valve there that they were going to test. And I believe it was a ten-inch valve of the same type. Not the same manufacturer. But it was a wedge gate valve.

MR. MICHELSON: Okay.

MR. CATTON: It was a massive piece of steel.

MR. SIESS: They were testing U.S.-made valves?

MR. CATTON: Yes. It was interesting, too.

MR. SIESS: Are they doing it for us?

MR. CATTON: Yes. NRC contracted EG&G who in turn contracted Kraffwerke Union to do the test.

MR. SIESS: We were told that when KWU started building nuclear plants, they decided the valves weren't good

enough and they went out and designed their own. Are there any tests like this on their own valves that we could use for comparison?

MR. CATTON: I think this test facility was there to test Kraffwerke Union valves.

MR. MICHELSON: Not gate valves.

MR. CATTON: Whatever kinds -- I don't know.

MR. SIESS: You don't think they designed new gate valves, Carl? You don't think KWU designed new gate valves?

MR. MICHELSON: No, the facility was designed, we visited, Charlie and I visited the facility a couple of years ago. And that is when we told the Staff, the Staff said there was nothing in the world where they could do the testing.

MR. SIESS: The question is that KWU, we were told, had developed their own valves as an improvement.

MR. MICHELSON: I'm leading to the answer to that.

The facility was built to test two types of valves, originally. And that was, they designed a very special main steam isolation valve with a relief valve capability on it, and it was originally designed to test that, because it was a very large valve, 20-some inch diameter.

We were over there two years ago, we asked them, and no, they hadn't tested any small gate valves, for instance, but the fellow from out here at Bechtel Alliance told us they had. I asked Charlie again and we agree. They never told us they'd

done that kind of testing. I think he was perhaps mixing it up with something else.

MR. CATTON: But there are other tests at the Kraftwerke Union arena, too.

MR. MICHELSON: Right, but not at that facility. That was our understanding, at least.

MR. CATTON: It was interesting that the finding valves to test was a bit of a problem. The manufacturers were very cooperative. So what they had to do was find one in a bone yard somewhere and they would take it to people who were in the business of refurbishing them. So, they would have the valve refurbished and then they took the refurbished valves to Germany, but they couldn't get the manufacturers to cooperate.

MR. SHEWMON: They could go down to a couple of the abandoned TVA plants?

MR. CATTON: Well, that's essentially what they did. There's a bone yard and you can go to the bone yard and find your own bones and refurbish them.

MR. CARROLL: I think the refurbishing part is that Roy Woods has taken this over, is very sensitive to the criticism of the earlier tests that they really didn't know what kind of shape the valves were in when they started.

MR. SIESS: Are we going to know a lot more if they don't test them; is that the argument? If you don't test them, you won't know how bad they are.

MR. CATTON: Well, one thing is sure. It takes a lot more force than the manufacturer said to close those valves.

MR. CARROLL: Not necessarily, because the earlier tests, the water tests that were done over there, duplicated the tests that Idaho had done with respect to the Anchor Darling valve. It apparently bowed and galled in the seat. The Walworth valve that was tested in Germany performed beautifully -- no problems.

MR. MICHELSON: But the friction factor was about t.5 and not .3 and I think that's what Ivan's talking about. That's the considerably bigger load.

MR. CARROLL: Except some of them specify .5.

MR. MICHELSON: Yes, but the manufacturer traditionally in this country has been using .3.

MR. CARROLL: I don't think that's necessarily true. It depends on the manufacturer and the application.

MR. MICHELSON: At any rate, that's what I thought Ivan was referring to.

MR. CATTON: I looked at the other valves that had been tested there and the seats on those other valves are not nice after the test. They may have closed with the right load, but I would refurbish the valve if I had the responsibility for it. The seats were damaged.

MR. REMICK: Ivan, thank you. I would like to use the additional 20 minutes we have for the reading of a draft

letter here.

[Discussion off the record.]

MR. REMICK: Back on the record. Let's move to Item No. 6 then. Let's move to Item No. 6. Staff here, I believe?

A little bit of history on this item -- several months ago, I was out at Idaho National Engineering Lab and had a briefing on the latest information that the people out there had looking at the bottom head of the TMI 2 reactor and they had recorded two four-inch cracks in the head. It was not clear exactly at that time, or not clear how deeply they were.

I reported that back and we did have showing at noontime one day a couple of months ago that video of their observation of the cracks but we thought it would probably be timely to ask the staff to come in and fill us in on recent findings that they might have with the explorations of the TMI 2 reactor.

So that's the purpose of this discussion. It's just background information. I'm not sure who is here from the staff; do we know?

[Pause.]

MR. STOLZ: My name is John Stolz. I'm project director, one four, and I wanted to provide a few introductions before we talk about the status of TMI 2 this afternoon.

In early '88, the TMI program office was abolished at the site and the responsibilities for that were assigned to

NRR. We were fortunate enough to have still with us in that transfer project manager Mike Masnik and Lee Thonus who is the project manager assigned to residents at the site.

Lee will be talking about the history of the accident briefly and concentrate on the current activities including the cracking in the bottom of the vessel. He'll have a videotape to show that. I think it's very instructive.

We also have Bob Van Houten from research this afternoon, and he is responsible for managing the research and the sampling program -- the sampling in the bottom of the head. That should take place in about a month and a half. Mike Masnik will finish up with describing our future plans for completing the cleanup and placing the facility in a monitored storage condition.

So if there are no questions, we'll start out with Lee Thonus.

MR. REMICK: Just a suggestion. We've had a number of briefings, of course, on the accident. I don't want to belabor that too much. It is the more recent findings and where you stand that we'd like to have emphasized.

[Slide.]

MR. THONUS: My name is Lee Thonus. I'm the on-site project manager. The first slide we have here is basically what the reactor looked like several hours after the accident. Of course, it took us about eight years to gather this

information.

This was basically put together by DOE and you can see at the top of the -- you all have a copy of this color slide in your hand out -- at the top, you can see there's a void that was roughly five feet deep when they first got a TV camera in there in 1982. That was the first thing that they found, below that, loose material, consolidated material, which was once molten, below that some partially intact assemblies which had shown some thermal damage and then you can see where the molten areas were.

It started out on the side where it melted through the baffle plates and made its way to the lower head. Next slide.

[Slide.]

MR. THONUS: I'm just going to very, very quickly run over where we've come from, not to belabor it, but just to give you, when I talk about where we are now, what got us there.

'79 was the accident. Initially looked at things like plant stabilization. People were putting in extra decay heat removal systems one of which was called the auxiliary decay removal systems. It never got all the way hooked up. There was one called long-term B. It started water processing through EPICOR II. It was a system that processed the water that was mainly in the auxiliary building.

That water is now called AGW, accident generated

water. There is 2 million gallons of it. At that time, in late 1979, we had what was called the City of Lancaster agreement. Accident generated water was defined as having greater than 0.25 microcuries per milliliter of tritium and there's a little bit more extent to it than that but that's very briefly what it was.

The deal was a three-way deal struck between the NRC, the Intervenors, the City of Lancaster, and the utility, that they would be allowed to use the process, clean up the water, but the ultimate disposition would be decided some time off in the future and it would go through some sort of a licensing process.

Anyway, 1980, the krypton was vented from the building. That allowed manned entries into the building. There was some early data gathering. '81, some dose reduction, decontamination activities. We're a couple of years into the accident. The last thing, SDS operational -- that's the system that cleaned up the radioactive water that was in the basement. There was about 600,000 gallons of water in the basement and it was roughly 150 microcuries per milliliter. Next slide.

[Slide.]

MR. THONUS: '82, they removed the lead screw at the H-8 location, lowered TV camera, got that first picture that I mentioned before. More decontamination, data gathering. '83, lot of '83 was taken up with polar crane. Some of you may or

may not remember, there were a lot of allegations about how the polar crane refurbishment was done, was it done safely, were things treated as ITS, not ITS and basically that set the clean up back about a year until all those issues were resolved.

Come into '84, the head was removed. The internal indexing fixture was installed on top of the reactor vessel flange, allowed it to be flooded up another five feet. The canal -- the end of the canal by the fuel transfer tubes was also flooded. The rest of the canal was kept dry by a dam. You see, we've gone five years post-accident before they get the head off and get a look inside. Next slide.

[Slide.]

MR. THONUS: '85, a video was taken of the lower head. There are holes that are used -- exercise holes -- for the internal vent valves. They lowered a camera down through the internal vent valves exercise holes, went down along the outer annulus of the reactor vessel, got a camera, looked at what was in the lower head. It looked like a pile of coal. There was also some shots of where dripping candle effect coming through the elliptical flow distributor of a lower core support assembly.

The plenum was removed in '85 and actually in late '85, I think it was October 31st, they actually started what was called defueling. That was preliminary moving things around -- not actually taking anything out. 1986, the rubble

bed, the loose stuff was defueled.

The core bore samples where they used an oil drilling rig to drill through the core and get vertical samples just like any geologist would take samples of the earth. Those samples were taken in '86. '86 was where they had the visibility problems. Bacteria and other organisms got in the reactor coolant system. It was an ideal growth medium. Temperatures around 80 degrees.

The hydraulic fluid, which was carbon-based, served as a source of nutrients. The lights they used for observing what was going on served as a source of heat and energy and at one point in time, the visibility was about that far.

The first fuel shipment went out in '86. 1987, they actually got down to where they were taking -- if you look at the color slide of the reactor vessel -- the assembly remnants. They got down to where they got underneath the lower end of the assemblies and popped the assemblies loose. That basically meant the core area was defueled.

There was sludge in the reactor building. At one point, everybody, oh gee, how deep is this sludge. It looked like a lot. It turned out to not be very much of anything. A lot of radioactivity associated with it compared to a normal plant. It was mainly probably a layer of silt only a quarter inch thick but looking at it initially, it looked like a big layer of mud, but it varied. The floor wasn't even and in a

couple of spots, it may have been a couple of inches deep and they said, oh, my God. Two inches deep over an entire containment building. There's going to be tons of this. There wasn't.

Decontaminated the reactor building walls, that was basically a mechanical abrasion process. There's a lot been written about this. The reactor building walls, you know, the water flooded 200 microcuries per milliliter. The activity leached in and again I'm trying to gloss over this very quickly. It tended to stay in the outer centimeter of the core concrete wall. It was also a hollow block wall, if we hit the next slide.

[Slide.]

MR. THONUS: Talking about defueling the lower core support assembly, that's somewhat we've got in the model here. Deconning the reactor building walls, same thing, a mechanical thing. The block wall flush. There was also hollow blocks, like cinder blocks. They poured water in the center but the water flowed out. It leached. It was about 35 percent successful in leaching radioactivity out.

The hollow walls absorbed radioactivity much more efficiently or to a much larger extent than the solid poured walls that were the 5,000 p.s.i. and 3,000 p.s.i. walls.

Yes, sir.

MR. SHEWMON: Is that because their one block that

had holes in the center was also more porous in its construction or aggregate or something?

MR. THONUS: The hollow wall was very much more porous.

MR. SHEWMON: Okay. Cinder block or concrete?

MR. THONUS: It's concrete -- as far as I know, but it's a concrete block but they were hollow.

If you want, I'll tilt up the model. I'll catch that in a second. We also had the evaporator hearings. Earlier, I alluded to the fact that there was water in the auxiliary building. There was also water in the reactor building. When you added up all the water that was here, there and then there was continuous makeup every time there was a little bit of leakage, they used fresh batches of DI water, added boron, added to the system, and it's continually adding to the total inventory but any more of the additions are very, very slow and when they leak water out, they reprocess it and they reuse it.

We're up to around 2.3 million gallons right now at the site.

There were public hearings on how that water was to be disposed of. Those hearings were held in late 1988, October-November, 1988.

Various alternatives were considered. We put out an addendum to the Environmental Impact Statement that dealt with the water processing possible alternatives. The alternatives

selected by GPU Nuclear was to evaporate the water.

At first I thought that took some people by surprise but there was -- everyone was expecting there to be a water discharge and the Intervenors would oppose that and when it was in evaporation the Intervenors also opposed that. The hearings were concluded in 1988-1989. The evaporator decision was rendered by the ASLB in favor of the utility. It went through the appeal process. There was a stay denied, appeal denied.

Right now they are in the phase of testing the evaporator. I expect that the evaporator testing will be complete and the first gallon of water will be evaporated probably sometime in January of 1990.

Defueling-wise, 1989 defueling lower core support assembly, which was quite a difficult job, the lower head which they are still doing a little bit of now and the area behind the core baffle plates.

Remember the first slide, the first color slide we had showed that a hole was melted in the baffle plate. You'll get to see that on the videotape and a lot of fuel was distributed behind the baffle plate. The last thing to happen this year, when they are finished with the fueling probably the first part of next month, we have an international research program -- Bob Van Houten's here and he'll be able to answer any detailed questions -- we'll hit that a little bit more but to obtain samples from the reactor vessel head, especially in

the areas where we have observed cracks.

Let's see what we've got for the next slide.

[Slide.]

MR. THONUS: This is probably a good point for me to tilt this up.

The various components of the lower core support assembly when they are cut apart, this obviously the forging is 14 inches thick. It is pretty tough to cut with anything. It was all cut under 40 feet of water with a plasma arc torch and every time just because of the way the torch head was, now this side was cut just as much as that one but the way the model is, one-half the model shows how it originally was and one-half shows after cutting.

You'll notice it is kind of a step defect. Every time you go down one layer, just because of the size of the head, you have to step in a little bit narrower, so by the time you got access through the final layer which we couldn't fit in the car -- we have a piece, the piece that was cut out -- this would fit underneath here like that [indicating].

MR. SIESS: None of this was melted?

MR. THONUS: Pardon me?

MR. SIESS: None of this was melted?

MR. THONUS: No, none of the -- there was very little damage, essentially no damage to the various layers of the lower core support assembly. There was a little bit of damage

and you will see some of it. It alludes to it slightly on the first color picture, that there was some damage noticed on the guide tubes. There was some damage to the guide tubes and when you see the in-core entry penetrations, you'll see it in the video, there was extensive damage done to those.

A lot of metal flowed through here but apparently it went through fast enough not to do any damage.

There are holes in the core formers that started out being three-quarters of an inch in diameter.

MR. CATTON: What is a core former?

MR. THONUS: Do we have that on a slide? Yes.

[Slide.]

MR. THONUS: This unfortunately is the wrong dimension for what I want to show you but the core former, if you have a round core barrel and then your actual -- the core is kind of a stepped, rectangular --

MR. CATTON: Okay, I understand.

MR. THONUS: -- so you have the baffle plate and the core former is the -- are these [indicating]. They are round on one side and flat on the other and a real odd shape, as best I could describe it. I'm not sure now to, but the core formers are oriented horizontally -- pardon me?

MR. CATTON: There are spacers?

