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NUCLEAR REGULATORY COMMISSION

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In the Matter of: ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

SUBCOMMITTEE ON SUSQUEHANNA NUCLEAR POWER STATION

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

SUBCOMMITTEE ON SUSQUEHANNA NUCLEAR POWER STATION

Nuclear Regulatory Commission
1717 H Street, N. W.
Room 1046
Washington, D. C.

Thursday, July 23, 1981

The subcommittee convened at 8:30 a.m., pursuant to notice, William Kerr, Chairman of the Subcommittee, presiding.

ACRS MEMBERS PRESENT:

W. KERR
D.W. MOELLER
J.J. RAY

ACRS CONSULTANTS PRESENT:

I. CATTON
W. LIPINSKI
Z. ZUDANS

DESIGNATED FEDERAL EMPLOYEE:

J.C. McKINLEY

OTHERS PRESENT:

MR. STARK
MR. CURTIS
MR. KENYON
MR. HENRIKSON
MR. TEDESCO

P R O C E E D I N G S

8:30 a.m.

MR. KERR: The meeting will come to order, and as soon as I get that public statement that I am supposed to read we will get started.

This is a meeting of the Advisory Committee on Reactor Safeguards, the Subcommittee on Susquehanna Nuclear Power Station. My name is Kerr. Other committee members present today are Mr. Moeller, Mr. Ray is expected. Consultants with us are Mr. Zudans, Mr. Lipinski and Mr. Catton.

The meeting is being held to discuss the request for an operating license being made by the Pennsylvania Power & Light Company. The meeting is being conducted in accordance with provisions of the Federal Advisory Committee Act. The designated federal employee is Mr. J. . McKinley. He is being assisted by Mr. Garry Young whom I assume is the deputy designated federal employee.

Rules for participation in today's meeting have been announced as part of the notice of the meeting published in the Federal Register of July 17 of this year. A transcript is being kept. We request that each speaker identify himself and use a microphone. We have received no requests for oral statements from members of the public. We have received no written statements f[illegible] members of the public. You have, I believe, copies of the proposed agenda and it calls for a first item from the NRC staff with spokesman, according to my copy of the agenda, Mr. Stark.

(Slide.)

MR. STARK: Good morning, my name is Richard Stark, I'm the project manager for the NRC safety review of the Susquehanna Steam Electric Station. I would like to point out that this is the second boiling water reactor to be reviewed by the ACRS after TMI. LaSalle was the first one, and that was approximately two months ago.

In addition, I would like to point out again that this is a two-unit review; Units 1 and Unit 2 for Susquehanna Steam Electric Station. And again, as was the case in the LaSalle application, we have conducted our review aiming toward a full power license and not a two-step license.

I would like to discuss the chronology or the history of the Susquehanna review and then I will get into the current status of the review. What I have on the slide -- and I also have a few copies of this passed out -- is some of the key dates relating to the Susquehanna application.

The document was tendered in April of 1978; it was docketed in July of 1978. The safety evaluation report was issued on April 10 of this year, 1981, and supplement no. 1

was issued July 7 of this year. The safety evaluation report that was issued in April had 103 open items, and the supplement that came out this month has 14.

And what I would like to do is to discuss the status of those 14 items right now for your benefit.

(Slide.)

I would like to indicate that a large number of these also appear on the agenda, so they will be discussed more than once today. And since we are in Washington, this time, many of the staff reviewers will also be here at times that should coincide with the applicant's presentation. So what I would like to do right now is to kind of discuss the status of each and every one of these.

The order that I have here is the same order that the open items appear in Supplement 1 and that is the reason for the order.

Item number 1 is turbine missile, and basically the status of our review right now is we are reviewing the basis for defining target and target areas. We have been looking at drawings and trying to determine angles, and what we have done to expedite this is there is a site visit planned and a meeting for next Wednesday, the 29th I believe, where the reviewer will try to rapidly identify those items so that we can go on with that particular phase of the review.

MR. KERR: Excuse me, Mr. Stark, I did not quite get what you are trying to tell me. There is a site visit?

MR. STARK: Yes. What the reviewer wants to do, rather than looking at drawings and trying to determine 3D and where the angles are relative to defining critical targets and areas, we tried several sessions on paper and we felt the best thing might be just to go and look at the three-dimensional site in order to come to a mutual agreement on what is a target and what is a target area and what the size is, so that we can crank in the probability numbers.

MR. ZUDANS: How do you plan to figure out the angles, walking in a room that is enclosed by a wall?

MR. STARK: Basically, one of the problems we have is defining targets. Initially, the applicant gave a very large over-estimate of it where instead of looking at critical equipment, he looked at, for example, the whole wall and not the insignia on the wall as a critical area, which produced very large numbers. And then, whenever we pointed that out to him, he tried to hone in on the target, and we want to make sure that what his basis is for defining a target and our basis is very similar.

As I said, we have gone through two sessions looking at drawings, trying to look at angles, and we thought that for all people's benefits it might be a lot easier to understand if we just looked at the plant.

MR. KERR: You stand at the turbine and throw rocks, and if the rock hits something -- .

MR. ZUDANS: That does it.

(Laughter.)

If I walk in the plant, I certainly lose the concept as to what is behind that wall, and I am figuring the only way you can determine the angles is really looking at the drawings, unless you have a doubt.

MR. STARK: You can argue that one either way. Sometimes people can see three dimensions in drawings; sometimes they can see it better -- .

In any event, we thought this would be a good way of wrapping that one up.

The next item I have is equipment qualification, and what I would like to say here is that the applicant has established a central file. We have had several meetings and several discussions where the content of the format of the file has been well established. The applicant will not have his file ready, essentially complete, until November of 1981.

MR. KERR: Excuse me, it also seems to me it is important to us to know whether the equipment is qualified. I guess I'm a little more interested in that than I am in knowing whether his file is qualified.

MR. STARK: What I was going to say is we cannot perform our audit until a large portion of that file exists. That will not be the case until November, so we have not done our audit and we will not start the audit until after November.

MR. KERR: Did you happen to ask the applicant how he is getting along with the qualificaton program? Or are you going to wait until his file is in place?

MR. STARK: Actually, we tried to do both, exactly what you said.

MR. KERR: All right. I will ask him. You did ask him?

MR. STARK: Yes, and what we tried to make sure of is that what he presents to us comes in, as I said, the right format, the right content. But a large portion of the actual qualification data itself is not there, and it is currently being assembled. And since there are some pieces of it there -- but we feel until a large portion of it is there, we will not --

MR. KERR: But you do not have any feel for whether the qualification process is fairly well along or not?

MR. STARK: I think until we do our audit I would not want to forecast it.

MR. KERR: Okay, I will ask him.

MR. STARK: We think they are headed in the right direction but we have not done the audit and we have not looked at it.

MR. KERR: Can I ask the applicant what he feels about the present status of item 2?

MR. CURTIS: My name is Norman Curtis. I believe agenda item G addresses this subject. We will be making a presentation.

MR. KERR: Okay, you're going to follow up. Good enough.

MR. STARK: That is true, a lot of these do occur later on.

MR. CATTON: Can I just cross items off on this big list that I have that you have down there?

MR. KERR: No, it is in the supplement. That's correct, isn't it?

MR. STARK: Yes.

MR. KERR: Do you remember what page?

MR. STARK: Section 1.9, Chapter I.

MR. KERR: Okay.

MR. STARK: It lists 108 total items. The 103 went to 108, but some of those were also resolved.

MR. KERR: But you have this list and the supplement, don't you? No, you don't?

MR. CATTON: No.

MR. STARK: These items are the items of 108 that are still open that are still requiring additional information.

MR. KERR: So that will show up in a supplement numbered 2 sometime.

MR. STARK: Supplement No. 2 I hope to take that whole 108 list sometime and show that they are all resolved.

MR. KERR: I guess I don't have this list. Do you have this?

MR. STARK: If you look at the safety evaluation supplement you will find that all of these items are picked out of the 108. These are the 14 that are still open within that 108.

MR. KERR: We are trying to get our files up to date.

MR. CATTON: Go ahead.

MR. STARK: Would you like me to point it out to you?

MR. KERR: He will find it.

MR. STARK: It is a handy thing for me, and if I can bring you up to speed on it, it may help you. Rather than glean all of the open items out of the 108, we threw the 14 -- .

MR. KERR: I wish you would not mention the 108 because I have never really believed that number. I just cannot believe there could be 108 open items in an SER.

MR. STARK: All that means is that the staff still does not have the right piece of paper at the time.

MR. CATTON: It sounds like it is premature.

MR. KERR: That's sort of what I thought.

MR. STARK: Okay. The next item I would like to discuss is steam bypass of the suppression pool, and the issue here is that the steam had required automatic wet well spray, and the applicant wishes to show that he has sufficient capacity or sufficient margin in his wet well design that he can -- and there is also sufficient time -- that he can rely on manual initiation of wet well spray.

The applicant is performing an analysis right now and that is due August 1st for us.

MR. KERR: Do you think he can do it?

MR. STARK: Well, based on some of the discussions we have seen so far, it appears that there may be sufficient margin and if he can confirm it in the analysis, we will probably accept it.

MR. KERR: Thank you.

MR. CATTON: Is his wet well different than other plants?

MR. STARK: It is a Mark II containment.

MR. CATTON: Is the volume different than other plants?

MR. STARK: Since it is a Mark II containment I suspect it would be very similar. I have not checked the number of cubic feet.

MR. KERR: We can ask him when he makes his presentation.

MR. STARK: By the way, we re going to discuss Mark II containment, which are the next three items. That is in the agenda coming up.

Okay, the next item is a justification of T-quencher loads, and just to give you an idea, the staff is presently preparing its -- or getting ready to publish -- its criteria. The applicant met with the staff and presented the assumptions that went into their analysis for analyzing the bending moments. We are currently reviewing their assumptions, and I can see that we are very close to accepting their assumptions. I have one more review branch right now, and I expect next week -- I show this action is subject to any need for additional information.

MR. CATTON: Excuse me, I do not recall steam bypass being a problem with Zimmer. Do you have different people who review the same aspects on different plants, who have different views of things?

MR. STARK: We have different reviewers. I have the same reviewer that existed on LaSalle.

MR. CATTON: I was thinking of Zimmer. I do not remember the steam bypass being in question. Was it missed on Zimmer or something?

MR. STARK: Since I am only associated with Susquehanna, it is hard for me to say. It may have been that they committed to automatic wet well spray and therefore, it was not highlighted. I don't know.

MR. CATTON: Oh, okay.

MR. STARK: As I indicated, I expect we are very close on that. I do not want to forecast where we are going to be but we are very close on this particular item.

MR. KERR: Excuse me. Doesn't LaSalle use a T-quencher?

MR. CATTON: This doesn't have anything to do with the type of quencher.

MR. KERR: No, but I am down on item 4 and they need additional justification of T-quencher loads.

MR. CATTON: Yes, it does.

MR. KERR: Are the loads different here than they were at LaSalle?

MR. CATTON: I'm just having trouble keeping up.

MR. ZUDANS: No, this one was -- .

MR. KERR: Why is this a problem on this? Why does one need different justification here than one needs at LaSalle?

MR. STARK: I'm going to put it in my own words.

I think initially, all of the applicants were presenting their plants and analyzing it more or less uniquely. And what we are attempting to do is to provide both a uniform review and also attempting to accommodate the different methods that were used in our analysis review.

MR. KERR: Let me go back and re-ask my question. Is this T-quencher markedly different or is it unique somehow as compared to the one at LaSalle?

MR. STARK: I guess it is the same. Do you recall, Tony?

MR. BOURNIA: It is the same.

MR. KERR: Does one require a different justification here than was required for LaSalle?

MR. BOURNIA: I think right now, as Richard has indicated, I think they are unique in each plant and they have to be looked at on a plant-by-plant basis.

MR. KERR: I thought you just told me that the quenchers were the same but the justifications have to be different. Is that right?

MR. BOURNIA: Right.

MR. CATTON: Could we ask why?