MR. THONUS: There are spacers. There are spacers between the baffle plate and the core barrel and they have

these three-quarter inch diameter holes in them that as the melt went through there apparently it had a long enough stay time or enough heat was -- and some of those holes are about this big now, about three inches or so.

MR. CATTON: Was the core barrel damaged?

MR. THONUS: Not to -- there's a couple of spots where it is kind of hard to say. It's been discolored from heat or material adhering to it. It wasn't melted through anyplace. It may have had small areas of ablation but it's kind of hard to call it, looking at it -- you know, you're looking through a camera that's under forty feet of water and maybe it's just kind of a shadow and maybe it's just something adhered and maybe there really is a little bit.

Most people tend to think that there was just a little bit of slight ablation in a couple areas on the core barrel.

[Slide.]

MR. THONUS: This shows -- while I've got this slide out here -- this was a couple of months back, what the status of everything was. This shows that the five layers of the core support assembly and how as you go down, the final one being the elliptical flow distributor, a hole through the center of the core gets a little smaller. Now this area here was all filled with fuel at one point in time and right now you also see that as you get down this far there's remaining fuel

material out here and out here [indicating]. When you flush it, it tends to fall downhill and wind up in the lower head, which is a convenient spot to pick it up.

MR. CATTON: Right in the center there is a spike in the downward direction. Have you looked at that? Was that the -- did the melt penetrate like that?

MR. THONUS: Yes, there was -- some of the melt that got pretty close to the lower end fitting near the center of the core but it wasn't -- you know, when you looked at the end fittings it didn't go through. There wasn't significant damage at the very, very bottom.

It went almost all the way.

MR. CATTON: So the crust failed and it spilled out.

MR. THONUS: The crust failed and it spilled out and it spilled out and went through the baffle plate. It kind of, like I said, enlarged those holes in the core formers as it went through.

It also expanded radially. It melted a hole -- and you will get to see that very, very dramatically when I show you the video.

MR. SHEWMON: This stuff that came around on the far side you think came out of the crucible there and ran around differentially?

Yes, that. How did that get from the left side to the right side?

MR. THONUS: Oh, it's 360 degrees around. When it spread it went all the way around.

MR. SHEWMON: But the source was only that one place on the left?

MR. THONUS: Yes. There was only one principal hole through the baffle plates. When they took apart the baffle plates -- and you'll get to see that hole -- it's a big hole. You could crawl through it with no problem without touching.

MR. CATTON: You show a crust up there on the right. High up above --

MR. THONUS: Yes, this is a three dimensional picture.

MR. CATTON: High up.

MR. THONUS: This crust?

MR. CATTON: Run your finger up a little bit.

MR. THONUS: Okay.

MR. CATTON: Is that crust material or is that a mistake?

MR. SHEWMON: That was filled with molten material before there was this opening up and it fell out.

MR. CATTON: That high?

MR. SHEWMON: Well, there's a lot of stuff on the bottom that was on top of what's still remaining there.

MR. THONUS: I don't -- I'd have to measure that. That crust that you are talking about on the top right looks a

little higher than my recollection of being any crust.

MR. CATTON: So the crust failure on the side won out over the penetration in the dominant direction?

MR. THONUS: Yes, the crust failure on the side won out over what was going down the center.

MR. CATTON: But it looks like it was a close race.

MR. THONUS: Yes. It looks like it was a close race. I certainly couldn't dispute that.

MR. REMICK: We are going to have to move ahead as fast as we can.

MR. THONUS: Okay, one more slide. We'll keep going forward.

[Slide.]

MR. THONUS: This gives you a rough idea of progress versus time. You find that they get something that they could dig out and they'd get something that would represent a new challenge, then they'd figure out how to attack it and then you would have a rate of progress, then a flat zone, a rate of progress and a flattened out area.

The big flat area here is trying to drill and cut and get through the lower core support assembly which is stainless steel and isn't a very easy material to cut. It smears rather than chipping nicely like carbon steel.

Next slide.

[Slide.]

MR. THONUS: I'll go through these real quick.

This is just some of the melting points. I'm sure that most of you probably know more about metallurgy than I do but anyway these are just some of the melting points of some of the material that was in the core. Stainless steel control rods, one of the first things to melt, spacer grids, Inconel. We'll see the spacer grids, also the in-core instrument penetrations are Inconel -- the UO2 5000 -- the Eutectic, if you melted zirc, you could actually sort of either form a Eutectic or you could actually dissolve a certain amount of uranium dioxide. It appears you also have some of that other Eutectics, other than zirc uranium. You could have a Eutectic of stainless steel dissolving zirc -- but not much of that happened.

MR. PEMICK: We are particularly interested in what you have recently found on the bottom head, the cracks, the depth of those cracks, and those type of things. You are going over a lot of information we've had in the past.

MR. THONUS: Just this little bit of background information for the video. These in-core instrument penetrations started out as one inch penetrations I think on the start-up of Oconee or one of those plants. There was a problem. They weren't large enough in diameter and there was flow induced vibration and damage to them so this was then ground out. There was a weld put in with a backing sleeve and

then the larger two inch diameter in-core instrument penetrations were put in.

Just to give you a history of what these things are, why they are two inch and why you have so much weld zone here at the base, you've got 3/16ths nominal stainless steel clad on a typical mg/mo carbon steel vessel.

Next we have -- what? Oh, next is the video. Okay.

MR. CARROLL: Relate that to this.

MR. THONUS: Oh, this is above the head. This is this [indicating] and this is this [indicating]. These are the guide tubes and these dowels are simulating the in-core instrument penetrations themselves. Then I'd have the lower head is what fits onto here that wouldn't fit in the car.

[Video presentation follows:]

MR. MICHELSON: One of the cracks, G-6, this is the smaller crack.

Go ahead, roll it.

[Slide.]

MR. SHEWMON: Is it always from top to bottom so there's apparently a white line as the fluid came around?

MR. MICHELSON: No, this is just purely a -- it's fuel dust somewhat obscuring a crack. Now, there is a crack looking vertically down. That also looks like G-6.

MR. SHEWMON: Which ways did the material flow when it came down --

MR. MICHELSON: The material flowed from top to bottom in the picture.

MR. SHEWMON: My question, did it flow top down, and it did.

MR. MICHELSON: It came more from a 45 degree angle. It's following the curvature of the head rather than vertically, okay. You know, there should be a hole in the center of this for the instrument tube and you can see that's filled.

MR. SHEWMON: What sort of dimension are we looking at here?

MR. MICHELSON: That's two inches roughly in diameter. Now, what this picture shows is they're trying to measure the diameter. It's two inches are built. When they measured it, it was actually off -- it was slightly smaller than two inches.

Go ahead, roll it.

[Slide.]

MR. REMICK: Still only two cracks found?

MR. MICHELSON: Well, more than two. This shows the better crack. This is E-7, and what you've got on here is what I call a little stinger. If you notice it's black and white striped so that you could tell the depth how many stripes went in. This little stinger is going to try and do like this, they're going to try and stick it in the hole.

MR. SHEWMON: How long is that crack?

MR. MICHELSON: That's probably around six inches from here to here.

MR. SHEWMON: Okay.

MR. MICHELSON: This is two inches in diameter, so figure that's about six. They brushed it to see whether or not the crack was a crack or whether the crack was a crack in some fuel deposits, you know, just some crusty material on top of it. But the crack after they brushed it the crack was a crack. Okay. In the metal. Now, there's some dispute over whether that's just in the clotting or whether that goes down into the base metal of the reactor vessel.

This thing is cut so that it'll fit the curvature of the head and right now it's backwards to the head and the stinger should be side toward you but it's on the side away from you and this thing was also the diameter, the diameter of it was sized so it would fit over one of the penetrations and it would fit the curvature of the head and the stinger would go in the hole. Well, as it turns out they got the stinger in the hole only with it turned free floating, not being aligned, and turned backwards, but such is the life of an engineer.

Okay, roll it.

[Slide.]

MR. MICHELSON: As you can see, the stinger right now is in the hole and it's moving back and forth about that much

freedom in that hole. The stinger is 3/32nds -- or, in diameter.

MR. SHEWMON: So, you couldn't see how deep it was?

MR. MICHELSON: There are people who, with calibrated eyeballs, have said how deep it went. I can't, but someone who is more familiar with it than I am declared a depth.

Go ahead, roll it.

[Slide.]

MR. MICHELSON: I could tell roughly, you know, it went from here to here back and forth if you're watching all the back and forth. You could tell how deep it went by looking at the number of black and white stripes that disappeared on you. Of course, with it facing the wrong direction I have a hard time and I didn't get to see it that well.

This is the center of the core looking out toward the outer periphery. You know, you're in the hole that's been cut through the center of the LCSA and you're looking out and you can see how there's a lot of junk out here on the outside. You're looking out and between the layers there's a lot of stuff that falls down there that's very hard to remove.

Keep rolling.

[Slides.]

MR. SIESS: What's that on the left?

MR. MICHELSON: It's just a post, a support post to align tools.

In the background there this is the hole. Of course, every time we freeze it we lose the picture quality. This is the hole that was melted through the baffle plate and we'll get a little bit better near the bottom of it. We get a little bit better look at it there and if you've got this kind of affect where you've got a step defect toward you you're looking at something like this and it's -- now, if you orient this vertically and this wall extends up and down for some distance, the hole is melted through on two bases that are 90 degrees to one another, and you'll see that and it goes in and out of both sides of this.

Go ahead and roll it.

[Slide.]

MR. MICHELSON: This striped affect on here is artifact of a high-pressure water flush. A super high water flush that they used to try and clean it off and it actually -- some of the metal was probably partially oxidized and embrittled and it actually blew away some metal, okay.

You can see the hole through there now. Back here somebody asked before about was the core barrel damaged and if you look at this shadow here and here and someone says, well, gee, the direction of the light was such that's not a shadow, that's a damage area, and there are other pictures that show that better than this one. But there is the holes through the baffle plate.

Dimensionally, how big are you looking at? These bolt holes here are roughly four inches apart and an assembly -- or, one of the steps is roughly eight inches.

Go ahead, keep rolling.

This is near the upper part of that -- we're getting a little bit higher. This is again the baffle plate, that's the hole melted through, you can see one of the core formers. There is where you see it's got two surfaces. There's a step here -- I should get my hand out of the way and let you guys look. This is the top of a little bit of a spire. You've got a dimension and then you've got another that goes in and out and you can see where it went in this way, came -- it went in this one, came around and out that one, sort of like almost like a spire staircase.

MR. SIESS: Have you made mark-ups of models of what you see?

MR. MICHELSON: To my knowledge no one has. There are drawings of it but there's no.

MR. SHEWMON: In the bottom can you -- how much strength does it have now? Does it easily fall apart or is it crystallized into something which is solid or firm?

MR. MICHELSON: The former core material with all the things that it dissolved in would have generally proven to be relatively friable; it broke up, except the layer that was on the very bottom of the lower head. The rest of it broke up

fairly readily. There was that -- the stuff that was behind the baffle plats. In other words, if this is the bottom of the core, which is this here, I've got -- was 156 inches or so long assemblies. This was loose up in here. Relatively loose. They just fall down. Some of this was solidified but broke up easily and as you got to the very bottom it became more difficult to break up. It was also --

MR. SHEWMON: What I'm trying to get at, I guess, is that if there was indeed a crust there and it tended to freeze and break up and particulate as it came down then -- the question is usually how molten is that material when it gets down to the bottom of the core and if --

MR. MICHELSON: All the indications are that the relocation occurred very very quickly and it didn't stop and freeze and thaw on the way, it just went bang once.

MR. SHEWMON: But it did go around a lot of obstacles which meant it had to break up and expose fresh surface to what.

MR. MICHELSON: Yes, and that's what I think the loose stuff is and you're finding that on the upper layers that the stuff was that was freshly exposed may have solidified as particles this big and settled out but the main melt that made its way down tended to stay intact to a certain extent. Yes, that's -- when we saw the lower head we saw the free coal pile, the chunks that looked like, if you didn't know you were

looking at an old core, you'd look like it was some kind of old coal mining heap. And then the stuff at the very very bottom that, you know, the stuff that got broken into pieces kind of fell off onto the side on the way down and the stuff that went out the very very bottom, there was a solid mask, maybe 18, 20 inches deep, five feet across, and that was also tougher than most to break up.

I want to stop that there.

All you're seeing here, that bent piece is when they were doing some defueling they hooked a tool on the bottom of one of the baffle plates and they bent it some, so you got. Now, what you're seeing here, these arrows are some cracks that appear to be out in the middle of no man's land not necessarily associated with any in-core instrument penetration, but the arrows are pointing at additional cracks. You see the cracks here? And I have seen other pictures, I mean, I sat through about six hours of looking at these tapes and I've seen some other cracks and if you follow them long enough sometimes you can lead them to a in-core instrument penetration so it's kind of up in the air.

Are they all associated with in-core instrument penetrations as a good starting point for the crack, or are they not? Two theories. I believe that -- yes, sir?

MR. SIESS: Why do you say a starting point? Usually cracks end at a hole.

MR. MICHELSON: But there's a lot of residual stress from the extra welding that had to go on to change those one-inch penetrations in the tube. So, there's probably more residual stress and more strange metallurgy in that particular area than the area where you had a very controlled process to lay down -- there was, you know, automatic welding machines I think that had four or five fingers on it that laid down this stainless steel cloud and just went around and around the head.

Okay, next, roll it. I think that's it. Do you want to go back and look at any particular one of those again? The crack or anything?

MR. REMICK: Are any of the additional ones they found of the same length as the first two? The four to six inch links?

MR. MICHELSON: The first -- the sixth one, the one at E-7 that's six inches or so long, that's certainly the most dramatic crack. There are a couple that I've -- you know, they're just, they're kind of shadowy looking because there's a layer of dust on the lower head. You really can't see it very well and there may be some of those other ones that were shown by the arrows that are as long but they're certainly -- those E-7 you can actually see separation and you saw the stinger go in the hole. The other ones, you know, you could have just drawn a pencil line on there. You know, it's a crack without any physical -- you can't see any separation from side to side.

MR. CARROLL: What was the diameter of the stinger, again? 3/32nds?

MR. MICHELSON: 3/32nds.

MR. CARROLL: You can't use something smaller in diameter than that?

MR. MICHELSON: Oh, they could have, but it just would have been a research process in the point where they're just trying to get the fuel out of the core. They took several days out of the fueling to get what information they did.

MR. CARROLL: The comment was these went in and cut in the order of an inch or so?

MR. MICHELSON: No. They went in -- the person who made that call -- I couldn't make that call. The guy who made the call I think called them in the same thing, 3/32nds of an inch.

MR. CARROLL: And the clouding thicknesses?

MR. MICHELSON: It's 3/16ths.

MR. CARROLL: Half-way through the clouding thickness if you believe that the probe got to the bottom of the hole --

MR. MICHELSON: Yes, I would tend to think looking at the crack, and again, there's no facts behind it, that that crack is more than 3/16ths deep, if you looked at that crack.

MR. REMICK: Any further questions?

MR. CARROLL: Is there any plan to try to get a better definition of --

MR. MICHELSON: Yes, next slide.

MR. CARROLL: All right. One other question. Just out of curiosity, how are TV cameras holding up down there with respect to lens browning or any other problems?

MR. MICHELSON: The colored TV cameras don't hold up very well, but the black and whites seem to hold up quite well. Right now the radiation feels that -- they aren't that intense anymore. Most of the fuel has gone, you're out of the area where there's very much neutron activation. You're down in the lower head.

What this is a slide of is a metal disintegration machine head and this is depicting the lower head of the reactor vessel and how this head is going to come in from one side and then the other and take out a triangular cross-section chunk out of the reactor vessel head. This is Bob Van Houten's program and this is what it looks like -- that's what it sort of looks like when it's backwards, that's correct, after it's done its job.

You can do two things. One is you can just take a piece out of the head and you can see the triangular cross-section and if we pull this down just slightly you can see the dimensions of this wedge, it's about this big and triangular in cross-section. You can also use the machine to take out a piece that includes one of the in-core instruments penetrations.

The first thing you have to do is cut off the in-core instrument penetration two to four inches above the reactor vessel wall and then there's an expanding plug that's put in the lower portion because the reactor coolant pressure boundary is right in here when that's in here. This, the reactor coolant pressure boundaries is there.

[Slide.]

MR. MICHELSON: We have this slide. Right here is the reactor coolant pressure boundary. So, when you take that out they have an expanding mandrel that then expands the tube against the hole in the reactor vessel head. It will hold over a 1,000 PSI and there's only, you know, whatever the static head of 40 feet of water and then you get this piece out that looks the same as this one except it has the in-core in it including what I'm sure Bob Van Houten hopes is the ones with the cracks.

MR. WARD: What is that called? I guess I would call it like an electron discharge device, very, very slow -- not inexpensive. You wouldn't want to do much production work with it, given the environment that they're working in. It will get the job done.

MR. THONUS: A metal disintegration machine.

MR. WARD: What is that? It's not electrolytic then. It's a spark discharge.

MR. THONUS: Yes, it's very high temperature. I

forget what it takes -- maybe an hour or so to cut one of the suckers out. They have plans for taking 20 samples and hopefully they're going to get these guys that include the cracks.

Bob tells me it will be about two years. You know, the data will flow back from the labs gradually, piecemeal. Samples will be taken, in-core instrument guide tubes will be sent out to the OECD countries in Japan and then as they go through their program, their results will come in.

It will be two years before the results will come in.

MR. STOLZ: Is there anything further from the staff?

[No response.]

MR. STOLZ: Mr. Masnik will talk about future plans.

[Slide]

MR. MASNIK: In 1987, the licensee formally submitted to the NRC, plans for long term storage of the facility after defueling. The licensee felt that further decontamination of the facility, once it had achieved a safe, stable, and defueled condition, would incur additional man-rem exposure without a significant increase in safety.

This first slide talks about the licensee's plans for the TMI 2 facility. The licensee intends to complete defueling by removing greater than 99 percent of the fuel. The fuel remaining in the facility will be in a condition that precludes criticality.

This will be assured by a variety of methods such as defueling below a critical mass amount, preventing the movement of fuel and removing the potential for a moderator. All contamination that has been removed from the facility will be packaged and shipped offsite, and all liquid rad waste will be disposed of.

Lee mentioned that the licensee will shortly begin the evaporation of the accident generator water. The next slide, please?

[Slide.]

MR. MASNIK: Some additional decontamination will be performed after defueling, but only that necessary to place and maintain the facility in long term storage. The licensee's term for this storage period is post-defueling monitored storage, or PDMS and in recent correspondence, the licensee has indicated that storage would likely be until Unit 1 ceases operation, at which time both Unit 1 and Unit 2 would be decommissioned simultaneously.

This would be approximately 23 years from now. There would be limited access to the facility during this storage period, and at first, there would be inspections to verify that the internal conditions of the facility are not changing and these may change or the frequency may change, if warranted.

The licensee is making no attempt to preserve the facility. The licensee's energy plans for the future do not

reflect the return to service of TMI 2. The next slide, please?

[Slide.]

MR. MASNIK: This next slide provides a schedule for the major remaining activities associated with the current defueling effort. Defueling will be done by the end of this month, early next month. The lower head sampling will begin, hopefully, in December and run for approximately 30 days.

The accident-generated water evaporation will begin in January and will take approximately a year to 18 months. The fuel shipping will be completed by March, 1990. The last fuel will be shipped offsite to Idaho. The decon of the facility necessary to place the facility in long term storage will be completed in March of 1991 and the licensee hopes to enter PDMS in April, 1991.

A license amendment is required to place the facility in long term storage, and if a hearing is required, this date may slip as much as a year or so. Waste shipments will be done in June of '91. The last six months or so will be principally evaporator bottoms associated with the evaporation of the evaporation-generated water.

The next slide, please?

[Slide.]

MR. SHEWMON: What are the main isotopes in the accident-generated water?

MR. MASNIK: Principally tritium which, of course, will be evaporated, but there is some strontium and some cesium -- less than a Curie each.

MR. REMICK: What is the licensee doing with the turbine generator. You indicated no interest in the capital preservation. Are they selling that, or is it just going to sit there?

MR. MASNIK: There have been some parts --

MR. THONUS: The turbine generator, at one point, was kept under nitrogen to preserve it. That's no longer being done. I'm sure if anybody wanted to buy it, the guy back there would take any bids, but if either Unit 1 or some other facility has a use for any parts in their current condition, I think GPU would be glad to sell them, and a few have been sold, but there's no effort being made right now to maintain those parts.

[Slide.]

MR. MASNIK: This last slide lists the principal remaining NRC staff actions associated with the cleanup. But first, and probably the most important is the defueling completion report. This is the licensee's submittal to the staff that establishes the end of the defueling.

It must demonstrate that the licensee has defueled the facility to the extent practicable and that the probability of a criticality is precluded. Next, is the staff's review of

the post-defueling fuel survey reports.

These are a series of fuel surveys of the various locations throughout the facility where fuel will remain after the facility is placed in storage. The purpose of these surveys is to form a basis for S&M accountability.

The staff also plans to fund an independent fuel measurements program that will hopefully verify the licensee's measurements and form the basis for a Commission policy statement on the completion of the cleanup, and the safe, stable, condition of the facility.

Next is the review of the long term storage option, PDMS. The staff has had the licensee's proposal under review since 1987 and this past August, we published a supplement to the impact statement that addressed specifically the issue of long term storage of the facility.

This Spring, we plan to issue the SER and PDMS and then the staff will likely have to go through the hearing process before an amendment will be issued. Finally, oversight of the evaporation of the accident-generated water, due to the significant public interest in this activity, the NRC on-site staff plans to closely monitor this activity, especially in the early months of operation.

We also plan to review and approve the detailed operating procedures of this activity, prior to operation. That's it. Are there any questions?

MR. SHEWMON: On the fuel quantification, is this for ALARA, or to avoid re-criticality, or what level of fuel quantification?

MR. MASNIK: This is a study we plan to fund, just to verify that the numbers that are reported to us by the licensee are correct and that we can say that the facility is in a safe, stable condition, principally for criticality.

MR. SHEWMON: Thank you.

MR. REMICK: Further questions?

[No response.]

MR. REMICK: Is that it for the staff?

MR. STOLZ: Yes.

MR. REMICK: Thank you very much for an interesting presentation, with all the color viewgraphs and models.

[Whereupon, at 3:30 p.m., the hearing was adjourned.]

REPORTER'S CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission

in the matter of:

NAME OF PROCEEDING: ACRS 355th General Meeting

DOCKET NUMBER:

PLACE OF PROCEEDING: Bethesda, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Marilynn Nations

Official Reporter
Ann Riley & Associates, Ltd.

T-2

NRR STAFF PRESENTATION TO THE ACRS

R. Barrett

SUBJECT: Generic Letter Supplement on Accident Management Strategies

DATE: November 16, 1989

PRESENTER: Robert L. Palla, Jr.

PRESENTER'S TITLE/BRANCH/DIV: Senior Reliability and Risk Analyst
Risk Appplications Branch
Division of Radiation Protection and
Emergency Preparedness
Office of Nuclear Reactor Regulation

PRESENTER'S NRC TEL. NO.: 492-1076

SUBCOMMITTEE: Severe Accidents

OUTLINE OF PRESENTATION

1. PURPOSE OF PRESENTATION

2. BACKGROUND
   - MEETING CHRONOLOGY
   - A/M PROGRAM ELEMENTS
   - A/M STRATEGY IMPLICATIONS IN RELATED DOCUMENTS

3. ACCIDENT MANAGEMENT STRATEGIES

4. GENERIC LETTER SUPPLEMENT

5. STATUS OF SUPPLEMENT AND NUREG/CR

6. SCHEDULE OF ACTIVITIES

PURPOSE OF PRESENTATION

1. TO DESCRIBE BACKGROUND AND APPROACH FOR THE PROPOSED GENERIC LETTER SUPPLEMENT

2. TO SOLICIT ACRS VIEWS/COMMENTS ON PROPOSED SUPPLEMENT

T-2

ACCIDENT MANAGEMENT MEETING CHRONOLOGY

MEETING	TOPIC
SEPT 9, 1988 - ACRS FULL COMMITTEE	PRELIMINARY CONCEPTS REGARDING A/M
JAN 13, 1989 - ACRS FULL COMMITTEE	STAFF PLANS FOR A/M REGULATORY AND RESEARCH PROGRAMS
JAN 23, 1989 - COMMISSION	STAFF PLANS FOR A/M REGULATORY AND RESEARCH PROGRAMS (SECY-89-12)
MARCH 2, 1989 - INDUSTRY (IPE WORKSHOP)	OVERVIEW OF A/M PLANS AND APPROACH
SEPT 20, 1989 - ACRS SUBCOMMITTEE	1. GENERIC LETTER SUPPLEMENT 2. A/M RESEARCH PROGRAM PLAN 3. NUMARC A/M GUIDELINES

A/M PROGRAM ELEMENTS

T-2

1. ACCIDENT MANAGEMENT FRAMEWORK

- REVIEW NUMARC/EPRI GUIDELINES FOR A/M	NOV 1989
- DEMONSTRATE GUIDELINES (INDUSTRY)	1989 - 1990
- PRESENT IMPLEMENTATION PLANT TO COMMISSION	SUMMER 1990
- ISSUE GENERIC LETTER ON ACCIDENT MANAGEMENT	FALL 1990

2. ACCIDENT MANAGEMENT STRATEGIES

- IDENTIFY AND EVALUATE "LESSONS-LEARNED"	FALL 1989
- ISSUE SUPPLEMENT TO IPE GL 88-20	FALL 1989
- EVALUATE ADDITIONAL STRATEGIES (RES)	ONGOING
- ISSUE ADDITIONAL STRATEGY GUIDANCE	AS NEEDED

T-6

A/M STRATEGY IMPLICATIONS IN RELATED DOCUMENTS

- IPE GENERIC LETTER 88-20
  - STATES THAT ACTIONS WHICH CAN SUBSTANTIALLY REDUCE RISK MAY BE IDENTIFIED DURING CONDUCT OF IPE
  - ENCOURAGES LICENSEES TO IMPLEMENT SUCH ACTIONS IN FORM OF EOPS OR SIMILAR GUIDANCE
  - DEFERS REQUIREMENT FOR LICENSEES TO DEVELOP A/M PLANS CITING WORK WITH NUMARC TO
    (1) DEFINE SCOPE AND CONTENT OF A UTILITY A/M PLAN
    (2) DEVELOP AN APPROACH FOR INCORPORATING IPE RESULTS INTO A/M PLANS

- IPE SUBMITTAL GUIDANCE DOCUMENT (NUREG-1335)
  - REQUESTS LICENSEES TO DOCUMENT STRATEGIES TO PREVENT/MITIGATE EFFECTS OF SEVERE ACCIDENTS
    - DEVELOPED AS PART OF IPE PROCESS
    - CREDITED IN THE ANALYSIS

RELATED DOCUMENTS - CONTINUED

- COMMISSION PAPER ON A/M (SECY-89-012)

  - DESCRIBES ACCIDENT MANAGEMENT PROCEDURES AS A MAJOR ELEMENT OF AN A/M PLAN

  - STATES THAT NRC WILL PROVIDE A/M STRATEGIES TO LICENSEES FOR THEIR EVALUATION

- STAFF REQUIREMENTS MEMORANDUM REGARDING SECY-89-012

  - DIRECTS STAFF TO PROVIDE LICENSEES A/M STRATEGIES WHICH MAY BE APPROPRIATE, ON SCHEDULE SO LICENSEES CAN CONSIDER THEM DURING IPE

    - ENSURE STRATEGIES ARE NOT LIKELY TO DETRACT FROM SAFETY
    - CAUTION LICENSEES ON IMPLEMENTATION OF STRATEGIES

T-6

ACCIDENT MANAGEMENT STRATEGIES

- EXAMPLE STRATEGIES FOR FURTHER ENHANCING EMERGENCY OPERATING PROCEDURES ARE IDENTIFIED IN SECY-89-012

  - STRATEGIES FALL INTO 3 GLOBAL CATEGORIES
    1. CONSERVING OR REPLENISHING LIMITED RESOURCES
    2. USING EXISTING SYSTEMS FOR INNOVATIVE APPLICATIONS
    3. DEFEATING INTERLOCKS OR OVERRIDING TRIPS IN EMERGENCY SITUATIONS (E.G., REOPENING MSIV'S IN ATWS)

- THESE STRATEGIES AND THEIR POTENTIAL DRAWBACKS HAVE BEEN FURTHER EVALUATED (RES)

- EVALUATION WILL BE PUBLISHED AS A NUREG/CR

- GENERIC LETTER SUPPLEMENT WILL PROVIDE STRATEGIES AND NUREG/CR TO UTILITIES FOR THEIR CONSIDERATION DURING THE PERIOD WHEN THE IPE IS BEING PERFORMED

T-6

GENERIC LETTER SUPPLEMENT

° THIS LETTER DOES:

- DESCRIBE ACCIDENT MANAGEMENT STRATEGIES, AND THEIR BENEFITS AND POTENTIAL ADVERSE EFFECTS (NUREG/CR)

- PROVIDE THE STRATEGIES TO LICENSEES FOR INFORMATION

- ENCOURAGE LICENSEES TO EVALUATE THESE A/M STRATEGIES IN CONJUNCTION WITH THEIR IPE

° THIS LETTER DOES <u>NOT</u>:

- REQUEST ANY INFORMATION ABOUT CURRENT OR PROPOSED ACCIDENT MANAGEMENT PROCEDURES (BEYOND WHAT GENERIC LETTER 88-20 REQUESTS)