MR. KERR: I am afraid to.

MR. CATTON: I am, too, but I'm curious.

MR. KERR: What does justification mean? I would have thought that if one found the T-quencher acceptable at

LaSalle, if it is the same as this T-quencher -- .

MR. STARK: I think the applicants could have analyzed them differently and come to the same conclusion and we are reviewing their analysis.

MR. KERR: If you have already analyzed LaSalle and it is acceptable and it is exactly the same as this one, what additional justification does one -- I am missing something. I realize my question sounds silly. It sounds silly to me.

MR. STARK: Let me do this -- .

MR. CATTON: They all belong to the same owners' group.

MR. STARK: The reviewer will be down later this morning as a part of that specific discussion. Maybe we can address that item then.

MR. ZUDANS: At the other meeting, we were advised that Susquehanna T-quenchers were tested and specifically by Germans, and that is where you derived low drum and that was a single quencher that was tested.

MR. CATTON: But, Zenons, they all belong to the owners group and they all have access to the same information, and they are all using the same T-quenchers.

MR. ZUDANS: But for the specific facilities, they do not. These were derived from the German test, not the GE test for this one.

MR. KERR: I guess I do not understand the structural engineering?

MR. ZUDANS: The hydraulics?

MR. CATTON: The mock-up was identical for the other plant where maybe some piping is slightly different at this plant. But I still do not see a need for it to remain as an item of question.

MR. TEDESCO: Let me just add a little bit here. We agree they have an owners group and they are approaching the issue for resolution on a generic basis. For LaSalle it is probably all right, but it does not necessarily mean that each licensee is going to adopt precisely the same generic resolution.

MR. KERR: Mr. Tedesco, let me -- my question was, is the T-quencher here the same as the one at LaSalle? Now, the answer I got was yes. Maybe that is the wrong answer.

MR. TEDESCO: I think that -- .

MR. KERR: If it is the same, then I don't understand why once one has decided that a T-quencher is accpetable, one has to do another analysis of an identical T-quencher to determine that it is acceptable. So I'm missing something and I'm trying to find out what it is I'm missing.

MR. TEDESCO: Let me make my point another way. We have a Mark-II containment here, we have a BWR-5. That has been reviewed before, too. Now, why are we doing it again? The answer is we tried to evaluate each plant, find out what the differences are and what the applicant -- .

MR. KERR: Indeed, I would encourage one to look for unique differences and that is the reason I asked if there were any and I was told there were not any differences; that the T-quenchers are identical.

MR. TEDESCO: As far as the installation, as far as the deposition of the loads, how they are applied, I do not know if they are the same. I do not think so.

MR. KERR: That is the reason I asked the question and the answer I got was yes, they were the same. I don't know.

MR. ZUDANS: They are not installed the same way.

MR. KERR: They are not installed the same way?

MR. ZUDANS: The specific test by Germans for their specific plant, that is where they derived the loads. Therefore, it is a different story.

MR. KERR: Okay.

MR. STARK: Mr. Tedesco brought up another plant. LaSalle is a BWR-5; Susquehanna is a BWR-4. So it could be the steam and the characteristics of steam forces going down are similar but not necessarily identical. So that could affect the loads, too.

MR. KERR: I feel better. There must be some basis for this. That is what I was looking for.

"R. STARK: Okay. The next item is the review of the submerged drag'oads and again, this is another instance where the applicants have more or less done unique analysis or unique presentations of the submerged dragloads. And what we have found so far in our review is that the methodology that Pennsylvania Power & Light is using is acceptable to us.

The staff has asked for additional studies, sensitivity studies, to confirm a multiplier factor that the applicant is using for hydrodynamic mass, and the applicant has indicated that he will try to give us some confirmatory information on the sensitivity study by September.

MR. KERR: And again, I take it the dragloads at Susquehanna are unique and quite different from those, say, at LaSalle?

MR. STARK: I'm sure that there are plant-specific differences and I do not know how to properly factor them in. But since this is scheduled to come up again later on today, there will be some people on both sides; the applicant and on NRC, who can probably address that since they sat in on most of them.

MR. KERR: Thank you.

MR. STARK: Okay. The next item that I have is IE Bulletin 7927, and 8006. IE Bulletin 8006 is loss of safety related function after reset. The applicant has submitted a response to this particular item, 8006. For the most part it satisfies the requirement in that it identifies exceptions, it documents their operation and it documents the required testing procedures.

However, the staff feels that they have not justified the exceptions and we have requested additional information for 8006, and that specifically, they justify the need for the exceptions. So that is the status of that one, and the applicant has indicated that he will get back around the middle of the month on that.

MR. KERR: The middle of August?

MR. STARK: The middle of August, yes. Now, IE Bulletin 7927 is loss of power to instrument and control system, and the status of this one is that we have not yet received the response from the applicant. And we had an estimate here of mid-August, whenever that one might be coming in, and we have done no review on it since there is nothing to review.

The next items we have is the review of the alternate shutdown system.

MR. KERR: Now again, both of these questions are plant-unique. This is quite different, for example, than LaSalle or -- .

MR. STARK: That is correct. These initially went out to the operating plants and asked for a plant-unique response, and that is also what we are asking for here.

MR. KERR: My question is, is the equipment plant-unique? For example, they cannot refer and say, we are doing the same thing as LaSalle. It is quite different than LaSalle, say.

MR. STARK: That is correct. Yes, we are asking for a plant by plant status and identification of the exceptions.

MR. KERR: Thank you.

MR. STARK: Okay, the next item is the review of the alternate shutdown panel and the review of this one is continuing, and I would like to kind of tell you where the staff is.

We feel that the remote shutdown system probably does not meet GDC-19 in that we do not feel it satisfies the redundancy requirement. The applicant is currently using jumpering to achieve redundancy, and we do not find that acceptable. We have been discussing that with the applicant and they are thinking of some alternatives.

MR. KERR: Tell me what you mean by using jumpering to achieve redundancy.

MR. STARK: Okay, what we were looking at is from the remote shutdown panel that you could operate channel A or channel B directly from the remote shutdown panel as you can from the control room where you could use A or B. What the applicant has is the ability to operate, let's say, channel A from the remote shutdown panel. But in order to operate channel B, B has to physically -- the panel does not allow that flexibility. So in order to get a channel B type of redundancy, he has to physically go in and jumper out A and jumper in whatever the particular piece of equipment is. It is not really a readily achievable redundancy, as we want to have it. It requires manual action physically to go in and connect and disconnect pieces of equipment, or access to pieces of equipment.

MR. KERR: Why is this a subject for negotiation? Is your requirement unclear, or -- .

MR. STARK: I think in all fairness to the applicant, our requirements have been very -- it has been a one or two-sentence requirement and some applicants have looked at it and interpreted it very broadly and some have interpreted it more narrowly. And I think that in this particular instance, they have looked at redundancy to, through manual action and through jumperting, to achieve redundancy. And I guess we could have been more positive.

In some of our meetings we have tried to since clarify our position on that. We are looking for direct redundancy, very similar to what you find in the control room where you can just go over and punch in a channel B or switch in directly to channel B.

MR. KERR: Okay. What is it you expect from the applicant? A commitment or what is there about this in your view that would close the issue? What would the applicant have to do?

MR. STARK: If we could see an opportunity to achieve redundancy that was more straightforward and direct. We are opposed to an operator knowing -- .

MR. KERR: I do not see anything unstraightforward and undirect about using jumpers. You may not like it, but it seems completely straightforward and direct to me.

MR. STARK: Well, I guess that is an item that you can discuss and we have been discussing with the applicant.

MR. KERR: Well, I'm trying to find out what it is that the applicant would have to do in order that you would consider this issue closed. What are some of the options he has?

MR. STARK: Well, --.

MR. KERR: I gather the option in your view is not using jumpers.

MR. STARK: That is correct. Let me postpone this. This is on the agenda for later today and the applicant is going to address this since we have had some discussions. We have not seen their -- I don't think we have seen their final response to it yet, but they have been thinking about it.

The other item that concerns us -- .

MR. ZUDANS: Could I ask you a question? Are we going to have item 6 on the agenda later or not?

MR. STARK: No.

MR. ZUDANS: Then I have a question relative to the SER supplement. On page 7-1 -- .

MR. KERR: Do you need to look at what he is -- .

MR. ZUDANS: I will tell you. Two different locations the incore thermocouple question is addressed and I find they conflict with each other. In one place it says that the applicant has indicated their intent to use the guidance of 1.97, and in another place, at page 22-11, it says applicants will be required to address incore thermocouple requirements. So have they committed to incore thermocouples or have they not?

MR. STARK: That is an interesting question and I would like to discuss it right now, and it will also come up later on.

The position of the staff has been that NUREG-0737 requires that the applicant address incore thermocouples. I guess the applicant as well as the owners group have had the strong feeling that it adds to the safety, but it adds very little. There have been a number of meetings, and there was one held with the owners group about a week and a half ago where the same item was discussed and it was not resolved at that particular point.

But the BWR applicants indicated their feelings, I guess, on the use of incore thermocouples, which they do not feel very strongly, and the staff I guess feels more strongly, is the correct way of seeing it now.

MR. KERR: Mr. Stark, to you what does the term "address incore thermocouples" mean?

MR. STARK: We are requiring that they install incore thermocouples as a redundant backup means for determining level control within the reactor.

MR. KERR: So addressing them means they agree to install them?

MR. STARK: That is correct. The applicant feels there are other diverse ways of achieving this without using incore thermocouples, and the discussion has been -- .

MR. KERR: Is that a requirement or not that they install them?

MR. STARK: Our interpretation right now is that it is a requirement that they install them.

MR. KERR: Then why is it a point at issue?

MR. TEDESCO: Right now, I think we have an agreement to disagree on this point. It is pretty generic with all the BWR's and that will be addressed and resolved as a generic issue. This is a case in point where it came up.

The staff has said for a BWR, you have to install incore thermocouples. We have taken that position on it. The engineering has not been resolved yet.

MR. LIPINSKI: Mr. Chairman, I think the problem arises as to the proposed installation. If I recall, they were going to put them in the instrument thimbles. There was a problem with regard to the core fuel height. It is not the fact that the thermocouples would not be beneficial. It is, could they resolve the problem of installation.

MR. CATTON: These are -- the question is, are they as good as the thermocouples in a PWR. The results from our calculations show that they do about the same job.

MR. LIPINSKI: In the proposed location?

MR. CATTON: Yes.

MR. KERR: I think -- are these two consultants putting the staff's position correctly, Mr. Tedesco? I look on them as experts so I have to take what they say very seriously unless I hear from you to the contrary.

MR. TEDESCO: There is a little difference here. I don't think I want to address it at this point.

MR. KERR: Okay.

MR. STARK: On agenda item 2C(3), we will have a reviewer who I believe will have a slide, and be prepared to describe what our position is on that.

MR. KERR: Okay.

MR. STARK: I discussed the review of the alternate shutdown panel, and as I indicated, that will also come up later on this afternoon. We feel that it meets Appendix R, and as I indicated with respect to GDC-19 which is still open, we want the applicant to discuss redundancy, and I hope we can come to a better definition, a better understanding.

MR. KERR: You are talking about item 7?

MR. STARK: That is correct.

MR. KERR: Now why, if you have a clear requirement, do you want the applicant to discuss it? I mean, do you have a requirement or not?

MR. STARK: In all fairness to the applicant, our requirement was not crystal clear. Applicants could interpret it more broadly or -- .

MR. KERR: Now that you know it is not crystal clear, why don't we make it crystal clear one way or the other?

MR. STARK: The staff has put down in writing their position in the staff review and they are amending the review procedures to show a better definition for future use.

MR. KERR: Does the applicant have a copy of that yet?

MR. STARK: As a matter of fact, the applicant saw it last week and they have had an opportunity to review it and I have not had a chance to talk to them since.

MR. KERR: You do not know whether they consider it crystal clear or not, then.

MR. STARK: I think it is a lot clearer to them now than it was several weeks ago.