- IMPLY A REQUIREMENT TO IMPLEMENT ANY OF THE STRATEGIES

STATUS OF GENERIC LETTER SUPPLEMENT AND NUREG/CR

- NRR/RES
  - REVIEW OF DRAFT NUREG/CR COMPLETED
  - COMMENTS INCORPORATED IN OCTOBER 1989 REDRAFT
  - ADDITIONAL COMMENTS EXPECTED TO BE MINOR

- OGC
  - REVIEW OF GENERIC LETTER SUPPLEMENT COMPLETED
  - MINOR CHANGES TO LANGUAGE
  - CAUTION THAT SUPPLEMENT PROVIDES NO BASIS FOR REQUIRING IMPROVEMENTS

- CRGR
  - APPROVAL NOT VIEWED AS REQUIREMENT FOR ISSUANCE
  - SUPPLEMENT AND NUREG/CR BEING PROVIDED TO CRGR FOR INFORMATION

- NUMARC/OWNERS GROUPS
  - DRAFT NUREG/CR PROVIDED FOR COMMENT ON TECHNICAL ACCURACY
  - PRELIMINARY FEEDBACK: NO MAJOR COMMENTS OR PROBLEMS
  - FORMAL RESPONSE EXPECTED BY END OF NOVEMBER

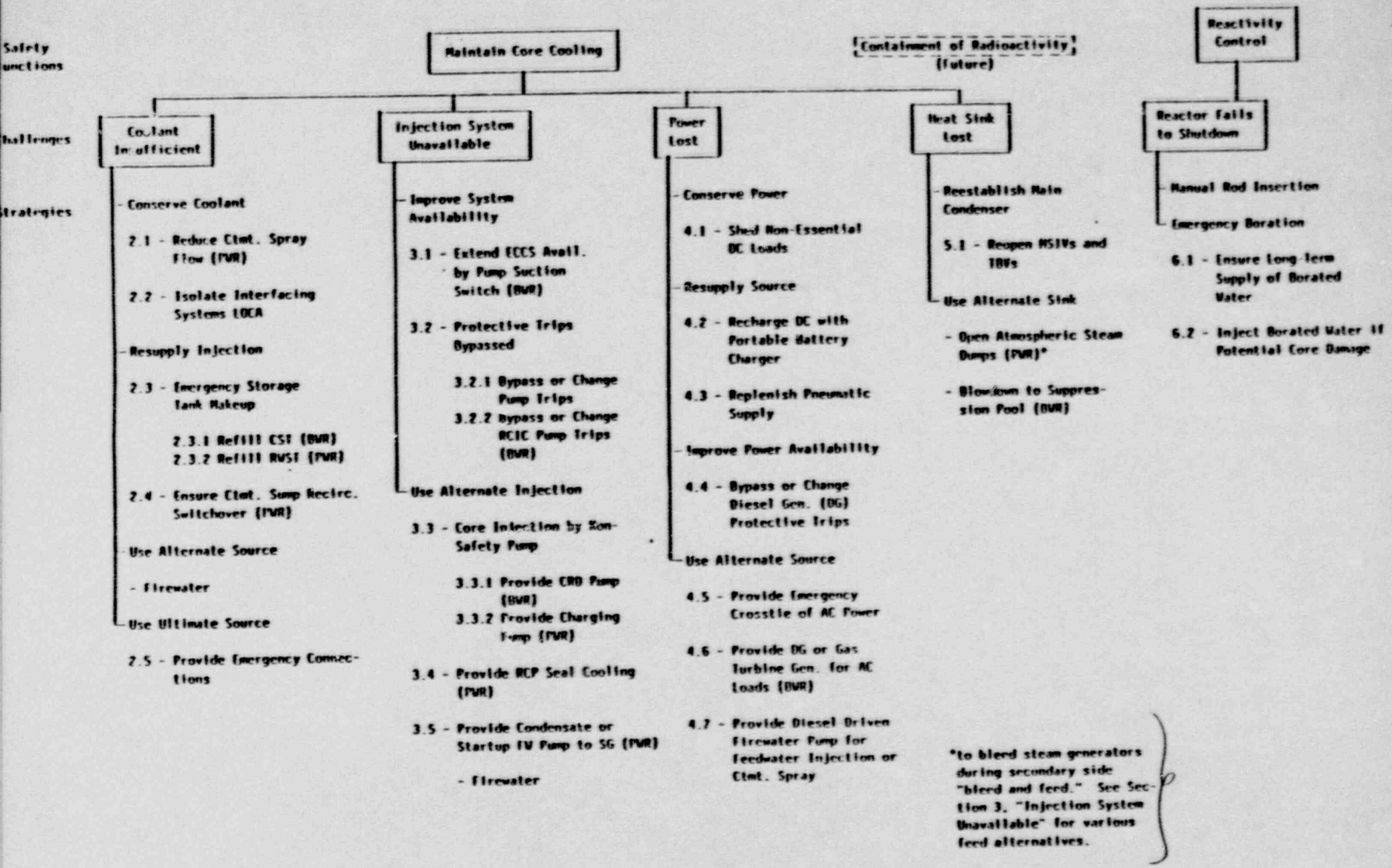
T-6

November 15, 1989

ACCIDENT MANAGEMENT GENERIC LETTER SUPPLEMENT SCHEDULE

4/21	-	First meeting with contractors regarding A/M strategies
6/15	-	Request to brief CRGR into concurrence
6/19	-	Draft strategy evaluations to key reviewers
6/28&29	-	Meeting with contractors and key reviewers
7/21	-	Revised evaluations for initial strategies
8/14	-	Revised evaluations for remaining strategies
8/28	-	Draft NUREG/CR to PRA Review Committee
9/7	-	TTC staff review meeting
9/11	-	PRA Review Committee Meeting
9/20	-	ACRS Subcommittee Meeting
10/20	-	Revised NUREG/CR to ACRS
10/24	-	CRGR Package into concurrence (for CRGR information)
10/27	-	Request for NUMARC/Owners Groups comments
11/16	-	ACRS meeting
12/1	-	Camera-ready copy
12/15	-	Publish NUREG/CR
12/29	-	Issue Generic Letter (SUBJECT TO CRGR ACTION)

Table 2 Logic Structure of Accident Management Strategies



CHALLENGES

COOLANT
INSUFFICIENT

STRATEGIES

- Conserve Coolant
  - Reduce Ctmt. Spray Flow (PWR)
  - Isolate Interfacing Systems LOCA
- Resupply Injection
  - Emergency Storage Tank Makeup
    - Refill CST (BWR)
    - Refill RWST (PWR)
  - Ensure Ctmt. Sump Recirc. Switchover (PWR)
- Use Alternate Source
  - Firewater
- Use Ultimate Source
  - Provide Emergency Connections

REDUCE CONTAINMENT SPRAY (CS) FLOW RATE TO CONSERVE WATER FOR CORE INJECTION (PWR)

- MAY BE ACCOMPLISHED BY:
  - THROTTLING CS DISCHARGE VALVES.
  - SECURING ONE OR MORE REDUNDANT SPRAY TRAINS.
  - RECIRCULATING PORTION OF DISCHARGE FLOW BACK TO RWST VIA TEST LINE.
- MAY HELP FOR SEQUENCES WHERE RWST INVENTORY SHOULD BE CONSERVED (SUMP RECIRCULATION IS UNAVAILABLE).
- MANY EOPs CALL FOR STARTING AND STOPPING ONE OR MORE CS PUMPS USING CONTAINMENT PRESSURE AS GUIDE, AS WELL AS MAXIMUM USE OF FAN-COOLERS.
- CONCERNS: INADEQUATE SPRAY COVERAGE, LACK OF ATOMIZATION.

ENABLE EARLY DETECTION, ISOLATION, AND OTHERWISE MITIGATION OF THE EFFECTS OF AN INTERFACING SYSTEMS LOCA (ISL) (BWR AND PWR)

- MAY BE ACCOMPLISHED BY:
  - PRIMARY INDICATORS: ABNORMAL PRESSURE, TEMPERATURE AND RADIATION LEVELS OUTSIDE CONTAINMENT.
  - INFORMATION CORRELATION OF VALVE POSITION INDICATORS, LINE FLOW RATES, PRESSURES, TEMPERATURES, INVENTORY LEVELS.
  - ISOLATION USING EXISTING VALVES IN AFFECTED SYSTEM.
  - MITIGATION THROUGH DEPRESSURIZATION.
- ALL EOPs ADDRESS VARIOUS ISL ISSUES, SUCH AS CHECKING OF MAJOR CONTAINMENT ISOLATION VALVES AND RECOGNIZING STEAM GENERATOR TUBE RUPTURE EVENTS.
- CONCERNS: CLOSING WRONG VALVES THUS SHUTTING DOWN VITAL SYSTEMS, FLOODING SPRAYS MAY CAUSE ELECTRICAL FAILURES.

REFILL CONDENSATE STORAGE TANK (CST) (BWR)

- MAY BE ACCOMPLISHED BY:
  - OBTAINING TREATED WATER VIA PUMPS OR GRAVITY DRAIN FROM DEMINERALIZED WATER STORAGE TANK (NORMAL SOURCE), CONDENSER HOT WELL, BWR REFUELING WATER STORAGE TANK, UNAFFECTED UNIT'S TANKS.
  - UNTREATED WATER FROM PLANT FIREWATER, COMMUNITY FIRE PUMPER TRUCK, MUNICIPAL WATER SUPPLY.
- MAY HELP TO MAINTAIN HPCI/HPCS AND/OR RCIC INJECTION LONGER IF SUPPRESSION POOL IS UNAVAILABLE.
- SOME CST MAKEUP PROCEDURES FOUND IN EOPs OF ALL PLANTS EXAMINED.
- CONCERNS: PLUGGING OF INJECTION LINES BY UNTREATED WATER.

REFILL REFUELING WATER STORAGE TANK (RWST) (PWR)

- MAY BE ACCOMPLISHED BY:
  - OBTAINING BORATED WATER FROM NORMAL RWST MAKE-UP (LIMITED), BORATED WATER HOLDUP TANK, SPENT FUEL POOL, UNAFFECTED UNIT's RWST.
  - UNBORATED SOURCES ALSO POSSIBLE.
- MAY BE HELPFUL FOR MAINTAINING ECCS INJECTION LONGER FOR INTERMEDIATE SIZE BREAKS IF CONTAINMENT SUMP RECIRC. WATER IS NOT AVAILABLE.
- SOME RWST MAKEUP PROCEDURES FOUND IN EOPs OF ALL PLANTS EXAMINED.
- CONCERNS: USE OF UNBORATED WATER COULD LEAD TO RECRITICALITY PROBLEMS, FUEL IN SPENT FUEL POOL.

T-15

STANDARDIZED PRESSURIZED WATER REACTORS

A PRESENTATION TO THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

November 16,1989

CHARLES L. MILLER, PROJECT DIRECTOR
STANDARDIZATION AND LIFE EXTENSION
PROJECT DIRECTORATE

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STANDARDIZED PWR PLANT REVIEW GOALS

WESTINGHOUSE RESAR SP/90	
o PDA ISSUANCE	JUNE 1990
EPRI REQUIREMENTS DOCUMENT	
o EVOLUTIONARY DESIGN SER ISSUANCE	MARCH 1991
o PASSIVE DESIGN SER ISSUANCE	FEBRUARY 1992
COMBUSTION ENGINEERING SYSTEM 80 +	
o LRB	APRIL 1990
o FDA ISSUANCE	APRIL 1992
WESTINGHOUSE AP - 600	
o LRB SUBMITTAL	JUNE 1990
o DESIGN SUBMITTAL	JULY 1992
o FDA ISSUANCE	DECEMBER 1993

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CE SYSTEM 80 +

DESIGN CERTIFICATION MILESTONES

FIRST CESSAR-DC SUBMITTAL	NOVEMBER 1987
FORMAL APPLICATION FOR CERTIFICATION	MARCH 1989
LICENSING REVIEW BASIS (LRB) DOCUMENT	
o STAFF REVIEW	IN PROGRESS
o ACRS REVIEW	FEBRUARY 1990
o COMMISSION REVIEW	MARCH 1990
o ISSUE	APRIL 1990
FDA (TWO YEARS AFTER LRB)	APRIL 1992

INITIAL CESSAR-DC SUBMITTALS RECEIVED

NOVEMBER 1987

- o GENERAL DESCRIPTION
- o POWER CONVERSION SYSTEM

APRIL 1988

- o REACTOR CORE & COOLANT SYSTEM
- o CHEMICAL & VOLUME CONTROL SYSTEM
- o PROCESS SAMPLING SYSTEM

JUNE 1988

- o SHUTDOWN COOLING SYSTEM
- o SAFETY INJECTION SYSTEM
- o EMERGENCY FEEDWATER

SEPTEMBER 1988

- o SITE ENVELOPE
- o SAFETY DEPRESSURIZATION SYSTEM
- o I&C SYSTEMS
- o HUMAN FACTORS ENGINEERING

MARCH 1989

- o LEAK-BEFORE-BREAK ANALYSIS
- o BALANCE-OF-PLANT DESCRIPTIONS
- o ELECTRICAL POWER DISTRIBUTION
- o REACTOR PROTECTION SYSTEM
- o FUEL HANDLING SYSTEM
- o RADWASTE SYSTEM
- o BUILDING AND SITE ARRANGEMENTS
- o CONTAINMENT SYSTEMS
- o SABOTAGE PROTECTION

INITIAL CESSAR-DC SUBMITTALS EXPECTED

DECEMBER 1989

- o RESOLUTIONS TO USIs/GSIs
- o PRA METHODOLOGY

MARCH 1990

- o REMAINING USI/GSI RESOLUTIONS
- o EQUIPMENT QUALIFICATION ENVELOPES
- o ADDITIONAL SYSTEM INFORMATION

JUNE 1990

- o SAFETY ANALYSIS
- o PRA & SEVERE ACCIDENT RESULTS
- o SEISMIC METHODS
- o BUILDING LAYOUTS

SEPTEMBER 1990

- o SEISMIC RESULTS
- o TECHNICAL SPECIFICATIONS
- o INSPECTIONS, TESTS, MAINTENANCE & RELIABILITY GUIDELINES

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CESSAR-DC REVIEW STATUS

- STAFF ISSUED 277 QUESTIONS
- CE RESPONDED TO 186 QUESTIONS
- CE WORKING ON 91 QUESTIONS

CURRENT RESAR SP/90 REVIEW STATUS

Accomplishments to November 1989

DSER PRA "FRONTEND"	MARCH 1988
ACRS SUBCOMMITTEE	APRIL 1988
DSER - SRP	JUNE 1988
DSER - SRP	MARCH 1989
WESTINGHOUSE RESPONDED TO OPEN ITEMS	JUNE-SEPTEMBER 1989
ACRS SUBCOMMITTEE	SEPTEMBER 1989
WESTINGHOUSE SUBMITTED AMENDED USIs/GSIs	OCTOBER 1989
ACRS SUBCOMMITTEE	NOVEMBER 1989

SCHEDULE TO COMPLETE RESAR SP/90 PDA REVIEW

Items to be Accomplished

STAFF COMPLETES DSER PRA "BACKEND"	NOVEMBER 1989
NRC REVIEWS USIs/GSIs AND PROVIDES INPUT TO WESTINGHOUSE	NOVEMBER - DECEMBER 1989
ACRS SUBCOMMITTEE Re: DSER CHAPTERS	JANUARY 1990
WESTINGHOUSE RESPONDS TO USI/GSI INPUT	JANUARY 1990
ACRS SUBCOMMITTEE Re: USIs/GSIs	FEBRUARY 1990
NRC ISSUES DSER ON USIs/GSIs AND SEVERE ACCIDENTS	FEBRUARY 1990
ACRS SUBCOMMITTEE Re: DRAFT FINAL SER	MARCH 1990
ACRS FULL COMMITTEE Re: DRAFT FINAL SER AND REQUEST LETTER	APRIL 1990
NRC ISSUES FINAL SER	MAY 1990
PDA DECISION AND SSER	JUNE 1990

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RESAR SP/90 SUMMARY

- ESTABLISH COMMISSION - APPROVED PRIORITY FOR SP/90 PDA
- 3 DSERS ISSUED
- OPEN ITEMS
  - 107 BEFORE PDA IS ISSUED
  - 53 BEFORE FDA IS ISSUED
  - 99 BEFORE FDA IS ISSUED AND/OR PLANT SPECIFIC APPLICATION
- RESOLVE USI/GSI AND SEVERE ACCIDENT ISSUES
- 2 ADDITIONAL DSERs NEEDED BEFORE PDA DECISION
- ROUND OF ACRS MEETINGS
- ISSUE FINAL SER
- ISSUE PDA AND SSER

T-16

EARLY REVIEW OF ALWRs

WITH PASSIVE SAFETY SYSTEMS

- STAFF TO CONSIDER POTENTIAL SAFETY ISSUES ASSOCIATED WITH CONCEPTUAL DESIGNS OF ALWRs WITH PASSIVE SAFETY SYSTEMS

- PURPOSE:

  1. TO PROVIDE EARLY GUIDANCE TO THE DESIGNERS TO ENSURE THAT DESIGNS ARE COMPATIBLE WITH NRC SAFETY PHILOSOPHY.

  2. TO DETERMINE WHETHER OR NOT EPRI AND THE VENDORS ARE TAKING ACCEPTABLE APPROACHES TO IDENTIFYING AND RESOLVING MAJOR DESIGN BASES AND SEVERE ACCIDENT APPROACHES.

  3. TO IDENTIFY ANY "SHOW STOPPERS" REGARDING PASSIVE DESIGN APPROACHES.

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SCHEDULE FOR EARLY REVIEW OF ALWRs

WITH PASSIVE SAFETY SYSTEMS

STAFF MEETS WITH VENDORS AND EPRI	AUGUST 1989-JANUARY 1990
STAFF PERFORMS REVIEW	FEBRUARY 1990-MARCH 1990
STAFF MEETS WITH ACRS	APRIL 1990
STAFF MEETS WITH COMMISSION	JUNE 1990
STAFF TRANSMITS RESULTS OF REVIEW	JULY 1990

ENSURE APPROPRIATE RECIRCULATION SWITCHOVER (PWR)

- ACCOMPLISHED BY ASSURING AUTOMATIC OR MANUAL SWITCHOVER AND USING MANUAL INTERVENTION IF AN AUTOMATIC SWITCHOVER RECIRCULATION FAILS TO OCCUR.

- EOPs OF THOSE PLANTS EXAMINED INCLUDE STEPS DIRECTING OPERATOR TO ASSURE SWITCHOVER INCLUDING MANUAL BACKUP TO AUTOMATIC FAILURE.

- CONCERNS: FOR MANUAL SWITCHOVER MAY NEED TO ACCESS POSSIBLE HIGH RADIATION AREAS.

ADEQUATE PLANT HEAT REMOVAL CAPABILITY BY EMERGENCY CONNECTION(S) OF EXISTING OR ALTERNATE WATER SOURCES (BWR AND PWR)

- MAY BE ACCOMPLISHED BY:
  - WATER SUPPLY TO SW FROM SOURCES SUCH AS RIVERS, RESERVIORS, MUNICIPAL WATER SYSTEMS, OCEAN, ETC.
  - SW SUPPLY DIRECTLY TO FW OR CONDENSATE SYSTEM
- SEVERAL PLANTS REVIEWED HAVE HARDWARE AND/OR PROCEDURES IN PLACE TO ACCOMPLISH THIS ULTIMATE CORE COOLING
- CONCERN:
  - WATER NOT ADEQUATELY FILTERED FOR BWR CORE OR PWR STEAM GENERATOR INJECTION
  - WATER SOURCE USED MAY BE OPENED TO RADIONUCLIDE CONTAMINATION

CHALLENGES

INJECTION SYSTEM UNAVAILABLE

STRATEGIES

- Improve System Availability
  - Extend ECCS Avail. by Pump Suction Switch (BWR)
  - Protective Trips Bypassed
    - Bypass or Change Pump Trips
    - Bypass or Change RCIC Pump Trips (BWR)
- Use Alternate Injection
  - Core Injection Non-Safety Pump
    - Provide CRD Pump (BWR)
    - Provide Charging Pump (PWR)
  - Provide RCP Seal Cooling (PWR)
  - Provide Condensate or Startup FW Pump to SG (PWR)
  - Firewater

EXTEND ECCS AVAILABILITY BY SWITCHING PUMP SUCTION (BWR)

- MAY BE ACCOMPLISHED BY SWITCHING TO THESE OTHER POSSIBLE SOURCES:
  - CONDENSATE STORAGE TANK.
  - MAIN CONDENSER HOTWELL.
  - OTHER LARGE QUANTITY OF CONDENSATE VIA TEMPORARY HOOK-UPS.
- MAY HELP IN SEQUENCES WHERE LOCA BLOWDOWN ALONG WITH HPCI AND RCIC TURBINE EXHAUST RAISE SUPPRESSION POOL (SP) TEMPERATURE ENOUGH TO CAUSE ECCS PUMP FAILURE DUE TO CAVITATION (NPSH LOSS) OR EXCESSIVE WEAR.
- NO STEPS FOUND IN EOPs EXAMINED RELATED TO SWITCHING ECCS SUCTION SYSTEMS BACK TO CONDENSATE FROM SP.
- CONCERNS: RISING SP WATER LEVEL AFFECTING CONTAINMENT PERFORMANCE; POSSIBLE BACKFLOW CONTAMINATION.

PROVIDE EMERGENCY BYPASS OR CHANGE OF PROTECTIVE TRIPS FOR INJECTION PUMPS (BWR AND PWR)

- MAY BE ACCOMPLISHED BY CAREFUL CONSIDERATION OF WHAT TRIPS CAN BE BYPASSED OR CHANGED IN AN EMERGENCY TO KEEP EQUIPMENT FUNCTIONING LONGER WITHOUT CAUSING FAILURE.

- MAY BE HELPFUL FOR SPECIFIC ACCIDENT SCENARIOS WHERE CONTINUED OPERATION OF EMERGENCY EQUIPMENT, EVEN IF ONLY FOR MINUTES, CAN PREVENT OR MITIGATE CORE DAMAGE.

- AT SOME PLANTS BYPASSES WERE NOTED ON CERTAIN INTERLOCKS AND TRIPS OF THE INJECTION PUMPS.

- CONCERN: INCREASED RISK OF DAMAGE TO VITAL EQUIPMENT.

EXTEND RCIC AVAILABILITY BY PUMP TRIP BYPASS OR CHANGE (BWR)

- MAY BE ACCOMPLISHED BY BYPASSING OR CHANGING ONE OR MORE TRIP SETPOINT(S).
- MAY BE HELPFUL FOR SITUATIONS WHERE NO OTHER SOURCE OF CORE INJECTION IS IMMEDIATELY AVAILABLE AND CORE DAMAGE CANNOT BE PRECLUDED, i.e., WHERE RISK OF DAMAGING RCIC PUMP IS PREFERABLE TO STOPPING ALL INJECTION.
- NO STEPS FOUND IN EOPs EXAMINED.
- CONCERN: FAILURE OF RCIC SYSTEM.

USE CONTROL ROD DRIVE (CRD) PUMPS FOR CORE INJECTION (BWR)

- MAY BE CONSIDERED:
  - BACKUP TO OTHER EMERGENCY INJECTION.
  - REACTOR LIQUID LEVEL/POWER CONTROL DURING ATWS.
  - LIMITING REACTOR POWER AFTER CORE UNCOVERY WHILE BORON IS BEING INJECTED.

- SOME PLANT EOPs CONTAIN STEPS FOR USING CRD PUMPS.

- CONCERNS: EXACERBATE CORE DAMAGE BY INJECTING TOO MUCH OR TOO LITTLE.

USE OF NON-SAFETY RELATED CHARGING PUMPS FOR CORE INJECTION (PWR)

FOR THOSE FEW PLANTS WHICH HAVE AT LEAST ONE NON-SAFETY CHARGING PUMP:

- MAY BE ACCOMPLISHED BY:

  ASSURING THE PUMP(S) HAVE A RELIABLE SOURCE OF POWER FROM ITS NORMAL BUS OR A MORE RELIABLE ALTERNATE.

- MAY BE USED FOR CORE INJECTION IN SEQUENCES WHERE RCS PRESSURE REMAINS HIGH, e.g., LOSS OF FEEDWATER TO SG, ATWS, OR SMALL BREAK LOCA.

- CONCERN: RELIABILITY OF NON-SAFETY RELATED BACKUP.

ALTERNATE SEAL INJECTION WHEN RCP SEAL COOLING IS LOST (PWR)

- MAY BE ACCOMPLISHED BY:
  - USING AN INSTALLED HYDROTEST PUMP.
  - USING A NON-SAFETY RELATED CHARGING PUMP.
- MAY BE USEFUL FOR SITUATIONS WHERE THE SAFETY RELATED CHARGING PUMPS AND THE CCW FLOW TO THE RCP THERMAL BARRIER HEAT EXCHANGERS ARE NOT ADEQUATELY COOLING THE RCP SEALS.
- AT LEAST TWO NON-U.S. PLANTS HAVE PROCEDURES IN PLACE TO USE HYDROTEST PUMP FOR ALTERNATE SEAL INJECTION.
- CONCERN: RELIABILTY OF NON-SAFETY RELATED BACKUP.

USE OF CONDENSATE OR STARTUP FEEDWATER PUMPS FOR STEAM GENERATOR INJECTION (PWR)

- MAY BE ACCOMPLISHED BY REDUCING STEAM GENERATOR (SG) PRESSURE, OPENING ISOLATION VALVES, AND STARTING THE PUMP(S).
- MAY HELP IN SITUATIONS WHERE MAIN AND AUXILIARY FEEDWATER PUMPS ARE UNAVAILABLE, BUT NORMAL AC POWER IS STILL AVAILABLE.
- THESE MAY BE LOW HEAD OR LOW VOLUME PUMPS.
- SEVERAL OF THE PLANT PROCEDURES EXAMINED CONTAINED STEPS FOR SG INJECTION VIA CONDENSATE PUMPS.
- CONCERNS: REESTABLISHING FEEDWATER TO A HOT, DRY SG MAY RESULT IN EXCESSIVE THERMAL STRESSES AND REPRESSURIZE THE SG ABOVE THE SHUTOFF HEAD OF THE PUMP.

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CHALLENGES — POWER LOST

STRATEGIES

- Conserve Power
  - Shed Non-Essential DC Loads
- Resupply Source
  - Recharge DC With Portable Battery Charger
  - Replenish Pneumatic Supply
- Improve Power Availability
  - Bypass or Change Diesel Gen. (DG) Protective Trips
- Use Alternate Source
  - Provide Emergency Crosstie of AC Power
  - Provide DG or Gas Turbine Gen. for AC Loads (BWR)
  - Provide Diesel-Driven Firewater Pump for Feedwater Injection or Ctmt. Spray

CONSERVE BATTERY CAPACITY BY-SHEDDING NON-ESSENTIAL LOADS (BWR AND PWR)

- MAY BE ACCOMPLISHED BY SHEDDING LOADS NOT NEEDED TO ACHIEVE AND MAINTAIN THE PLANT IN A SAFE SHUTDOWN STATE.

- HELPFUL DURING AN SBO WHEN NORMAL STATION BATTERY CHARGERS ARE UNAVAILABLE.

- ALL PLANTS EXAMINED HAD SOME PROVISIONS FOR LOAD SHEDDING.

- CONCERN: POSSIBILITY OF SHEDDING WRONG LOADS.

USE OF PORTABLE BATTERY CHARGERS TO RECHARGE STATION BATTERIES (BWR AND PWR)

- MAY BE ACCOMPLISHED BY USING A RELIABLE POWER SOURCE SUCH AS A SUITABLY SIZED PORTABLE GASOLINE DRIVEN BATTERY CHARGER.
- HELPFUL FOR PROLONGED SBO.
- NOT FOUND IN PLANT EOPs REVIEWED.
- CONCERN: USE OF NON-SAFETY RELATED EQUIPMENT ON A SAFETY RELATED SYSTEM.

ENABLE EMERGENCY REPLENISHMENT OF PNEUMATIC SUPPLY FOR SAFETY RELATED AIR OPERATED COMPONENTS (BWR AND PWR)

- MAY BE ACCOMPLISHED BY CROSS CONNECTION OPTIONS SUCH AS INSTRUMENT AND SERVICE AIR SUPPLY SYSTEMS, USE OF DIESEL AIR COMPRESSORS AND BOTTLED AIR.

- HELPFUL FOR SITUATIONS WHERE A PROLONGED SBO OR OTHER CONDITIONS MAKE ADDITIONAL AIR SUPPLY NECESSARY.

- MOST PLANTS EXAMINED HAD MADE MODIFICATIONS TO PROVIDE BACKUP AIR SYSTEMS.

PROVIDE EMERGENCY BYPASS OR CHANGE OF PROTECTIVE TRIPS FOR DIESEL GENERATORS (BWR AND PWR)

- MAY BE ACCOMPLISHED BY CAREFUL CONSIDERATION OF WHAT TRIPS CAN BE BYPASSED OR CHANGED IN AN EMERGENCY TO KEEP EQUIPMENT FUNCTIONING LONGER WITHOUT CAUSING FAILURE.

- MAY BE HELPFUL FOR SPECIFIC ACCIDENT SCENARIOS WHERE CONTINUED OPERATION OF EMERGENCY EQUIPMENT, EVEN IF ONLY FOR MINUTES, CAN PREVENT OR MITIGATE CORE DAMAGE.