MR. KERR: Okay, thank you.

MR. STARK: The next item is one of the TMI items; it is II.K.3, item 18, and it deals with the ADS logic. This is still an open item. To give you a little background, the BWR owners group has recently decided -- and this is the position in La Salle -- to modify their logic in one of two ways, and the staff finds these acceptable.

One is to eliminate the high dry well pressure trip, the second one is to bypass the high dry well pressure trip after run-out of a timer, and this timer is started at low pressure ECCS initiation.

As far as this application is concerned, Pennsylvania Power & Light has not endorsed the owners group recommendation, so this item is open. And I -- .

MR. KERR: Do you know why they do not endorse it?

MR. STARK: To tell you the truth, I do not.

The next item I would like to discuss is also -- .

MR. TEDESCO: I just want to make one point about the three items we talked about; 6, 7 and 8. I realize that we had put in an awful lot of work on them, staff and the applicant. We do have a number of open items but we feel that the items 6, 7 and 8 could be resolved by the time of the full ACRS meeting, giving a little more opportunity for the applicant to give us the information. I would just like to take this opportunity to make that point known and to encourage a little more effort on the applicant's part to get some more information in to us so we can reduce these issues.

MR. KERR: Well, I hope the applicant knows what it is you are requiring of him, because I could get the impression from what I have heard that it might not be altogether clear to him what he is being asked to do.

MR. TEDESCO: It is my understanding that they do understand.

MR. STARK: I think, Dr. Kerr, that what you are saying relative to item 7 is perhaps correct. Item 8 and item 6 are much older requirements.

The next item is item 9 and it is also a TMI item, II.K.3 item 27, and it relates to making sure that all the instrumentation that show vessel level all have the same reference level. And I should add that I don't think this is a serious issue.

Where we stand right now is that the applicant has proposed one or two methods of achieving this goal. We think we have found a way that is more straightforward and we have been discussing -- we both have been discussing acceptable ways of achieving the same end goal. And I think the applicant has verbally indicated that they will accept the staff position.

MR. KERR: What do you mean by making certain that everything has the same reference level?

MR. STARK: It is possible that someplace you can look at the reactor vessel and find a zero to 100% scale where someone else -- another area might show it as elevation. I don't know what the appropriate elevation is, but elevation X and another place it might be shown as elevation X, so that for consistency, all bottom levels are elevation X, all top of the vessels are X plus delta, whatever that is. So you don't have it one place 50% and another X plus delta. It just put them all on the same basis. If you are talking a level, everyone uses the same level, elevation level, to avoid confusion.

It is a convenience, I guess for the operator.

MR. KERR: It is not the same reference level. It is the same notation for indicating level, I think, isn't it? In each case the reference is zero, zero percent or zero something or other. It might not be zero.

MR. STARK: The way one refers to the bottom of the vessel, you can do it any number of ways. It is an attempt to put it all on the same basis.

The next items are also TMI items. The next three relate to emergency preparedness. The discussion on item 10 is well under way. The applicant has submitted an emergency preparedness plan which we have reviewed. Basically it meets the current requirements as you see in Appendix D of the supplement, our complete evaluation as it stands right now.

We have identified eleven minor items as requiring additional information or clarification.

MR. KERR: Excuse me. You said basically it meets the current requirements.

MR. STARK: Well, we have eleven questions on the last page, so I cannot say that we are fine tuning it or going back for additional clarification, but what is there is pretty close to what we feel is required subject to those eleven items. And as I said, our review will continue as we are working out those particular eleven items.

The next item, which is -- these are all interrelated, and by the way, these will all be discussed later on in the agenda, I think still this morning.

MR. KERR: Okay.

MR. STARK: The operator emergency support facilities. The staff is reviewing these. The find the facility meets the interim requirements. We are looking at the long-term requirements right now relative to whether it meets NUREG-0696, and I guess the only thing I can say is that our review continues and that is the status of it right now.

The last item that we have on long-term emergency preparedness, I did not put the numbers here but it is TMI Item III.A.2. The staff review is continuing. We have had several discussions with the applicant. One of the items that we are currently discussing is perhaps the need for an additional met tower. The applicant has agreed in the short term to put in a supplemental met tower.

We are concerned about the accuracy of the dose models and meteorological data based on the mountain-side and the terrain if we just use one met tower. We are concerned, for example, that the wind coming from a given direction, say east, may no longer go east because of the terrain. So we want to use a backup tower at least long enough that we get confidence that we can accurately predict and model what is going to happen from a meteorological standpoint.

MR. KERR: You are not concerned about your models being able to predict the presence of the mountain as long as you have good meteorlogical data, I take it.

MR. STARK: I think we are saying the same thing.

MR. KERR: No, I do not think we are. You are talking about a met tower, which is a data collector. I am talking about a model into which you feed those data, and I --

MR. STARK: The modeling -- maybe we are not arguing about the model but we are arguing can the data coming from one tower affect how you use that tower.

MR. KERR: I am saying is your model accurate enough so that that better data will mean anything?

MR. STARK: I do not think our issue is with the model. Our issue is is the right data being fed into the model.

MR. KERR: I recognize that. I am asking you, is your model accurate enough so that that improved data will effect any improvement in your ability to predict?

MR. STARK: Steve, can you address that item?

MR. KERR: Do you know what item you are being asked to address, Steve?

MR. CHESNUT: I did not hear the last question.

MR. KERR: The issue as I understand it is one would like to have an additional meteorological tower because of the characteristics of the terrain, and my question was is the model that one has available to do predictions of dose accurate enough that these additional data will improve things drastically, or significantly, I should say?

MR. CHESNUT: I guess there are a couple of answers to this question. The first is the model can factor in the terrain features, and the applicant has committed to perform an evaluation of the terrain and it is currently developing the dose model which takes into consideration some of the fixed terrain factors. Our meteorological reviewers have looked at it and feel that because of the complicated terrain, an air plume can go in one direction, completely reverse course or have several other alterations just due to the complex terrain, and that a supplemental met tower may be in order or at least some evaluation by licensee that meteorology in the area is straightforward enough not to require an additional met tower.

MR. KERR: Could I interpret that answer to mean we do not know yet?

MR. CHESNUT: We are not 100 percent sure yet. Our Meteorological Branch position is that they believe it is probably necessary, just looking at the terrain and the meteorological data they have from the area.

MR. KERR: So in the meantime the requirement is going to be that an additional met tower is installed, or is that requirement crystal clear at this point?

MR. STARK: No, that is correct. I think the question right now is the applicant has at least verbally agreed to put it in on a temporary basis, and I think that --

MR. KERR: I do not understand what one means when you say he verbally says he will put it in on a temporary basis. Do you mean he will put it in and take it out?

MR. STARK: I am speaking for the applicant, but what we want is that we want greater assurance that one met tower can accurately put the right parameters on the model. We want some assurance. We are not sure that there is not a requirement for additional met towers. In order to properly --

MR. KERR: At what point will you know what you are going to require from the applicant?

MR. STARK: At this point I cannot answer that. This is an item of discussion. I think the applicant knows that we are concerned, we feel that there is a need for additional met data, and that has been our position.

MR. KERR: If I were the applicant I would be confusei, but he probably has more information than I have. So continue, please.

MR. STARK: The next --

MR. MOELLER: A quick question. How many other licensed plants or applicants have had to put up two towers or have been required to put up two towers?

MR. STARK: I do not know if I can answer that. Steve?

MR. CHESNUT: To be honest, I am not aware of how many. I believe some of the California plants have been asked to, and at Salem they are also performing a study to determine their need because of the sea breeze and environment. They have a lot of strange meteorology there. This is just a recent requirement and it is part of the long-term requirements that are not required until October of '82.

MR. KERR: But will a commitment of some sort be required as a condition of the license, or has this been decided?

MR. STARK: In my opinion I believe that is what will happen. I will have to talk to the specific reviewer on that and see what his final findings are, if he would be more confident if he had some assurance that that one met tower were going to reliably --

MR. KERR: Okay. The decision-making process is such that the individual reviewer makes that decision. It is not made by some set of people, an organization within the staff, but rather it is left up to the individual reviewer.

MR. STARK: Well, the reviewer makes his findings and his recommendation which he passes up through his branch chief and through his assistant directors within that given discipline. That is where we are right now.

MR. KERR: Okay, thank you.

MR. STARK: Okay. the next item is No. 13, heavy loads. The staff published NUREG-0612, which required a two-part submittal on the part of the applicants. The first submittal, which the applicant called the six-month report, addresses the interim actions, and these are a tabulation of heavy loads, verification of testing inspection and maintenance, and a number of other items. The applicant has submitted the first phase. His submittal is acceptable.

The second phase is specific requirements, or example in the reactor building, and the applicant has indicated that he will submit that on the 22nd of September, and that is the status of that particular item.

The last item was a concern that came up after the SER. It also came up on LaSalle. It is a pipe break in the scram discharge system. The staff currently is preparing a NUREG to address that. It will be NUREG-0803. It is expected to be issued early in August and it is in the final stages of review.

As it exists right now it will require the applicant to address three categories. The first category is piping integrity, and this includes verification of as-built drawings plus an in-service inspection program of that particular piping. The second phase requires the applicant to discuss mitigation capabilities, that is, mitigation of an accident that results in a pipe break in the scram discharge volume, and then that will require the applicant to include procedures that describe how he will mitigate that particular accident.

The third category is environmental qualification, and that is of all systems and equipment that are used to detect a pipe break system and to mitigate that particular accident. The action, as I say, is for the staff --

MR. CATTON: Does the scram discharge volume in piping have to comply with General Design Criterion 31, which is fracture prevention of the reactor pressure boundary?

MR. STARK: We will have a reviewer here later on. You might want to bring that up.

MR. CATTON: I will.

MR. STARK: As I understand the reactor boundary, wha we are doing is extending the boundary onto another valve. I think that Michaelson postulated a failure in the valve and then a pipe break that extended the boundary ougnt farther than we had previously looked at.

MR. CATTON: There is a previous period of time where the boundary does extend out through it, right?

MR. STARK: Maybe. I do not know the answer to that. What I would like to do is say that someone will be here later on and as a matter of fact that will be discussed after the lunch break. It is Item I. So perhaps you can bring that up again at that point.

MR. CATTON: I will.

MR. STARK: This completes the status report of the 14 open items. I thank you for your time. Do you have any additional questions?

MR. CATTON: Mr. Chairman.

MR. KERR: Mr. Catton.

MR. CATTON: There is quite a discussion of the thermocouple question in the LaSalle supplement.

MR. KERR: Mr. Baynard was kind enough to call that to my attention.

MR. STARK: The staff will use LaSalle as the lead plant as far as we are concerned on that particular item.

MR. KERR: Are there questions of Mr. Stark?

(No response.)

Thank you, sir.

MR. STARK: Thank you.

MR. KERR: We now have a presentation from

Pennsylvania Power and Light, and I believe Mr. Curtis is going to be straight man on this.

(Laughter.)

MR. CURTIS: Good morning, gentlemen. My name is Norman Curtis, Vice President, Engineering and Construction-Nuclear for the Pennsylvania Power and Light Company. I will introduce the PP&L portion of the program and will serve as moderator for the balance of the day for those portions of the program handled by PP&L.

I would like to express our pleasure for being here before this committee. Our last appearance was eight years ago, and I hope that by being here today we convinced ourselves and others that construction of at least Unit 1 at Susquehanna is nearing completion.

I would like to propose to the committee that the next item on the agenda, which is an overview of the site and a general description of the plan, be waived. We have submitted to the committee a written report on this subject. It is our feeling that the environmental report, the safety evaluation and other documents have not identified significant issues of concern resulting from our site; consequently, it would be my proposal to focus during my limited time on the subject that we feel is important, and that is the personality and character of Pennsylvania Power and Light Company.

Dr. Kerr, I would appreciate your thoughts on that.

MR. KERR: Are there any questions from members of the committee or consultants on the site and plant description?

(No response.)