- ALL PLANTS REVIEWED BYPASS SOME TRIPS ON THE DIESEL GENERATORS DURING EMERGENCY STARTUP AND OPERATION.

- CONCERN: INCREASED RISK OF DAMAGE TO VITAL EQUIPMENT.

ENABLE EMERGENCY CROSSTIE OF AC POWER BETWEEN TWO UNITS OR TO ONSITE GAS TURBINE GENERATOR (BWR AND PWR)

- MAY BE ACCOMPLISHED BY ESTABLISHING EMERGENCY CROSS-TIE WITH AN EQUIVALENT AC POWER SYSTEM BETWEEN TWO UNITS AT A MULTI-UNIT SITE, OR CONNECTING AN AVAILABLE ONSITE GAS TURBINE GENERATOR TO THE AC SYSTEM.

- HELPFUL WHEN BOTH NORMAL AND EMERGENCY AC POWER SOURCES FAIL.

- MOST MULTIPLE UNIT SITES HAVE CROSSTIE EQUIPMENT.

- CONCERN: POSSIBLE COMPROMISE OF AC POWER RELIABILITY.

USE OF DIESEL GENERATOR OR GAS TURBINE GENERATOR TO DRIVE APPROPRIATE PUMPS (BWR)

- MAY BE ACCOMPLISHED BY MAINTAINING A MOBILE DIESEL GENERATOR OR ONSITE GAS TURBINE GENERATOR TO PROVIDE AC POWER TO THE CRD OR OTHER APPROPRIATE PUMPS (e.g., RHR, CONDENSATE/FEEDWATER).

- MAY BE HELPFUL IN SBO SITUATIONS.

- PROCEDURAL STEPS HAVE NOT BEEN FOUND FOR THE PLANTS EXAMINED.

USE OF DIESEL-DRIVEN FIREWATER PUMP FOR BWR CORE INJECTION, PWR STEAM GENERATOR INJECTION OR CONTAINMENT SPRAYS

- MAY BE ACCOMPLISHED BY USING AN APPROPRIATE SPOOL-PIECE OR TEMPORARY HOSE CONNECTION ARRANGEMENT TO LINK THE PLANT FIRE MAIN, SUPPLIED BY A DIESEL-DRIVEN PUMP, WITH THE INDICATED PLANT SYSTEMS.

- MAY HELP IN SEQUENCES INVOLVING A LOSS OF ALL FEEDWATER OR A LOSS OF CONTAINMENT SPRAY. COULD BE USED DURING STATION BLACKOUT.

- SOME EOPs EXAMINED CALL FOR USE OF DIESEL-DRIVEN FIRE PUMPS AS SOURCE OF BWR CORE INJECTION OR PWR SG INJECTION; NO USE FOR CONTAINMENT SPRAY FOUND

- CONCERNS:

  - REDUCTION IN FLOW AVAILABLE FOR FIRE SUPPRESSION.
  - CLOGGING OF SPRAY NOZZLES.
  - UNBORATED WATER TO CONTAINMENT SUMP IN PWRs.

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CHALLENGES	HEAT SINK LOST
STRATEGIES	• Reestablish Main Condenser - Reopen MSIVs and TBVs • Use Alternate Sink - Open Atmospheric Steam Dumps (PWR) - Blowdown to Suppression Pool (BWR)

REOPEN MSIVs AND TURBINE BYPASS VALVES TO REGAIN MAIN CONDENSER AS HEAT SINK (BWR AND PWR)

- MAY BE ACCOMPLISHED BY MAINTAINING CONDENSER VACUUM, AND EQUALIZING PRESSURE ON BOTH SIDES OF MSIVs, WHILE DRAINING AND WARMING MSLs AND CLEARING AND RESETTING ISOLATION SIGNAL. AN ALTERNATE MIGHT BE TO JUST OPEN THE MSIV BYPASS (DRAIN HEADER).

- MAY BE HELPFUL FOR THOSE SITUATIONS WHERE THE MAIN CONDENSER IS AVAILABLE (i.e., CIRCULATING WATER AND VACUUM PUMPS ARE AVAILABLE), AND THE CIRCUMSTANCES WHICH CAUSED ISOLATION ARE CORRECTED OR CAN BE TOLERATED

- SEVERAL OF THE BWR AND PWR EOPs EXAMINED CONTAINED PROCEDURAL STEPS FOR REOPENING MSIVs and TBVs

- CONCERNS:

  - AUTOMATIC ISOLATION CAPABILITY LOST.
  - POSSIBLE CONDENSER FAILURE.

CHALLENGES	REACTOR FAILS TO SHUTDOWN
STRATEGIES	• Manual Rod Insertion
	• Emergency Boration
	- Ensure Long-Term Supply of Borated Water
	- Inject Borated Water if Potential Core Damage

ENSURE ABUNDANT SUPPLY OF BORATED MAKEUP FOR LONG-TERM ACCIDENT CONTROL (BWR AND PWR)

- MAY BE ACCOMPLISHED BY CONSIDERING THE RANGE OF WORST CASE ACCIDENT SCENARIOS AND ENSURING THAT AN ADEQUATE SUPPLY OF BORON IS AVAILABLE FOR ALL CONTINGENCIES.

- MAY BE HELPFUL FOR SEQUENCES WHERE NORMAL SOURCES OF BORATED WATER WOULD BE INADEQUATE.

- CURRENT METHODS AND PRACTICES AT PWRs PROVIDE BORATED WATER TO THE RWST AT A VERY LIMITED RATE. AC POWER IS NEEDED FOR INJECTION. IN BWRs BORON SUPPLIES AND INJECTION ARE IN CONFORMANCE WITH THE ATWS RULE. MAY BE INSUFFICIENT FOR SOME SEVERE ACCIDENT SCENARIOS.

INJECT BORATED WATER IN CASE OF POTENTIAL CORE DAMAGE AND GUARD AGAINST BORON DILUTION (BWR)

- MAY BE ACCOMPLISHED BY:
  - APPROPRIATE USE OF SLCS, OR
  - ALTERNATE INJECTION METHOD (e.g., CONTROL ROD DRIVE OR REACTOR WATER CLEANUP).
- NEED TO GUARD AGAINST BORON DILUTION TO PREVENT POSSIBLE RECRITICALITY WHEN RECOVERING FROM ATWS OR A CORE DAMAGE EVENT WHERE CONTROL RODS WERE LOST.
- THE EOPs EXAMINED GIVE SEVERAL METHODS OF INJECTING BORATED WATER.

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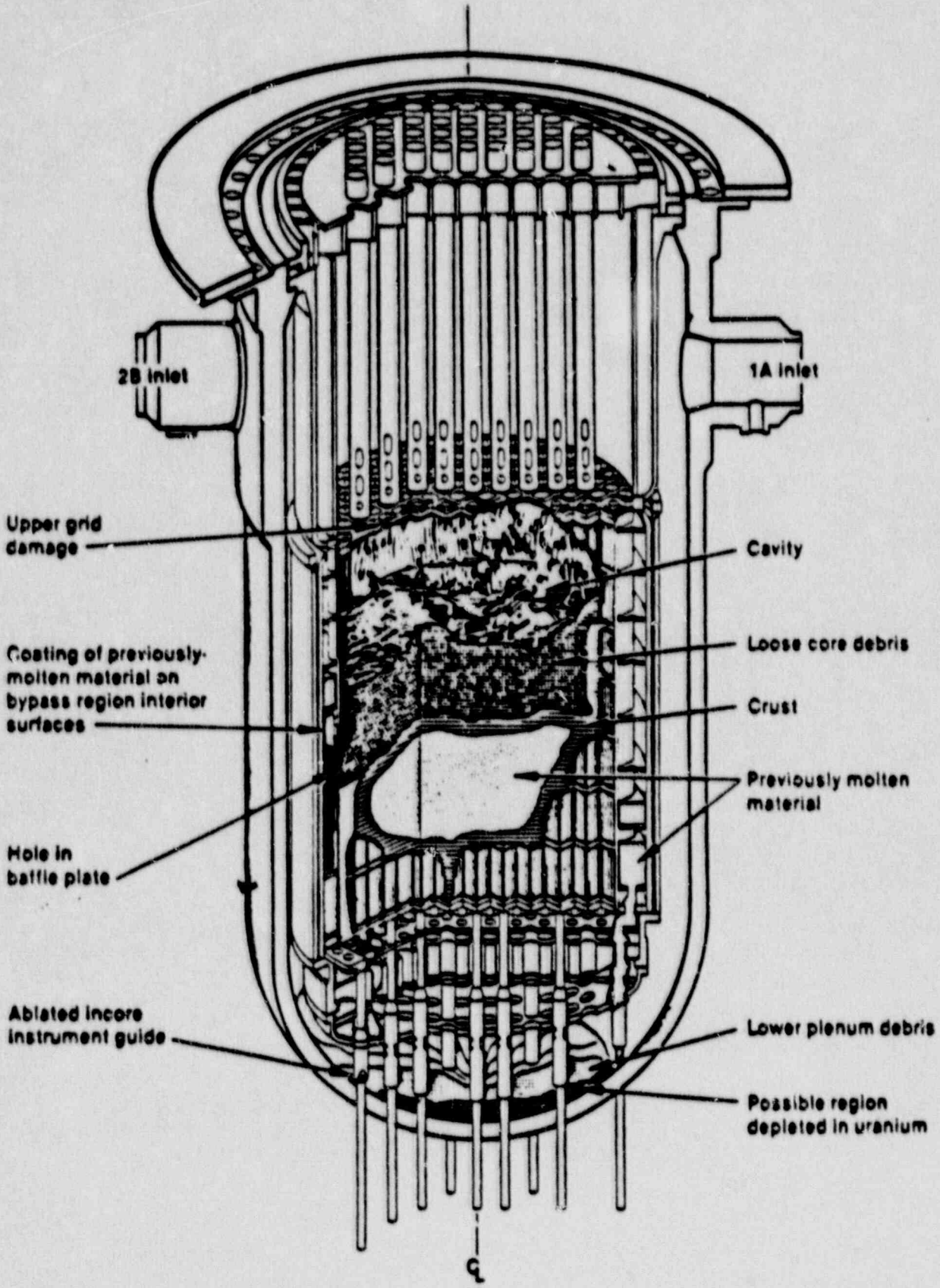
STATUS OF THE CLEANUP AT THREE MILE ISLAND UNIT 2