MR. KERR: It seems to me Mr. Curtis' position is well-taken. Unless there are questions I shall suggest that you proceed as you have suggested, Mr. Curtis.

MR. CURTIS: Thank you, sir.

Pennsylvania Power and Light Company is a medium-sized utility. Susquehanna is its only nuclear power plant and properly will remain so for a considerable period of time, despite the fact that --

MR. KERR: What is the size of a medium-sized utility? What is your system capacity at present?

MR. CURTIS: At the present time we have capacity of around 6000 megawatts, as I recall, a peak load of around 4500 megawatts.

MR. KERR: Thank you.

MR. CURTIS: Despite this fact, we have been in the nuclear business, though, since 1954. At that time we were one of the early bidders in the commercial nuclear power demonstration program that was the first entree of the public utilities into the nuclear power business. We were perhaps an unfortunate bidder in obtaining the homogeneous reactor in a project we sponsored and which we cancelled about five years later.

Since that time we have been continuously in the nuclear business, though, and have used the intervening time to acquire people, train organization, stay up with the state of the art and in effect prepare ourselves for our current activities.

I would like to focus a little bit on one of the main issues and lessons that have come out of TMI. We feel that many of the lessons learned have focused in on management style, management organization, the qualifications of people and issues related to the ongoing part of the business, perhaps much more so than some of the hardware problems that we are prone to discuss; and there are characteristics of PP&L that have been in place for many years. As the lessons learned have focused in on these areas, we have found ourselves in a position of making a very easy transition.

Within our company we are conditioned to fully identify and expose our problems and concerns. We address these openly within our management organization. We discuss these openly with the public, including our customers and our share owners, the financial community, and I hope we do this also in an open way with the regulators with whom we must work.

Normally we try to apply proven technology in solving problems. However, we are strongly encouraged to be innovative when this is appropriate and solve problems perhaps on our own if nec.ssary as we deem fit, and in doing so we get strong endorsement and encouragement from our corporate officers.

I will be touching on a few examples that I think are illustrative of this. And above all we are encouraged to employ full disclosure. When the regulations related to CFR 100 Part 21 were issued, we found ourselves already operating with a procedure in place which, of course, had to be changed for our nuclear project to accommodate the specific language of Part 21. But the process and the intent of full disclosure was our normal way of practice with us.

In order to stress these points I would like to identify a number of areas where we feel that we have departed from the pack and have indulged in a fair amount of innovation and perhaps some leadership in the company in addressing and solving the specific problems.

(Slide)

We have been working continuously for several years, and in fact starting prior to the event at Three Mile Island, to analyze and as necessary and restructure our organization. We will have a presentation of the subject shortly. I would like to stress the point that this issue was a concern to us, and shortly after Three Mile Island we did move ahead aggressively with significant changes.

There was discussion earlier this morning on the quencher, which leads me into the MARK II containment program. Early on in that program, PP&L did depart on its own seeking assistance from overseas. We executed contracts with craftwork unions to apply their technology, the expertise that they had, and eventually working with them were responsible for developing the T-quencher which is currently used at Susquehanna and most other BWR MARK II plants.

We established a policy quite some time ago that we would be in compliance with 10 CFR Part 50, Appendix R, and to date we have not identified any reason that we have not met that objective. We were one of the first utilities to submit a comprehensive and complete security plan in response to the regulations that materialized several years ago, and while the hardware of that plan has not been fully installed in the field, we are making progress in that regard and we feel that the concepts contained in that plan are well-founded and not only address the regulatory requirements but go beyond the intent of those requirements in many respects.

We will be making a presentation later in the program on the advanced control room. This is the name we have applied to the control system that is installed at Susquehanna, and without preempting that presentation I would like to stress the point that the techniques applied in that concept were not developed for power plant usage and in particular power plant usage but they were developed in response to the problems demonstrated by the utility industry back in the early sixties with regard to the adequacy of power supply and the cascading blackouts that occurred in 1965 and later in 1967.

PP&L exercised a role of leadership in developing the hardware that we are now using throughout the PP&L and the Pennsylvania and New Jersey systems and have applied in many respects to Susquehanna.

MR. MOELLER: Excuse me. In discussing advanced control room, if I understood your remarks you are looking at it a little differently than I would have in reading the words. I thought you were going to talk about human factors and the studies perhaps that you have done to assure that your control room is properly designed from that standpoint.

MR. CURTIS: Yes, that is certainly an issue of concern. We will address that in our formal presentation later in today's program.

MR. MOELLER: Would you say again, then, what the principal point of your advanced control room is? How does it prevent blackouts, or did I misunderstand?

MR. CURTIS: The key element of that concept is that the operator is faced with assimilating and digesting a massive amount of information. In the 1960s our system operators, those people who operate the power system, had the same problem, and the only solution they had was a massive array of hardwired instruments.

And consequently, as digital computers became available during that time period we worked with manufacturers to develop display techniques using real time processing computer and formatting those displays in a readily available and appropriate displays for the operator so that he could at a glance know what is going on. And that is exactly the technique that is used in our control room.

MR. MOELLER: Thank you. That helps.

MR. CURTIS: Yes, sir. We will also be later talking about our simulator and how it is being used on the Susquehanna project. I would like to stress the point that that simulator has been in active and productive use for two years, and the decision to acquire that simulator was made many years ago, long before the current popularity of that technique materialized. It was an expensive and difficult decision to make at that point but we were convinced that it had to be done.

The final area is in the area of stress corrosion cracking, and again I feel that we have been in the front of the pack in terms of our involvement with the Electric Power Research Institute and with the technology not only in this country but also overseas in recognizing and taking corrective action to mitigate some of the problems experienced with the materials used in our plant.

We have made significant changes in hardware and materials and are continuing to follow the requirements and our continuing commitments to take further action in the future such as induction heating to mitigate stress problems.

I have been asked to comment briefly on the construction status, the schedule for Susquehanna, and here I would like to point out that we do have two completion dates. There is a madness behind this, or a purpose behind this madness, but we feel it is necessary.

First, we have a target construction completion date of January 1982. That is a date with no float. It is a date that is intended to drive the working organization people designing and building the plant to as early a completion as we can. At the present time we are six weeks behind that schedule.

We have a formal completion date which we identify as our fuel load date of April 1982. In other words, three months of float between construction completion date, which is a working date, and the fuel load date, which is a licensing and financially oriented date. So we are midway between those two. We still have a significant amount of work to complete. We are making major changes in hangars within the plant. This seems to be a haunting problem on every project.

We are in the process of backfitting many changes in the electrical system, some of these as a result of the commitments we have made resulting from Three Mile Island. We are about midway through our preoperational test program and it is our expectation that that program will culminate at about the end of this year.

Now, there are some specific milestones I would like to call out as a point of reference. We currently expect the testing of the control rod drive system will be completed this September. We have substantial work being done both within the vessel and within the containment wet well. That work is expected to be completed in October.

The pre-operational test program is scheduled for completion in December. We expect to complete our hangars and process the acquisition of N-stamps on our piping systems in January 1982. We have a security system that completed factory system testing last week at the contractor's shop. That system is being delivered this week. We expect it to be installed and fully tested and operational by January of next year.

And then finally, we have a date that I do not think is meaningful in this forum but it is meaningful to others, and that is a commercial operating date which is the second quarter of 1983. That date is significant from the standpoint of ratemaking. It is the date at which the capital investment for the plant can be entered into base rates, and because of that it is a very significant date from the standpoint of financing and the interests of the financial community.

In that schedule we deliberately have substantial float to make sure the budgets we are currently projecting are at least as much as what we ultimately will wind up with and hopefully more. So there is a substantial float in that schedule.

We have experienced a number of licensing milestones, and I will highlight these very briefly. Repeating what Rich Stark reported, our SER was issued in April of 1981. The supplement was issued in June of this year. We are targetting according to the staff's schedule a second supplement in August. Our prehearing conference, incidentally, is in process yesterday and today, and out of that I hope there will be a schedule for the start of hearings, which we have recommended to commence in October, early October of this year.

Back to the staff schedule, they are projecting a decision by the ASLB in May and a Commission decision in June 1982.

Briefly with regard to operator training, this will be a presentation subject later today. We have 38 operator candidates ready for licensing, and they are currently scheduled for final examination in March of 1982. That is a date we hope we can accelerate somewhat.

This completes my opening remarks. Are there any questions?

MR. MOELLER: You mentioned your experience in the nuclear field and you mentioned the homogeneous reactor. Do you operate other nuclear power plants at the present time?

MR. CURTIS: No, we do not.

MR. MOELLER: Thank you. These two units, then, will be as much as 25 percent of your total capacity when they are completed.

MR. CURTIS: Yes, right.

MR. KERR: Are there other questions of Mr. Curtis?

(No response.)

He has given us a Nuclear Department organization booklet, which has some nice pictures in it. I must say I thought that the Yankee Raiders had stopped going south until I read this.

(Laughter.)

Are you sure that Mr. Calhoun is not really named Jack C. Calhoun? It is really Jack R.?

MR. CURTIS: Jack is scheduled to be here. He will arrive shortly.

MR. KERR: I would have felt better if he had been named John C. Calhoun.

(Laughter.)

Also, I do not see anybody in this lineup that has degree in nuclear engineering. That is not a requirement, of course, but it was -- there are at least two people who have been through Navy Nuclear Power, I see, and certainly Mr. Calhoun has had --

MR. CURTIS: We will be exposing one of those people very shortly.

MR. KERR: Do you sort of mistrust people with degrees in nuclear engineering or have you gotten those people farther down in the organization?

MR. CURTIS: None of the key managers -- all of our key managers are identified in that book -- to my knowledge have a degree in nuclear engineering.

MR. KERR: I was thinking --

MR. CURTIS: Our plant superintendent does have such a degree, Kenyon, a masters.

MR. KERR: Are there other questions?

(No response.)

Thank you, Mr. Curtis.

MR. CURTIS: I would like to introduce at this time Phil Henrikson who will go through the open items list and comment on each of the items that were previously discussed by staff.

MR. KERR: If I try to follow the printed agenda, he is handling C(3) sort of, in effect.

MR. CURTIS: Yes, sir, that is correct.

MR. KERR: Okay, and you handled everything else.

MR. CURTIS: I handled all of Item C.

MR. KERR: C. Yes. Thank you.

MR. HENRIKSON: Good morning. My name is Phil Henrikson. I am Manager of Nuclear Licensing for Pennsylvania Power and Light. In general regarding the open items, we in general concur with Mr. Starks' presentation. We feel we have provided information needed to close out all of the -- a couple of these open items, and I will briefly go through and give you the current status as we see it on these open items.

First, turbine missiles. We have provided the information that has been requested by the NRC on turbine missiles. As Mr. Stark mentioned, we have a meeting scheduled on the 29th at the site to discuss any further concerns NRC might have.

(Slide)

Environmental qualification of electrical equipment. We suppl..d preliminary information in November 1980 and in April 1981 to show conformance with NUREG-0588, Category 2 requirements. We expect to be ready for an NRC audit in November of 1981.

Item 3 on steam bypass of the suppression pool --

MR. KERR: Can I ask you the same question I asked Mr. Stark? Is your equipment qualified and it is just a matter now of collecting the documentation, or are you still in the process of determining whether it is qualified?

MR. HENRIKSON: We are still in the process of determining whether all of our equipment is qualified. I would say that we could say right now with certainty that at least 80 percent of our equipment is qualified. I guess another way to look at the documentation is that some of the documents are 95 to 98 percent complete but are considered incomplete because they lack, you know, a few items of information, and we will be closing those out in the next few months.

MR. KERR: What you have to do between now and November is primarily a collection of information rather than, for e.ample, testing or whatever.

MR. HENRIKSON: Yes. We will have a presentation on this item later on this afternoon.

MR. KERR: Fine.

MR. HENRIKSON: On item 3, steam bypass of the suppression pool, the NRC has requested further information, confirmation in this area, and we have agreed to provide them with a complete transient analysis, steam bypass showing that the operator has about 30 minutes to take action for this event, and we will be providing that information in the middle of next month, the middle of August.

MR. ZUDANS: Does this relate to automatic or manual spray initiation?

MR. HENRIKSON: Yes, sir. We show the operator has about 30 minutes to take action and that would justify us using manual actuation.

MR. KERR: I thought you were going to ask a question here. I do not want to nudge you if you do not want to ask one.

MR. CATTON: Well, I understand what the problem is now: spray or no spray.

MR. ZUDANS: Automatic initiation or no.

MR. CATTON: That is correct.

MR. KERR: I thought you were going to say that before the spray could be turned on, the operator had to say, "Let us spray," but you were not going to say that.

MR. CATTON: No.

(Laughter.)

If I had thought of it, I would have.

MR. KERR: What is the difference between this and Zimmer? Does anybody know?

MR. CATTON: I am assuming we are going to hear a presentation on this.

MR. KERR: There is a man with his hand up in the background. This is just for education of Mr. Catton and me.

MR. CRIMMINS: We had not planned a presentation of the subject, but perhaps I could clarify the issue at this point. I cannot address Zimmer, but we are quite similar to LaSalle and we have two basic reasons to conclude that our transient analysis which we now have under way will successfully demonstrate that the 30-minute requirement that the staff has recently imposed will be met.

One is that a transient analysis of this nature was done on LaSalle and it established sufficient time, 30 minutes for operator action. We have have done simplified endpoint calculations which show that we have in the range of 30 minutes to accomplish this action before exceeding or reaching the design pressure of the wet well. It is just a matter of proceeding with the analyis, accomplishing the analysis in order to demonstrate this time period to the staff.

We anticipate doing this in August and we think the issue will be resolved.

MR. CATTON: If the analysis was done on LaSalle and LaSalle is the same as your plant, why does the staff have a question? Is there something else that we are missing?

MR. STARK: I do not think that the applicant has established or shown that they can accommodate 30 minutes.

MR. KERR: I don't think you understood Mr. Catton's question. He said if LaSalle has demonstrated it, why does this applicant have to redemonstrate? Wasn't that your question?

MR. CATTON: Yes, as far as I can tell the suppression pool is the same and the plant size is the size.

MR. TEDESCO: The plants are identical in all respects with regard to certain parameters, and they have endorsed completely what LaSalle is doing. Then I would have to agree with you, but apparently that is not the case. I think we have to wait until the reviewer gets here to tell you why.

MR. CATTON: Okay.

MR. TEDESCO: I have to say yes, it is a very logical thing. There must be something else in there.

MR. CATTON: I guess we're going to hear what the something else is later.

MR. KERR: Thank you, Mr. Crimmins.

MR. HENRIKSON: Item 4 on the additional justification required for T-quencher loads, we have submitted calculations using loads acceptable to the NRC, and this item is closed out.

Item 5 on review of submerged dragloads, we will provide, as Mr. Stark mentioned, sensitivity studies for appropriate values of the hydrodynamic mass constant.

MR. KERR: Do you know what hydrodynamic mass constant is?

MR. CATTON: I have read the GE document so I could guess.

MR. KERR: Okay, please continue.

MR. HENRIKSON: On IE Bulletin 7927, we have been working on this item and we so far have identified the group of instrumentation and controls that would be lost as a result of a degraded bus condition. We are in the process of identifying the buses needed to respond to emergency conditions. We are also in the process of providing a schedule to provide procedures in operator training necessary to address these conditions.

We will comply with the requirements of Bulletin 7927. And IE Bulletin 8006, the NRC has requested explicit rationale or justification for not modifying some of our valves on emergency safety features reset controls. Part of that justification will be that the containment isolation valve for these containment isolation valves, the operator has to take deliberate action to reset these valves. And the letter we sent to the NRC did not make that clear, so we will be making another submittal making the justification more clear and pointing that out.

MR. KERR: You mean you just did not say that in the letter, or you did not say it in words which the NRC staff understood?

MR. HENRIKSON: Maybe we did not say enough in the letter. We will provide that to formally document what we had discussed.

MR. KERR: Okay.

MR. HENRIKSON: On fire review of the ultimate safe shutdown system, I might add that we will be making a presentation later on in the agenda on this item.

MR. LIPINSKI: On this item you have the word fire in there. The staff does not have this limited to fire review.

MR. HENRIKSON: This is a little bit -- I guess I could speak a little bit for the NRC here. This is really the group of the NRC that is responsible for the safe shutdown panel and has to give their approval of our arrangement. Part of that has to do with fire protection. As far as the fire protection people of the NRC are concerned we understand that they have accepted our fire protection.

MR. LIPINSKI: The discussion we heard earlier goes farther than the fire review. It is the question of using jumpers in redundancy.

MR. HENRIKSON: That has to do with general design criterion 19, and we are currently evaluating NRC comments and we intend to comply with the general design criterion 19. We will put in hard wire with interlocks or whatever is necessary. So hopefully, we will not have to use jumpers or rewiring.

MR. KERR: Have you told the NRC yet, or is this the first time they know that?

MR. HENRIKSON: We have told them that in meetings, yes. It has not been more formal than that.

Concerning the requirements for the safe shutdown panel concerning Appendix K, 10 CFR 50 Appendix K, we also intend to comply with the NRC criteria. The NRC has found that we meet the requirements of Appendix R.

MR. KERR: There are two items here which refer to a date of next action on the part of the applicant. In at least the slide that Mr. Stark used, it says the date of next action is August 14. That is awfully close to the ACRS meeting. Do you suppose it would be possible for you to have that information into the staff in time so that maybe those issues would be resolved by the time of the ACRS meeting?

MR. HENRIKSON: We would hope -- that is a goal. I don't know whether we can get to the staff in time for them to reach a conclusion or not.

MR. KERR: But you will try to get it to the staff in time so that if they are fast conclusion reachers, they could?

MR. HENRIKSON: That is one of our goals, yes, sir. Concerning the modification of the automatic depressurization system logic, we intend to meet the NRC criteria for automatic ADS upon pipebreak outside the containment, and we anticipate implementation during our first refueling outage.

Item 9 on providing common reference load for the vessel -- .

MR. KERR: Excuse me. Again, maybe I should have asked Mr. Stark, but I will ask the two of you, on his slide it showed the next move up to the applicant, and the date of the next action was sometime late in the year, the fourth quarter. What does one have to do that takes that long? If you were going to meet -- I'm missing something. Are you telling me that you're going to meet the requirements or you are going to meet part of their requirements, and you are still studying it, or what?

MR. HENRIKSON: The NRC has offered several alternatives to meet this requirement, like a timer on the ADS or an interlock on the HPS and HCIC, and we have been evaluating that and doing the analysis. We do not feel that we're ready right now to make a major decision until we know what the consequences are.

MR. KERR: How many alternatives has the NRC offered? Two, three?

MR. HENRIKSON: Those two that I said.

MR. KERR: Are you ready to commit to one of them? You are not sure which one? You are not sure you will commit to either one?

MR. CRIMMINS: Sir, the BWR owners group with GE's assistance did an evaluation of what might be done to correct this situation. It is a fairly fundamental change to the BWR protection system logic to actuate ADS on less than the coincidence of high dry well pressure and low water level, which has been the historical actuation system.

There are a number of possible modifications which would allow for automatic depressurization on breaks that do not result in a high dry well pressure, and that is really the problem we are trying to get around.

The difficulty in commiting to one -- as I say, there are several options that were developed at the BWR owners group, and the difficulty in committing to them is that this actuation needs to be considered with respect to a number of other normal operating situations, and other transient situations which, in those cases, the change might be detrimental. And we feel that we want to really spend the time and understand what the significance of this fundamental change to the control circuitry is.

MR. KERR: I cert ıly agree with you that this is fairly fundmental. What I was trying to find out was whether you think that eventually you will commit to one or the other of the two options, or whether you have not decided yet whether you think it is wise to commit to either one of those.

MR. CRIMMINS: Sir, I think our position is that we recognize the objective that the NRC is trying to achieve, and we are not in opposition to that. That there is a logic here that says that ADS ought to be automatically initiated on these breaks.

The concern is that we not opt for one without understanding the full implications of it. So, whether we pick one of the available options now or manage to engineer it in some other way, we are heading in the direction of satisfying the intent of the NRC's requirement. We just do not know the specific design right now. We need time to analyze it and figure it out.

MR. KERR: And you are not, at this point, certain that it is wise in your view to commit to either of the two options? You understand the spirit of the requirement; you are in sympathy with the spirit, but you want to know what you are doing before you commit.

MR. CRIMMINS: Precisely.

MR KERR: Thank you.

MR. HENRIKSON: Item 9 on providing common reference level for vessel level instrumentation, we will meet the NRC requirement here. We would use a reference as instrument zero. There are several definitions for level zero. It can be the steam level skirt which is about 160 inches above the active fuel. Another way to say that is it about 35 inches below the normal operating level. All of our indicators will use that same reference point.

MR. CATTON: What is your position on the incore thermocouples?

MR. HENRIKSON: We will talk about that in a presentation later on today.

MR. CATTON: Fine.

MR. HENRIKSON: Briefly, we don't feel there is enough information to make a firm commitment as to what should be done right now.

MR. CATTON: I can wait.

MR. HENRIKSON: On emergency preparedness, on upgrading the emergency preparedness, we responded to the NRC concerns in a letter dated July 21. Hopefully, we should resolve all those concerns.

MR. KERR: That is the emergency preparedness as contrasted with upgraded, or is the upgrade to which you responded?

MR. HENRIKSON: Well, the NRC reviewed our emergency plan and upon their review they had comments and suggestions. I guess there were 11 action items they required us to act on, and we documented our action as required by NRC in this response.

MR. KERR: So you have made a response to upgrade preparedness, upgrade support facilities and long-term emergency preparedness; all of those?

MR. HENRIKSON: We are just talking about upgrading emergency preparedness first. Upgrading the emergency support facilities. We have provided in our May submittal of our Appendix I to our emergency plan the design of our emergency support facilities. We are awaiting NRC comment on that submittal.

MR. KERR: What is the significance of upgrade? Is that a generic term?

MR. HENRIKSON: That is kind of a generic term.

MR. KERR: Emergency support facilities; they are all upgraded, or does it have to be upgraded or what?

MR. HENRIKSON: Upgrade to me means it is upgraded to the new TMI requirements in the NUREG's. We feel we have met the requirements. It is not good terminology.

We also provided a letter to the NRC in April for our schedule for making these facilities operational. On our long-term emergency preparedness we submitted in June a letter of documentation addressing the NRC concerns, and we are waiting for NRC comments.

MR. KERR: Let's see, from the staff's slide I cannot tell who they think the next move is up to, because they have something called applicant/staff. What does it mean?

MR. STARK: I guess what I want to indicate here is that the staff defines that as the 11 items that we have, plus the discussions that we got into before on the need for an additional met tower. So what we have right now is more of a discussion between the applicant and the staff on what the plan is, or what plan we have.

MR. KERR: In your view, is there somebody who is responsible for the next move, or is that unclear?

MR. STARK: In the area of emergency planning, there are a number of people that get involved in it. And what we have been trying to do, we have been trying to meet on a regular basis right now the emergency planning in addition to the NRC and the applicant, also involves FEMA and TEMA, and we have tried to combine as many of those hearings as we can in the last few weeks, also in the future, to complete our review of the whole emergency planning area.

MR. KERR: I think that was a very good answer to a question I did not ask. But let me ask the question again. To whom is the next move up to, or something like that?

MR. STARK: I guess we would like to review the 11 questions, the response to the 11 questions, which the applicant indicated was sent on the 21st, which as of yesterday I have not seen yet.

MR. KERR: Okay, I would interpret that comment to mean that the next move is up to the staff.

MR. STARK: That is probably correct, if the applicant has submitted its response.

MR. KERR: Thank you.

MR. HENRIKSON: Some on the heavy loads generic letter, we have responded. Our first response to NUREG-0612 was made in June. Our final response, as required by that letter, will be made in September on schedule.