TMI-2 Core End-State Configuration



CHRONOLOGY OF THE CLEANUP

1979 ACCIDENT

PLANT STABILIZATION

WATER PROCESSING – EPICOR II

1980 KRYPTON VENTED

FIRST ENTRIES

DATA GATHERING

1981 DOSE REDUCTION/DECONTAMINATION

RADWASTE ACTIVITIES

SDS OPERATIONAL

1982 QUICK LOOK TV PICTURES

DECONTAMINATION

DATA GATHERING

1983 POLAR CRANE REFURBISHMENT

POLAR CRANE ALLEGATIONS

BASEMENT WATER FINISHED

1984 HEAD REMOVAL

IIF INSTALLED

IIF/CANAL FLOODED

1985 VIDEO OF LOWER HEAD
PLENUM REMOVAL
BEGIN DEFUELING

1986 DEFUELING RUBBLE BED
CORE BORE SAMPLES
VISIBILITY PROBLEMS
FIRST FUEL SHIPMENT

1987 DEFUELING ASSEMBLIES
SEDIMENT REMOVAL IN RB
DECON RB WALLS

1988 DEFUELING LCSA

DECON RB WALLS

BLOCK WALL FLUSH

EVAPORATOR HEARINGS

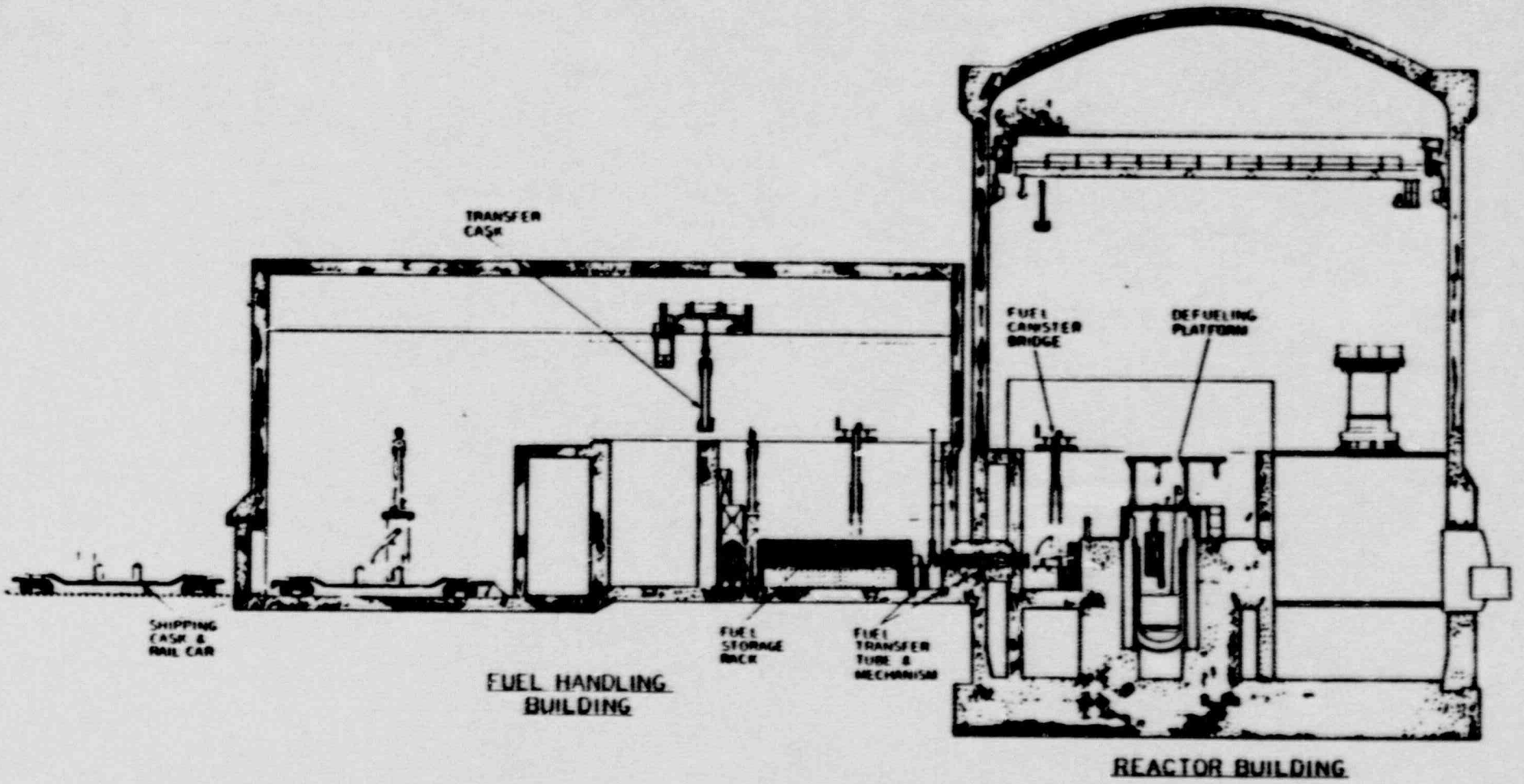
1989 DEFUEL LCSA/LOWER HEAD/BAFFLE

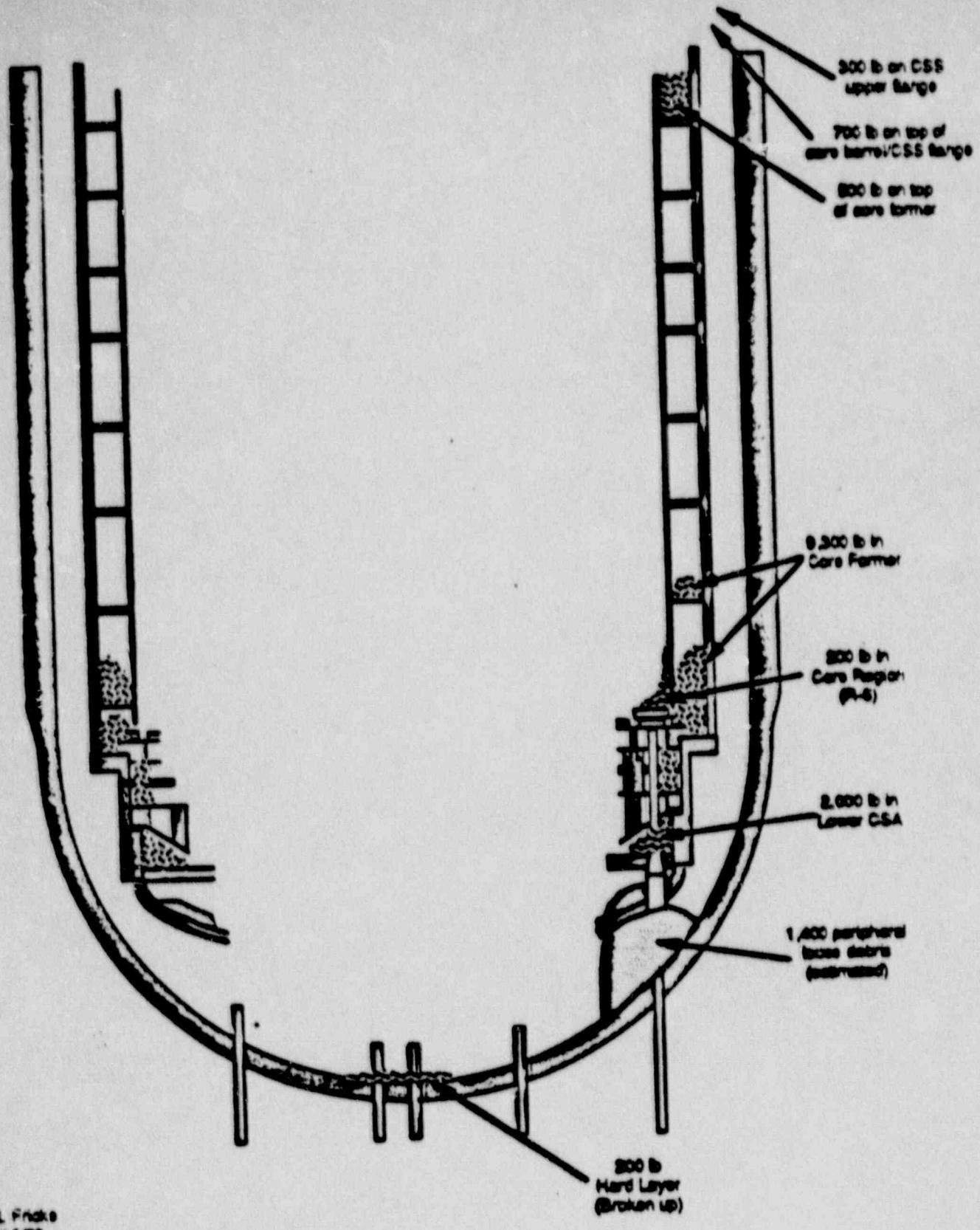
EVAPORATOR APPEALS/TESTING

RV METALLURGICAL SAMPLES

T-20

TMI-2 DEFUELING PLAN

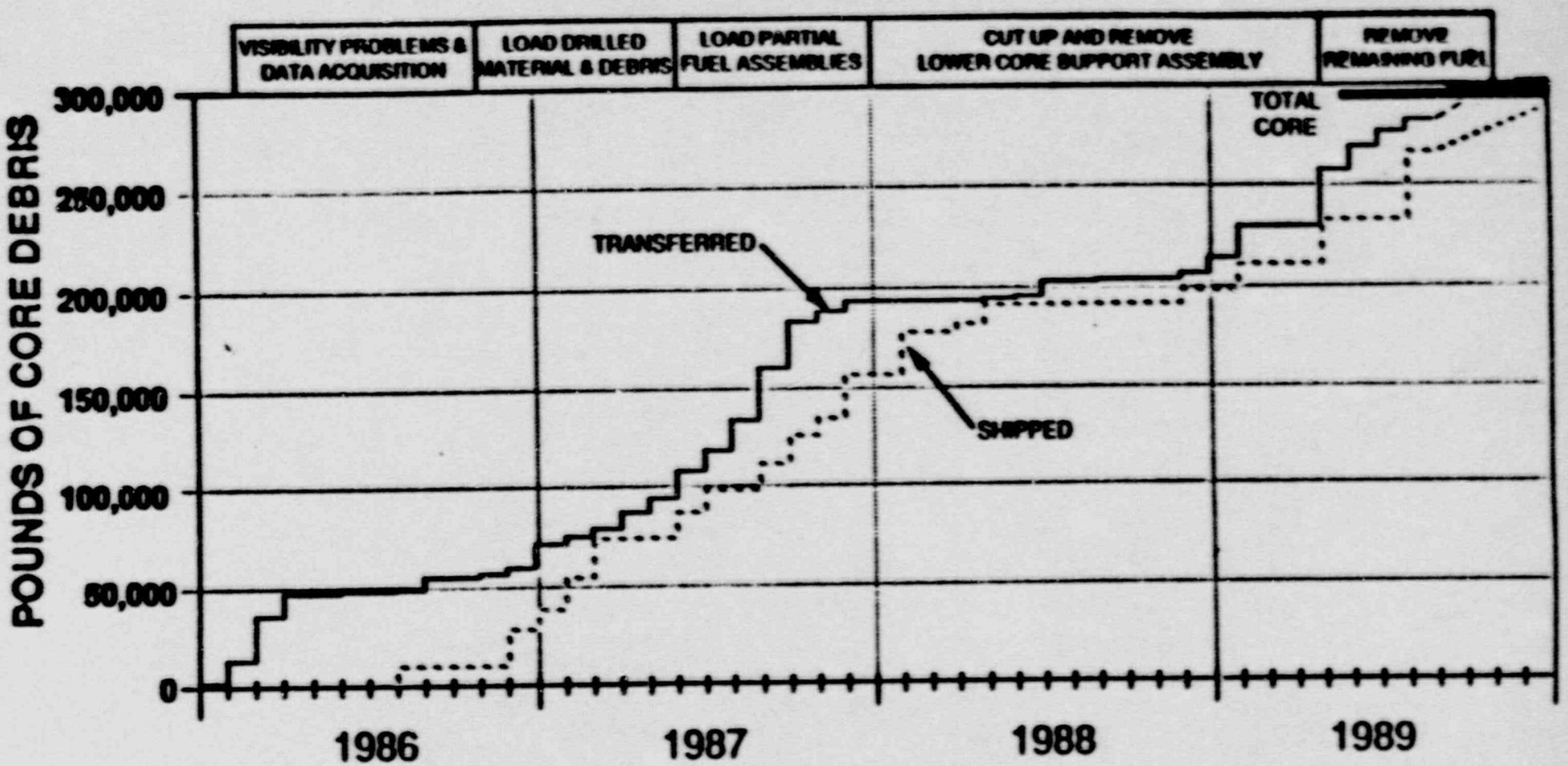




JR. Finke
9/15/89

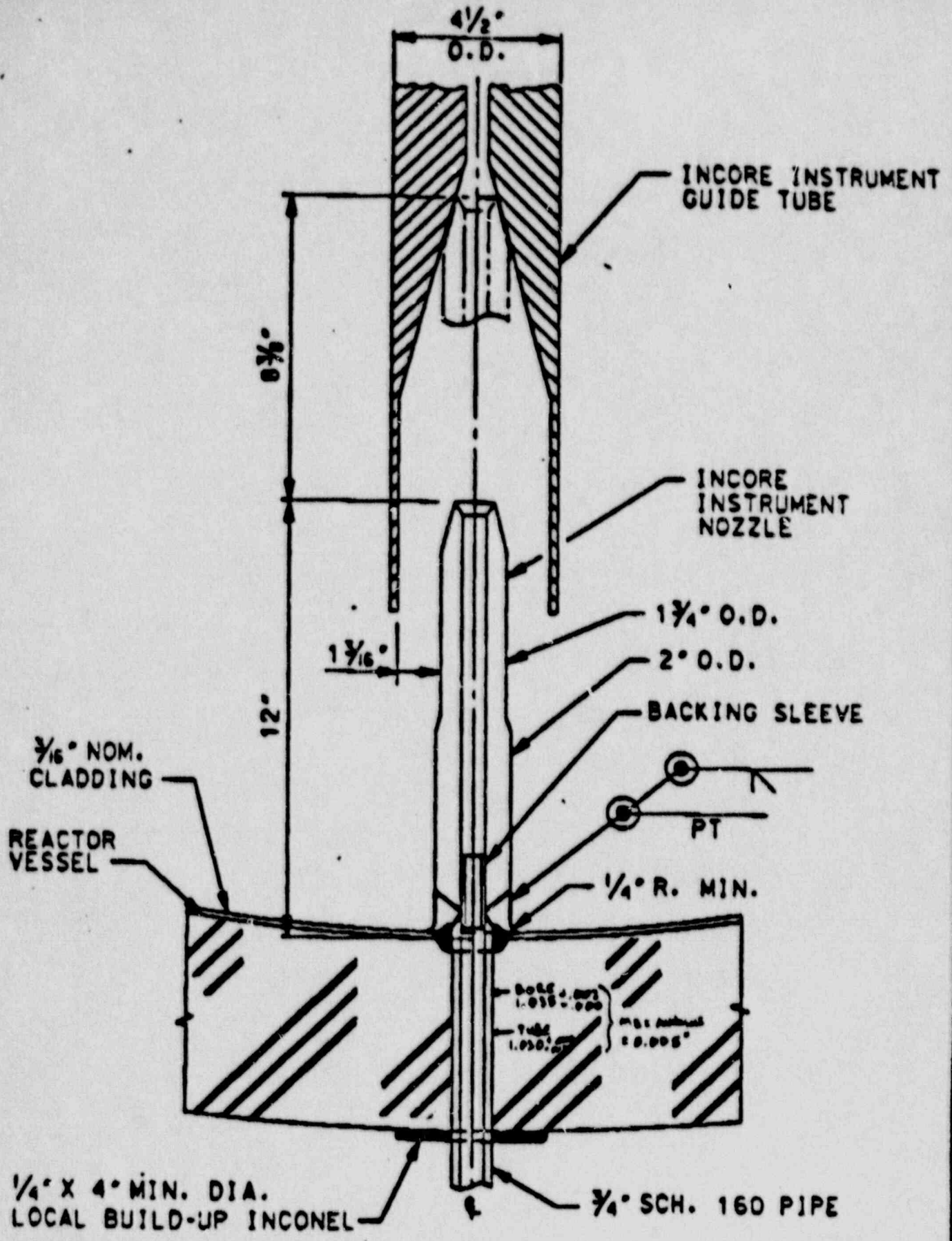
TMI-2 MATERIAL REMAINING IN THE REACTOR VESSEL

TMI-2 DEFUELING PROGRESS

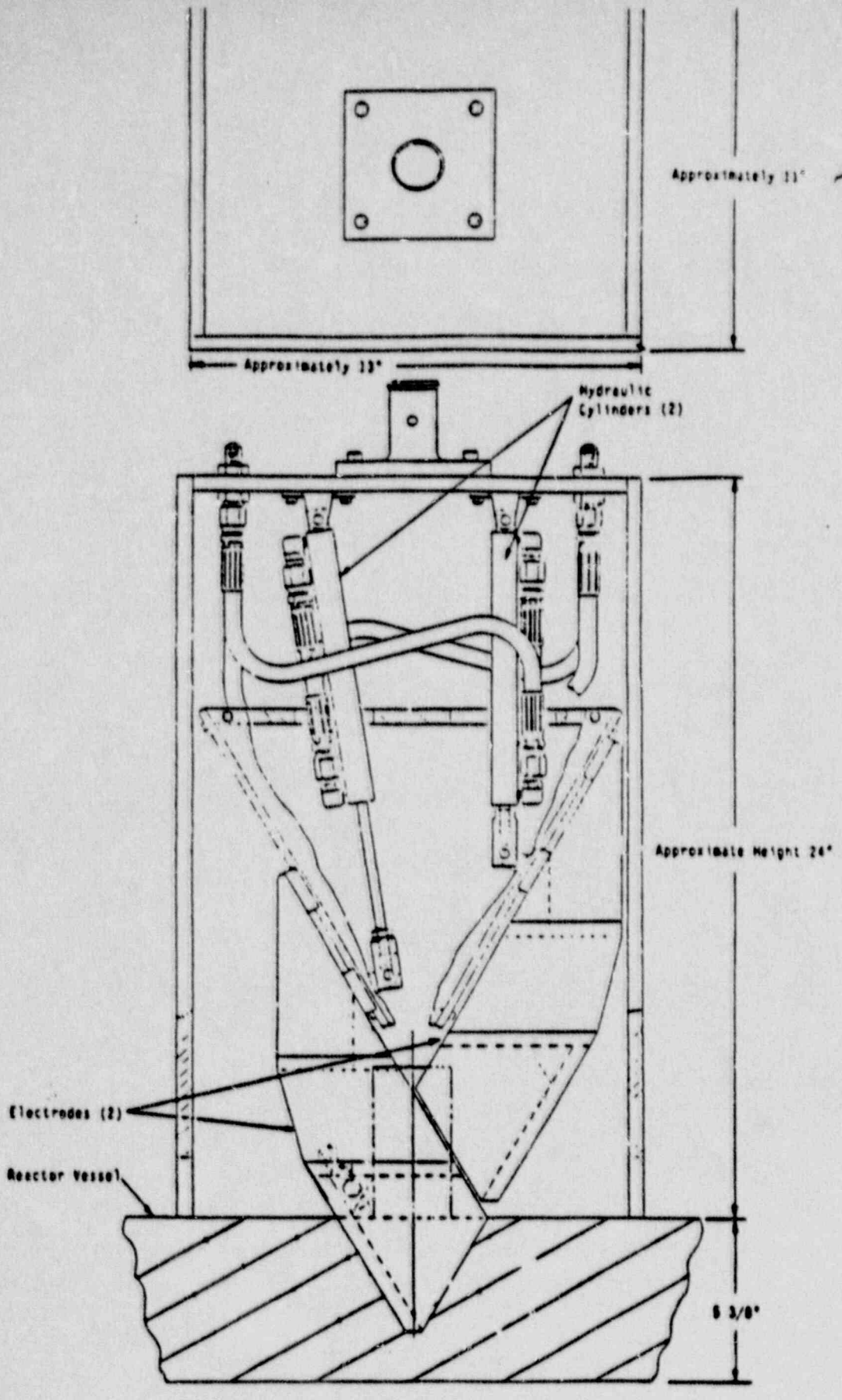


MAJOR CORE MATERIAL PARAMETERS

MATERIAL	WEIGHT	MELTING POINT
Fuel	104 Tons	5080F
Cladding(Zr)	23 Tons	3362F
Control Rods(Ag,In,Cd)	3 Tons	1472F
Spacer Grids(Inconel)	1.5 Tons	2300F
Burnable Poisons	0.5 Tons	2300F
Eutectic(Zr,UO2)	-	4700F
Lower Core Internals(Stainless Steel)	8 Tons	2550F