The NRC has identified no concerns on the submittals we have currently made.

MR. KERR: What does it take two responses to take care of heavy loads? Are they heavy enough that you cannot handle them?

(Laughter.)

MR. HENRIKSON: The NRC generic letters requires a tremendous amount of information and they realized that when they wrote the letter, so they said provide this information in this amount of time, and the rest of the information in that amount of time.

MR. KERR: So the heavy refers to the letter, not the loads.

MR. HENRIKSON: Yes.

(Laughter.)

On the generic response on the scram discharge volume generic letter, we feel the General Electric response is applicable to Susquehanna, and we are currently underway to make it a plant-specific analysis, and we will probably have to modify that and provide input to the new criteria that NRC is coming out with.

MR. KERR: Thank you.

MR. CATTON: On the last item, I asked earlier about whether or not general design criterion 31 was going to be met for the scram discharge system. The staff indicated that you would answer that question. That is, fracture prevention of reactor coolant pressure boundary.

MR. HENRIKSON: Let us work on that and we will see if we can report back in a couple of hours.

MR. CATTON: Okay, thank you.

MR. KERR: You know what the answer has to be.

MR. CATTON: I just want to hear them say it.

(Laughter.)

MR. LIPINSKI: We will hear more on the subject for Item I? It is on the second page of our agenda.

MR. KERR: Yes, that is when we get to full load. Other questions of Mr. Henrikson? I see no questions, and my agenda calls for a break at 10:10. And how is that for being on time?

MR. CURTIS: Dr. Kerr, I wonder if I could quickly disposition a question that came up a short time ago by introducing Jack Calhoun to my right, Senior Vice President, Nuclear PP&L, and at this point in time, I confess I am reluctant to identify his middle initial.

MR. KERR: Okay. Welcome, Mr. Calhoun. A ten-minute break.

(A short recess was taken.)

MR. KERR: The next item is management structure and technical resources, compliance with NUREG-0731, and so forth.

MR. KENYON: Good morning, my name is Bruce Kenyon, Vice President, Operations, Pennsylvania Power & Light Company. The purpose of my presentation is to briefly describe our nuclear organization and its staffing assembled by this company to properly manage our nuclear activities.

Our organization does comply with the essential requirements of NUREG-0731, and this is true, even though our organization was developed prior to our receipt of this document.

(Slide.)

Consequently, and in the interest of brevity, I intend to concentrate on those areas of our organizations which are unique, innovative, which serve to demonstrate those areas where we have gone beyond the basic requirements, and in so doing, I plan to demonstrate PP&L's management philosophy, commitment, competence to properly operate our nuclear activities. I believe these attributes should be of interest to the ACRS.

(Slide.)

Prior to Three Mile Island we had a rather traditional approach to our nuclear organization. Nuclear engineering was part of fossile engineeing, and nuclear fuels was part of fossile fuels, and so forth. We were concerned that this approach might not be sufficient to do the job.

Immediately following the Three Mile accident, we formed a number of assessment committees, PP&L assessment committees. We wanted to do our own assessments specific to our nuclear project. We wanted these to be very timely assessments so we could take whatever lessons would come out of that and apply them properly.

The members of these committees were mostly personnel who are not part of the project. Many were from within the company who had appropriate areas of expertise. We also had many who were from the outside, outside the company.

The areas assessed -- or the various committees, if you will, were design, organization and staffing, radiation monitoring, emergency plans and communications. In the area of emergency plans we also had an emergency planning advisory committee which was constituted of community leaders, leaders from the communities surrounding the plant, and this demonstrates an important PP&L objective mentioned by Mr. Curtis previously; and that is, we are a very open, responsible company, very concerned about dealing with the issues that are of interest to the public.

One result of these various assessments -- and I will mention several more as I go through this presentation -- was that we concluded it was necessary to reorganize the company, and we did this by taking the four traditional departments within the company and increasing it by one to five to form a nuclear department.

(Slide.)

This slide shows our corporate management organization. The boxes outlined in blue represent those top officers of the company who are members of our corporate management committee, or CMC. CMC is the highest decision-making policy-setting group within the company. They meet weekly to discuss a variety of the issues and interests.

The point that you should note is that our senior vice president, nuclear who heads the nuclear department, is a member of the Corporate Management Committee. You should also note a rather unique position; a special assistant to the president, Susquehanna. This is an individual located in Burwick, which is a community nearby the plant.

This individual reports directly to the president, as is indicated on the chart. He serves as a communication link between the president of our company and the community, serving to address concerns regarding nuclear power, our Susquehanna project and PP&L in general. We found that this rather unique position has been very instrumental in the generally good acceptance we have in the surrounding communities regarding our project. This was another result of our post-TMI assessments.

(Slide.)

This slide shows the nuclear department organization.

MR. KERR: Is your president someone with an engineering background, business background, law or what?

MR. KENYON: He has a degree in mechanical engineering, a Master's in mechanical engineering, an MBA and a Doctor of Jurisprudence.

MR. KERR: You are kidding.

(Laughter.)

MR. KENYON: No, sir. The nuclear organization headed by the senior vice president, nuclear. This senior vice president has the singular responsibility within the company for the proper management of our nuclear activities. For emphasis, the red line on the chart shows the chain of command to the plant superintendent.

(Slide.)

I would like to describe this organization beginning with the nuclear operations portion. As Vice President, Nuclear Operations, I am responsible for the startup operation and maintenance of our Susquehanna units, plus providing certain support functions. Reporting to me are five functional areas; an administrative areas which provides administrative services to the entire department including records management and those personnel policies and programs which are unique to nuclear. A support services area which provides a variety of support functions in support of operation, maintenance, health physics, emergency planning, and our environmental programs which are unique to Susquehanna.

We have a training organization and I would like to pause on that organization to discuss some highlights or some accomplishments in that area.

(Slide.)

Previously, our training functions were scattered over several groups within our nuclear activities. Following our assessments, we pulled the various training functions together into one organization. This creates a very solid, integrated approach to our training activities, and this organization does provide training services for the entire department. It is located onsite but it services the entire department. We elevated the reporting relationship such that the head of this organization reports to a vice president, myself. This is commensurate with the level of importance that we place on this function.

The various groups within the training organization are headed by nuclear-experienced individuals, we did create a managerial level position on top of this, and we staffed that position after an extensive search with an individual who has a Ph.D. in industrial education. We feel that this has been a very important change in strategy on our part, and we are very pleased with what is happening in this area as a result of that change.

Our training approach is a very comprehensive approach. We have identified training requirements that we must meet prior to fuel load for the entire organization; the vice president on down to technician -- and this includes 61,000 hours of training other than licensed operator training.

As was mentioned previously, we committed in 1976 to build a plant-specific simulator. We did this not because it was required at the time, but because we felt it was crucial to the proper development of a highly competent operator. This has been operational since the fall of 1979. It has been very valuable to us, not just in training operators, but in other ways which will be mentioned in a subsequent presentation.

MR. CATTON: Is there any tie between your nuclear training organization and Safety Review Boards and so forth for the plant?

MR. KENYON: We did not initially put the manager of nuclear training on the Safety Review Board. This is something, though, that has come up recently and we are reconsidering that position.

At present, no, but we are re-thinking that.

MR. CATTON: I think it is a good idea and I'm glad to hear you are reconsidering it.

MR. LIPINSKI: On the simulator, you have the advance control room. Is there a relationship between the advance control room and the simulator?

MR. KENYON: The simulator duplicates the advance control room.

MR. LIPINSKI: How does this relate to Black Fox? I thought Black Fox had the advance control room/simulator setup.

MR. KENYON: The advance control room -- the Black Fox simulator is a BWR-6 simulator. It is the GE's advance control room. Our advance control room was the prototype advance control room. GE has done certain things that are different than what we have done, and thus, the two simulators, as are the tw control rooms, they are different.

MR. LIPINSKI: Okay, we will hear about this later in the next presentation.

(Slide.)

MR. KENYON: We have the plant organization. Mr. Harold Keiser, the plant superintendent, will follow me to describe the plant organization. We also have a fuels organization which is responsible for the procurement, analysis and disposition of the fuel.

(Slide.)

Our engineering and construction organization is headed by Mr. Curtis, Vice President, Engineering and Construction, Nuclear, in addition to those personnel involved in constructing the project. And in project management, Mr. Curtis has three functional areas reporting to him; licensing, with traditional responsibilities, engineering, Mr. Crimmins, and that includes a safety analysis function, and also, a planning and controls organization which develops department-wide schedules, cost tracking and analysis, those types of functions.

Also reporting to the senior vice president is our quality assurance organization. This includes both QA and QC. We made the decision sometime back to take the plant quality organization out of the plant and have it report directly to the home office organization. This organization thus has people both onsite and at the home office. We made that separation to improve the independence and level of credibility.

Another unique feature of our organization is a safety assessment group. I contrast the function of this group with the function of quality assurance, which basically confirms that we are following our programs, following our procedures. Safety assessment has the fundamental challenge of probing, testing, questioning, what-iffing. Is what we are doing good enough? Never mind if it meets the requirements.

The creation of this organization was something we did, again, as a result of our assessments and we did this prior to the NRC identifying the independent safety engineering group, which we are using this organization to meet. We believe that our approach here is perhaps more encompassing in that the charter for this organization involves assessing both onsite and home office activities. And we will, through some mechanism, give this group the capability of running drills.

You can test certain things with a simulator. I am not talking about the traditional drills of emergency planning and so on, but there are a lot of other things that we feel you really need to do to know whether or not that operating crew is really on its toes and ready to handle whatever might be around the corner.

(Slide.)

MR. KERR: Is somebody later going to talk about the shift technical advisor position? My question is, how does he relate to this nuclear safety assessment group, if there is a relationship? If that is going to be answered later on, why -- .

MR. KENYON: It will be answered later on. A later presentation will show you how the shift technical advisor fits into the organization. The shift technical advisor is not part of the safety assessment group.

MR. KERR: Does he have some sort of working relationship or communication with them?

MR. KENYON: Yes.

MR. KERR: And somebody will say something about that?

MR. KENYON: Yes.

MR. KERR: Do you have a non-nuclear QA organization for your non-nuclear plants?

MR. KENYON: We have a quality assurance organization that is not really involved in our fossile plants, but it is involved in some of our [illegible]er activities within PP&L. For example, our transmission [illegible]d distribution. I think Mr. Curtis is more familiar with that. Can you address that?

MR. CURTIS: We do not have a formal program or formal organization to handle non-nuclear construction or operating features of our company. We do have a formal organization though that is charged with monitoring our compliance with regulations in the environmental area. And the structure of that organization, the techniques that are employed by them, are pretty much paralleled from our nuclear program.

MR. KERR: I raise the question because I assume that you do try to achieve some level of quality in your non-nuclear organization, and I wonder how you can achieve it without a QA organization since it seems to be necessary in the nuclear area.

[illegible] wonder, it must be that either you have worked out a way of achieving quality without a QA organization in the non-nuclear area or -- .

MR. CURTIS: Yes.

MR. KERR: This has nothing to do with regulations; I am just trying to learn how one achieves quality.

MR. CURTIS: I understand. We have not been involved in the building of a fossile plant for a good many years. The last plant we built went into service about

1974, as I recall. And at that point, of course, we and the industry were really just settling down with regard to nuclear quality assurance programs.

Our techniques at that time were to use dedicated people and organizations to seek quality, but not in a formalized, structured sense that we are used to in the nuclear business. The end result was probably adequate for the time period, but it certainly was not the rigid kind of a programmatic approach that we would do now if we were to set up another fossile project. We have no formalized program, to my knowledge, in the area of fossile operations.

MR. KERR: Do you think it would improve the quality of the fossile operation if you did have a formal structure?

MR. CURTIS: I believe the results we have been achieving from the operation of our fossile plants would indicate that it would not. Our track record in the eastern part of the United States has been excellent. The operating availability of our fossile plants has been among the best in the country, and I would question whether or not the super-imposition of a formalized organization and the costs that go with that would serve any real purpose.