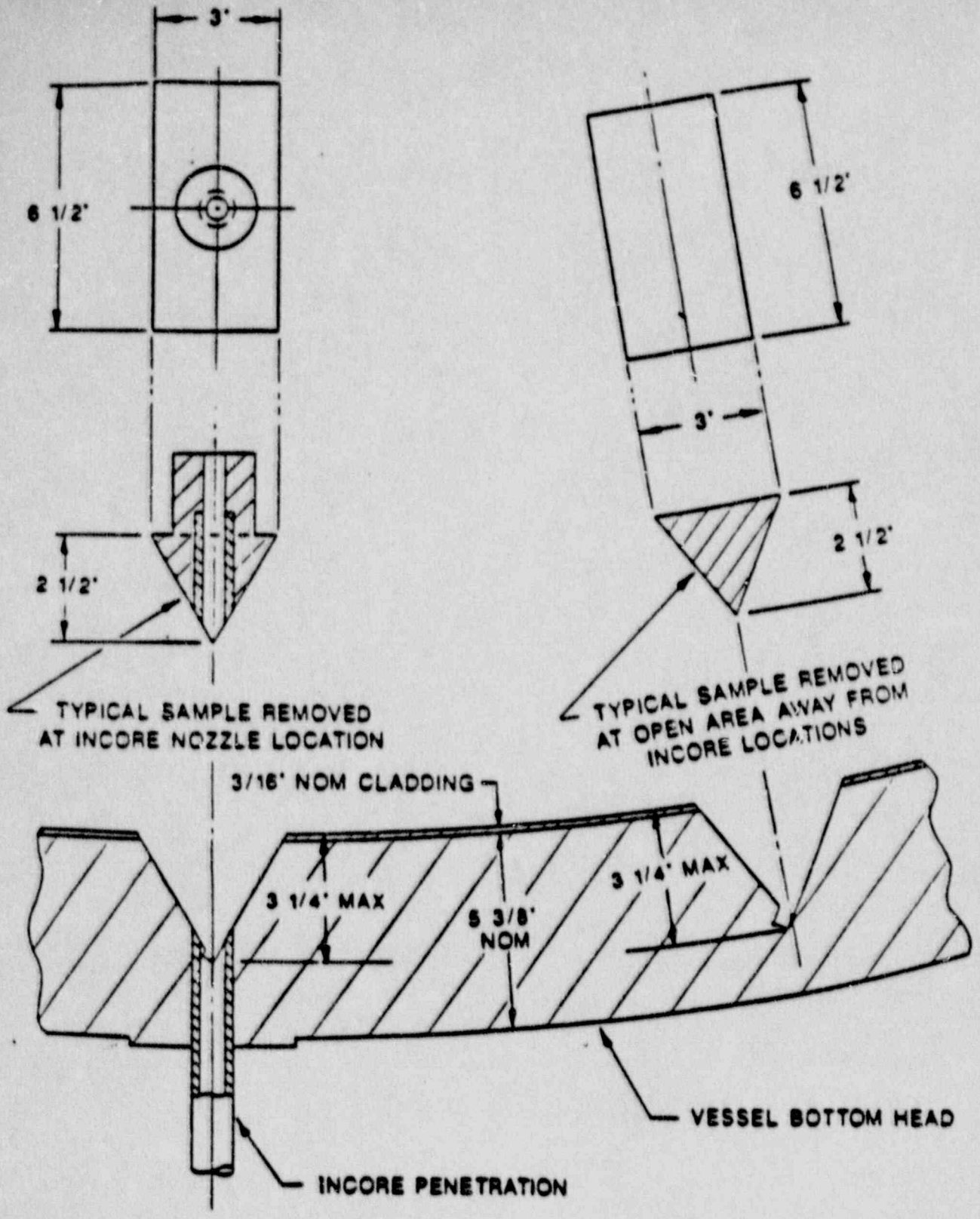


INCORE INSTRUMENT GUIDE TUBE / NOZZLE INTERFACE



T-21

MDM HEAD
GENERAL ARRANGEMENT



SAMPLES BEING REMOVED
FROM BOTTOM OF REACTOR VESSEL

T-20

LICENSEE'S PLANS FOR THE TMI-2 FACILITY

-Remove greater than 99% of the fuel.

-Maintain the facility in a configuation that precludes a criticality.

-Remove all radwaste from the facility.

-Dispose of all liquid radwaste.

LICENSEE'S PLANS FOR THE TMI-2 FACILITY

-Place the facility in long term monitored storage, called Post Defueling Monitored Storage(PDMS), until TMI-1 is ready for decommissioning(about 23 years) and decommission both units simultaneously.

-Limited access to facility during storage for monitoring.

-No attempt to preserve capital investment.

REMAINING LICENSEE ACTIVITIES	
ACTIVITY	**SCHEDULED COMPLETION**
Complete Defueling	Nov 89
Lower Head Sampling	Dec 89
Begin AGW Evaporation	Jan 90
Complete Fuel Shipping	Mar 90
Complete Decon of Facility	Mar 91
Enter Long Term Storage(PDMS)	Apr 91
Complete Waste Shipments	Jun 91

REMAINING NRC STAFF ACTIONS

Review of the Defueling Completion Report

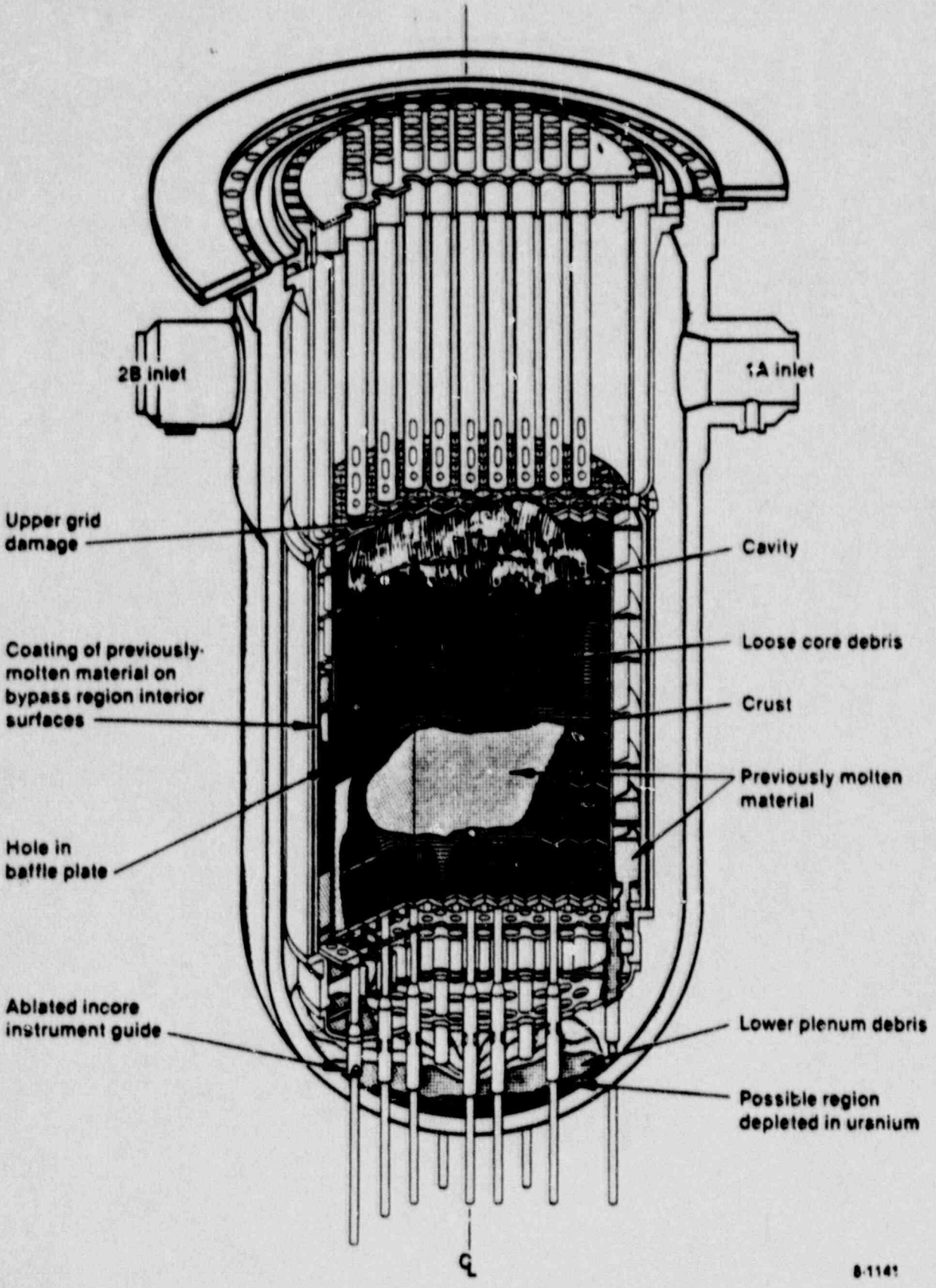
Review of Post Defueling Fuel Survey Reports

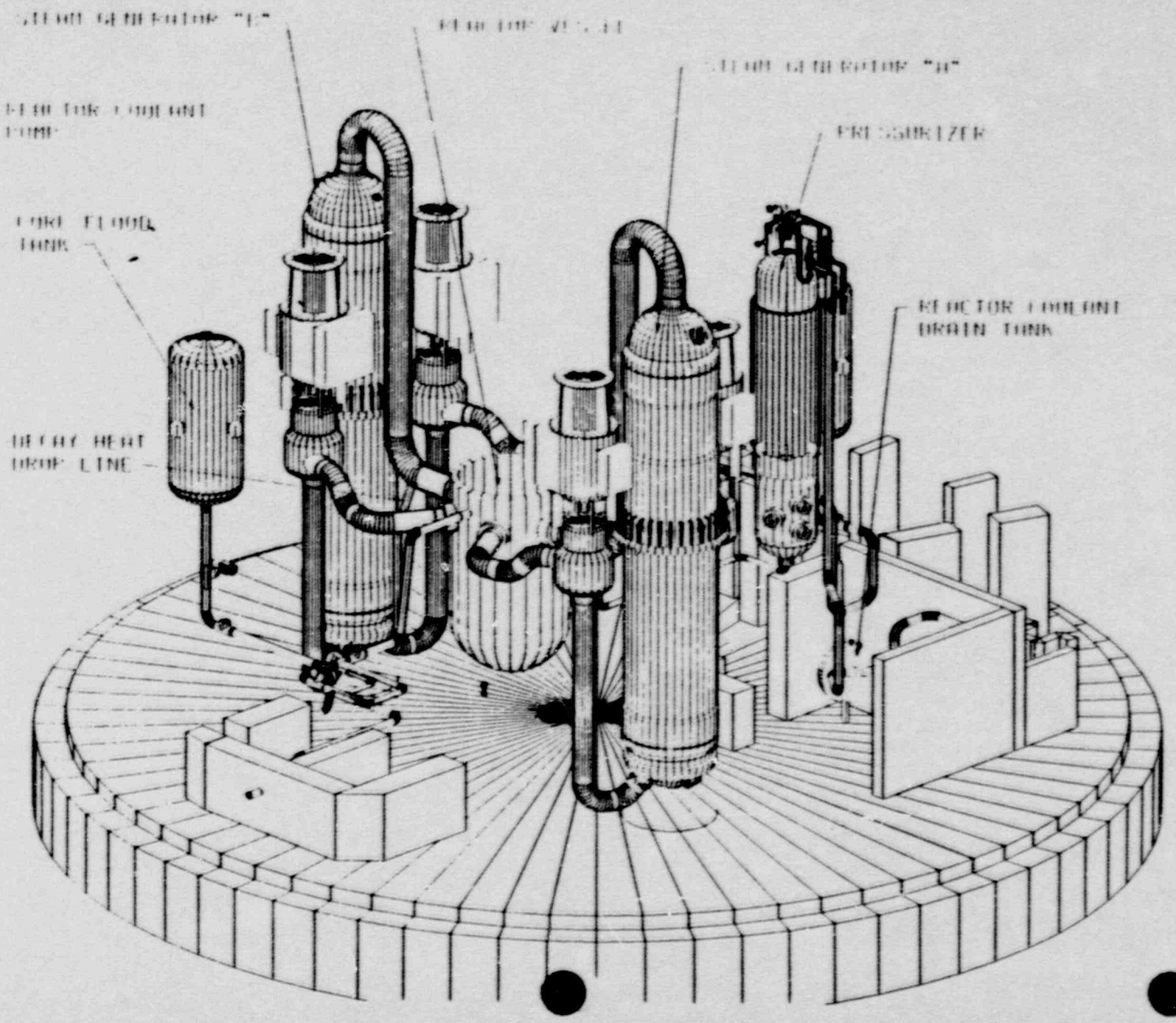
Independent Fuel Quantification Program

Review of Long Term Storage(PDMS)

Oversight of AGW Evaporation

TMI-2 Core End-State Configuration




PRESSURIZER
REACTOR COOLANT
DRAIN TANK

LOWER CORE SUPPORT ASSEMBLY