If we were to embark on the construction of a new power plant, I would advocate a modified program.

MR. KERR: Thank you.

MR. KENYON: Let me expand on that answer. There are a number of ways of doing business that are required in the nuclear world and we do see considerable potential for spinoff, perhaps not the total program, perhaps just certain segments of it, into the rest of the company. And as we shake out these programs within nuclear, it is our intention to make those visible to the rest of the company and take the good parts, but not necessarily the not so good parts, and apply them where we think there is benefit.

(Slide.)

Reporting to the senior vice president are several committees. The Susquehanna review committee is the traditional offsite review committee, but there are two other committees which we believe are unique to PP&L. One is a radiation advisory committee. The purpose of this committee is to give our managemet additional expertise and advise regarding low-level occupational radiation exposure.

This is staffed by people entirely from outsid the company, two physicians and two health physicists, and these are individuals of considerable reputations. I would like to simply give you a feeling of the stature of this committee and mention who they are. Dr. Russell Morganis a renowned radiologist and former dean of Johns Hopkins. Dr. Bond is the associate director of Brookhaven National

Laboratories and a distinguished radiobiologist with a long history of involvement in radioactive protection standards. Dr. LaMar is chairman of the department of radiation planning, Polytechnic Institute of New York. He has a long association with radiological health problems. The final member is Dr. Carl Morgan, formerly associated with Oak Ridge National Laboratory. He has been the Kneeley Professor at Georg.a Institute of Technology and he is famed with his work with national and international bodies responsible for the setting of radiation standards.

We are in the process of constituting our environmental advisory committee with a similar purpose, to advise us whether or not we are doing all that we should be doing, beyond the basic question of whether or not we are complying with standards. And we will constitute that committee with individuals of similar stature.

MR. KERR: Will the committee meet on some regular basis or when you call them together?

MR. KENYON: The committee meets quarterly.

MR. KERR: Does the committee have some kind of supporting staff in the interim that keeps up what they should be doing and making certain their recommendations are carried out? What sort of inputting mechanism is there to make certain that the committee recommendations get into the organization?

MR. KENYON: Let me move to the next slide.

(Slide.)

The committee reports to -- really, reports to our corporate management committee through the senior vice president, nuclear. Thus as the committee issues reports or recommendations they are made visible to our corporate management committee, and of course the senior vice president, nuclear, is a member of that.

We have staff people working with the radiation advisory committee, indicating to them issues that we suggest they look at, as well as whatever else that they might want to look at. Thus we have focused on the senior vice president those organizations, committees, for reviewing, advising, checking, testing, critiquing, our nuclear activities.

I have mentioned these two rather unique committees. This is the assessment group I have mentioned. It does send its reports directly to the corporate management committee.

MR. KERR: The nuclear safety assessment group is people, inside people, is it not?

MR. KENYON: Yes, it is.

MR. KERR: Okay.

MR. KENYON: Although our approach here is to have a core group of inside people, and recognizing that they might not have all the expertise that we would want them to have to pursue a certain area, they are empowered to go out and get consultants or whatever if they want to trace a particular area further than they feel they can comfortable do with their expertise.

The Susquehanna review committee, which is the traditional one, and also the plant review committee.

MR. KERR: I guess I do not know enough about what is traditional to know. Does that have outside people on it?

MR. KENYON: The Susquehanna review committee will have outside people. The plant operations review committee is an advisory committee to the plant superintendent, and it is staffed with key plant personnel.

MR. MOELLER: To follow up a little bit on this radiation advisory committee and some of the implications of it, in your -- in the data that you provided to the staff -- and I ask this here because I do not see it elsewhere on the agenda -- you have projected an annual collective dose of about 740 -- 737, to be specific, personrem when this plant is in full operation. And the staff said that this estimate is consistent with current average experience.

I wondered -- I wanted to quiz you or whoever the right person might be a little bit on this, because why isn't your plant -- why doesn't your plant have a goal of doing better than the current average experience? Because your plant in the design of the various radiation protection features is supposed to have had the benefit of newer thinking that the older plants did not.

MR. KENYON: We do have an ALARA review program and that is what we submit as a nominal number. That does not mean that that is our goal. Our goal would be to do better than that. I do not have a number personally that indicates what that is.

We do have an ALARA review committee that is empowered or has the function to assess how we are doing and to set goals.

MR. MOELLER: Have they set a goal?

MR. KENYON: No, they have not.

MR. KERR: That is another committee.

MR. KENYON: Well, we have incorporated that into the Susquehanna review committee. So we are asking -- previously we had a separate committee. We incorporated that function in here, and thus through a subcommittee of this group they will annually assess how we are doing in terms of looking backwards and also set goals for what our expectations should be for the next year.

MR. MOELLER: Well, if you look at the recent experience, say the last five years or so of the commercial nuclear industry in the United States, you will find that the collective doses at the operating plants have been consistently increasing each year.

Now, your biographical data shows that you spent five years or so in the nuclear navy, and if you look at the nuclear navy's collective doses per operating unit you will find that there has been a consistent decrease. In other words, they are showing progress, they are showing reduced collective doses each year.

Are you familiar with any of the work in the navy that resulted in the reduction of their doses?

MR. KENYON: Not at this point, no. Obviously I knew what they were doing when I was in the navy. I have been out eleven years now.

MR. MOELLER: Do you have any people on the staff that would be -- on your staff that would be familiar with this experience or with, for example, the Canadian experience or the British experience, where they are showing consistently an improvement in the collective doses each year? Do you have anyone that is familiar with or studying that experience and hopefully trying to incorporate it into your facilities?

MR. CANTONE: My name is Stephen Cantone, manager -- I am not personally familiar with the work done by the navy, but getting back to your original question about why are we not doing better than that industry average, we are really faced with some conflicting problems and information. In one case, as you point out, we have gained from past experience and have offset some of the radiation doses experienced by the older plants.

By the same token, we are faced with many more requirements to implement, particularly the in-service inspection areas, than the older plants were faced with. For the sake of argument, we are doing ISI all class 1, 2 and 3 code components, which is conceivably more than the older plants. So the two tend to offset each other. And by maintaining a relatively constant value, that in reality is an improvement.

MR. MOELLER: Thank you.

Let me ask quickly the staff, because in your SER on page 12-7, or in fact 12-8, you state that since 737 personrem is consistent with current average experience it is therefore acceptable. Now, did you really mean to say that, or would you agree that they should always be trying to achieve a goal that is better than current average experience?

MR. STARK: I do not think I have the right person to answer that question now. I would like to perhaps defer it if I can and see if I can get that answer for you.

MR. KERR: It seems to me from the way the question was asked the answer is obvious.

(Laughter.)

MR. KERR: But maybe not.

MR. MOELLER: Let me ask the applicant one other question. Several members of the ACRS and its consultants visited with the Canadians a month or two ago, and they stated that some of the reasons they are able to bring their collective doses down is because they staff their plants with more people than we do and they devote more attention to maintenance, preventive maintenance so that they do not have breakdowns and do not have repairs and associated high doses.

Have you looked at your staffing to see if it is optimum from the standpoint of maintaining minimum collective doses?

MR. KENYON: We have looked at our staffing from the standpoint of whether or not we have a clearly sufficient number of people to do the job properly. We have also looked at our operation from the point of view that we do not want breakdowns. We want to have a very good preventive maintenance program.

I think this kind of look is something that for us is an iterative process. We have looked at it several times and we have made adjustments on that basis. I do not think we are through adjusting it.

Our clear intention is not to just have some minimum number of people that are all thrown into the radiation areas and consequently you run up a considerable number of exposures. So that is one of the criteria we consider in sizing the organization.

MR. MOELLER: How much will you depend upon contractors for operations, particularly at refueling and so forth?

MR. KENYON: A lot less than is typical. If I can move on one or two slides, I will show you how we do that.

MR. MOELLER: Fine, go ahead.

MR. KENYON: Okay.

(Slide.)

Just in a way of a quick review, we, as far as our organization goes, we have established a nuclear department with a singular purpose, to properly operate and maintain the Susquehanna units, and we are not distracted by other responsibilities. We have set up an organization with clear responsibilities and authority. It is logical, well-conceived, and we are embarked upon an effort to develop an effective procedure program. We feel that good procedures at the department level are essential to ensure efficient, proper and consistent actions in response to a variety of circumstances.

The proper performance of any organization is dependent in part on good communications, vertically, horizontally, and externally. I have mentioned that our senior vice president is a member of the corporate management committee. This is an opportunity for him on a weekly basis to update the president and others.

Mr. Curtis and myself make a presentation roughly monthly to the corporate management committee, and also on about that same frequency to the board of directors. This verbal presentation supplements a written report, and obviously is in addition to a variety of status meetings and so forth.

In terms of horizontal communication, we feel it is very important that the organization as a whole understand major developments, significant activities. They have got -- the various parts of the organization have to understand how everything fits together and what is going on.

We have a variety of approaches to that, but one that is somewhat unique is a four to six-page newsletter that we issue every two weeks to try and keep -- and I think do a very good job -- of keeping the organization up to date on what is happening.

In terms of external communication, our objective is to be very open and forthright and very prompt. And two examples that I have mentioned previously are the special office of the president, which is a rather unique approach, and also the emergency planning advisory committee, where we involve community leaders in our decisionmaking process regarding how to upgrade the emergency plan.

(Slide.)

We are very proud of the management team that we have assembled to operate our nuclear facilities. At the beginning of the meeting you were given a booklet which highlights the backgrounds of our key people. This slide summarizes that to some extent.

Our nuclear department is headed by Mr. Calhoun, senior vice president. He is the former director of nuclear power at TVA and has 21 years of nuclear experience. Our safety assessment manager also has 21 years of nuclear experience, part of which was being commanding officer of a nuclear submarine. Our quality assurance officer also has 21 years of experience, ranging from AEC to architect-engineer and ultimately with the utility.

I have had 16 years of experience. I qualified on five different nuclear plants. I have senior license on both BWR and pressurized water reactors. Mr. Curtis has 19 years, dating back to our initial project with Westinghouse.

I do want to highlight just one or two more. You see our nuclear administration manager only has two years. That is a little misleading. He has 24 years of personnel and management experience as a former colonel in the air force. Also note that our training manager has zero nuclear experience. He has been with us a relatively short period of time. But this is the individual I highlighted has a Ph.D. and has strong nuclear experience right under him.

We have a plant superintendent with 18 years experience. He has a bachelor's in metalurgical engineering and a master's in nuclear engineering. Other backgrounds are indicated in the booklet.

I just want to make one point in this area, and that is as a utility about to operate our first nuclear facility I think we are somewhat unique to have three former plant superintendents in the home office: Mr. Calhoun, myself, also Mr. Cantone.

(Slide.)

In terms of manpower, this slide shows the number of personnel in each functional area as of May. Note that the plant staff has 395 people, engineering 81, for a total of 732.

Moving on to the next slide, this we feel is good for where we are.

(Slide.)

By the end of '82 we want to be totally staffed and we are looking at a total of 881. That is what is presently budgeted. I think as we continue to look at requirements in the changing world we are in, by the time we get to this point in time we will be over 900.

(Slide.)

This would be a good point to mention that this shows a plant organization of 531, which includes our security people. PP&F has one other other very relatively unique operation, and that is we have roughly a 1,000-man construction department. This construction department builds facilities, transmission lines. But it expends over half its man-hours in maintenance activities at our fossil plants or capital projects at our fossil plants.

This has proven to be an extremely valuable resource to the company. Our intention is to -- and we are basically there now. They have 75 to 100 people at Susquehanna on a year-round basis. And then when we come to a refueling outage, from this construction department that is very experienced in doing the kinds of things we need to do we should be able to gear up to 300 or 400 during an outage.

Now, that will not totally handle all outages, all types of work that we do in an outage, but it should put us in a position where we are much, much less reliant on outside contractors, and we do feel this is to our benefit.

(Slide.)

We also believe our experience level is very good. I will mention, though, that another action as a result of our TMI assessment was a conclusion that the experience levels, training levels that we had immediately following TMI were just not good enough and we needed to do more. Consequently, we embarked on a very energetic recruiting program -- you can see the results of some of that in the pamphlet -- where we brought in people from the senior vice president on down to technicians.

(Slide.)

MR. MOELLER: Excuse me. Did the 881 include the full-time construction people?

MR. KENYON: No, it did not.

MR. MOELLER: It did not?

MR. KENYON: It did not.

In summary, in terms of organization, we have established a nuclear department that is dedicated to the proper operation and maintenance of our nuclear facility. This grew out of a concern we had prior to Three Mile Island as to whether or not our approach was adequate. But then following our assessments we concluded we had to change.

We have extensive top management involvement in our activities and are very committed to what is going on at Susquehanna. I mentioned the CMC meetings, the monthly board meetings. Annually the board goes to Susquehanna, to meet. And I think the point that our senior vice president is part of the corporate management committee is very noteworthy.

We have established a strong review and assessment function. I mentioned quality assurance as being very independent and reporting to the senior vice president. The safety assessment group has a rather unique approach. Our radiation advisory committee, our environmental advisory committee; in addition to the traditional approaches, these demonstrate a very strong review and assessment function.

We are proud of the management team in terms of staffing, experience levels, and we feel we have taken a number of very innovative actions to get to our present point. I mentioned the TMI committee. We have talked about our approach to training, our simulator. The advanced control room has been mentioned briefly. There will be a presentation on that later. But as a former operator I give you my personal comment that this represents a major step forward.

We talked about communications and some of the innovative things we are doing there, and there will be other examples as we go through subsequent presentations.

Our goal is to be one of the best-run nuclear organizations in the country. We feel that this translates into a very safe operation and also an operation with high availability. Our large fossil plants have been typically the best in our interconnection in terms of forced outage rates or availability. In terms of heat rate, they are among the top in the nation. Over time we expect nothing less from our nuclear facilities.

If there are no questions, I would like to introduce Mr. Harold Keiser, our plant superintendent, who will review the plant organization.

MR. KERR: Are there questions of Mr. Kenyon?

(No response.)

Thank you, Mr. Kenyon.

MR. KEISER: Good morning. My name is Harry Keiser. I am superintendent of the plant for the Pennsylvania Power & Light Company at Susquehanna Steam Electric Station.

The purpose of my presentation is to outline the station organization and briefly describe the functions of its various sections.

(Slide.)

This hopefully identifies those individuals who report directly to the superintendent of plant. They are the integrated startup group supervisor, the plant fire and safety specialist, security supervisor, personnel and administrative supervisor, a staff assistant, and the assistant station superintendent.

Assisting the superintendent of plant in the performance of his duties are the nuclear quality assurance and quality control organizations and the nuclear safety assessment group. While these organizations report to managers located in Allentown, they have direct lines of access and communication to myself.

(Slide.)

This next overlay shows reporting to the assistant plant superintendent are the supervisor of operations, the technical supervisor, instrument control supervisor, supervisor of maintenance, health physics supervisor, and the Unit 1 coordinator.

(Slide.)

This overlay identifies the plant organization with responsibilities and present and projected staffing. The administration section, headed by the personnel administrative supervisor, is responsible for traditional personnel administration, procurement, warehousing, document control, and clerical support. Its present complement is 37 individuals.

The security section, headed by the security supervisor, is responsible for implementation of the station security program. There are presently 82 permanent individuals in the security section. I would like to point out that the permanent security personnel are all Pennsylvania Power & Light employees. They are not contract employees.

The average age of our security officer is 20 years of age and 73 percent of our security officers hold a college degree.

MR. ZUDANS: Average 20 years of age?

MR. KEISER: 27, 2-7. 64 percent of these individuals hold a bachelor's degree and nine percent hold associate degrees. A majority of the degrees are in the criminal justice area.

As you can see, our security section is composed of security officers who are basically young, they are well educated, and they are well motivated individuals. We are extremely pleased and proud of the quality and the ability of our security section. And this is but one more bit of evidence that reflects the management philosophy, commitment and confidence of Pennsylvania Power & Lighting in carrying out its nuclear responsibilities.

The integrated startup group is comprised of 27 full-time Pennsylvania Power & Light employees. This group is responsible for the preoperational checkout, testing, startup activities of both units. The group is comprised of Bechtel employees, General Electric employees and other contract employees, and the total group numbers approximately 100 individuals. But of these presently there are 27 Pennsylvania Power & Light employees there.

Reporting to the assistant superintendent is the operations section, which is responsible for the plant system and equipment and plant operations. It is presently comprised of 73 individuals. The operations section is staffed for a six-shift rotation. At present this group is heavily involved in our preoperational startup activities.

I would like to point out that the reactor control operators were formed as a group back in 1976, and since the fall of 1978 they have been on shift performing their duties.

The maintenance section is comprised of mechanical and electrical maintenance groups and is responsible for both preventive and corrective maintenance. There are presently 91 individuals on the section. The group is performing the startup test activities that are required to support the functions of the integrated startup group. Consequently, our electricians and our mechanics know how to repair and maintain Susquehanna today.

As Mr. Kenyon has already pointed out, we have authorization to staff the unit today for our two-unit complement. Mr. Kenyon has also pointed out that we have approximately 125 individuals from the Pennsylvania Power & Light construction department on site assisting us in the electrical-mechanical checkout, and they will assist us in the future.

In our maintenance section, as in all our sections, Susquehanna makes extensive use of computerized systems to assist us in the performance of our duties. The mechanical and maintenance section uses a system called PMIS, P-M-I-S, plant maintenance information system. This system allows for a computerized assignment of all our maintenance activities. It is developed so that an operator can easily retrieve the repair history of any plant system.

The plant technical section is staffed to support the station in performing systems results engineering, plant results engineering, and reactor core monitoring. The plant chemistry section reports to the station technical supervisor, along with the station shift technical advisors.

MR. ZUDANS: May I ask a question?

MR. KEISER: Certainly.

MR. ZUDANS: You may have made it clear, but not to me. You have integrated startup group supervisor, which is not reporting to assistant superintendent. Yet you named several groups of people who report to assistant superintendent involved in that activity. How did that -- what are they?

MR. KEISER: The integrated startup group -- when the plant is constructed, it is constructed by the construction department. Once they say it is fully constructed, that system is turned over to the integrated startup group and that group is responsible for performance of the checkouts and the checking.

To do the checkouts, they go to the mechanical and electrical maintenance departments that work for the assistant plant superintendent and say, give me men to check out the system.

MR. ZUDANS: I see, they do not have their own line personnel. They go to the assistant superintendent to get the people, right?

MR. KEISER: They have no craft personnel.

MR. ZUDANS: Is the assistant superintendent involved in startup operations?

MR. KEISER: Yes.

MR. ZUDANS: But he does not control them?

MR. KEISER: That is correct. The integrated startup group reports directly to me, as does the assistant station superintendent.

MR. ZUDANS: Okay. Let's go ahead.

MR. CATTON: In your chart I do not see any mention of plant safety operations review boards or anything. Where do they fit into the scheme of things.

MR. KEISER: The plant operational review group.

MR. CATTON: With regard to this chart, could you maybe point on it where? Where might such a board reside?

MR. KEISER: The board reports directly to me.

The plant operational review committee is made up of those supervisors that report to the assistant station superintendent, including the assistant station superintendent. And that group, which I am the chairman of, reports to me. That is the plant operational review committee as defined in the technical specifications.

MR. CATTON: Who specifically is on this board?

MR. KEISER: I am the chairman of the board. The vice president is assistant station superintendent. And then, excluding this individual, these individuals also comprise the board (Indicating).

MR. CATTON: So the person who heads up each of those blocks below you is a member on the board?

MR. KEISER: They are the members.

MR. CATTON: Do you think it would be a good idea maybe to have somebody from your training arm be a member of that board as well?

MR. KEISER: As Mr. Kenyon mentioned, that is undergoing review.

When I say they are the members, there are also alternates.

MR. CATTON: He said it was under review. I was just curious about your opinion.

MR. KEISER: At the present time I am not in agreement with that, no.

MR. CATTON: You are not in agreement with that?

MR. KEISER: No, personally.

MR. CATTON: Why? Do you think he would just get in the way?

MR. KEISER: No, I do not think he would get in the way. I feel that -- in later presentation I will show the lines of communication between the training department and the plant staff. That will clarify.

Bruce?

MR. KENYON: A point of clarification. When I was asked that question, it was in reference to the offsite, or at least I understood it to be in reference to the offsite, review committee, and that is a particular area that we are considering adding the training manager.

MR. CATTON: It would not be here?

MR. KENYON: No, because the training organization services the entire department and more than just the plant staff are involved in the proper performance of plant activities and activities supporting the plant. So we are looking at the offsite committee as a potential to add the training manager. We are not at this time considering adding a training individual to the plant operations review committee.

MR. KEISER: So I would say one of the primary responsibilities of this committee, called for as defined in the tech specs, is to review modifications, system operations, and plant procedures to determine if there is an unreviewed safety question.

MR. CATTON: I understand, but in that it is your training arm that is going to make sure that your operators know what those procedures are and how to implement them, I personally think that it is a good idea to have him somewhere near the point where procedures are initiated.

MR. KEISER: And he is.

MR. CATTON: He is not on your committee, so he is not. He is a step removed.

MR. KEISER: The procedures -- you are talking about operating procedures, right? They are written by the technical section, reviewed by the operations section, walked down to the simulator, the procedures are walked through the training department personnel, and revisions, comments, et cetera, are included in the procedure prior to it coming back to the PORC committee.

So the assumption of this procedure when it walks into the PORC committee is it is essentially a technical procedure.

MR. KENYON: Assuming for the moment we put the training manager on the offsite review committee, one of the functions of the offsite review committee is to oversee the activities of the plant committee. The offsite committee really checks that the plant committee has checked those things that the plant committee should have addressed. Thus by having a training manager on the offsite review committee -- I do not want to characterize that as a situation where they are oblivious to what is going on at the plant committee.

MR. KERR: Whether you agree with his position or not, do you understand the point that Mr. Catton is trying to make?

MR. KEISER: It is not very clear to me, no.

MR. KERR: Ivan, I think it is important. Maybe you ought to clarify things a bit.

MR. CATTON: My exposure to PORC-type committees is somewhat limited, in that we just have a little old reactor at UCLA. And one thing I found, that when things come up about how the plant is operated, what kinds of things have to be changed, that how the operator is going to see these things, how he is going to be trained to make sure that they are accomplished is very important. And typically the guy who trains our student operators has always made good contributions. We sometimes try to do things that he just says you cannot do.

MR. KEISER: I agree with you 100 percent. I my next presentation on training I will cover tha. But we feel that the training department has a vital role to play, and we are vitally concerned about is the training department training our people the way we want them trained.

MR. CATTON: And your PORC committee, does it not have the responsibility of seeing to it that all of these things are done?

MR. KEISEP: PORC has a responsibility to overview plant safety performance, which includes those things.

MR. CATTON: And a major portion of plant safety is the operator and what he does. And the person who has to see to it that he does it or is capable of doing it is the one who is training him.

MR. KEISER: He trains them so he is capable, the one who is responsible to see that he performs properly.

MR. CATTON: This is getting a little bit confused.

MR. KERR: Mr. Peyser, you have to recognize that both Mr. Catton and I are in the education business, and so we think it is very important that somebody in the education business be on all the important committees.

(Laughter.)

So you have to interpret these comments to some extent in that light.

MR. KEISER: I would also point, as Bruce had previously, that we recognize this. We recognize its importance, which is one reason we went out and obtained an educator to head up our training program.

MR. CATTON: I was quite impressed with that. And you also placed your training program in a very prominent position that reports to a reasonably high person in the executive structure.

MR. KERR: If I interpret Mr. Catton correctly -- I am not always sure I do -- he wants to make certain that there is somebody who is on a day-to-day basis, almost, in the job of training operators and, therefore, has some idea of what they can be trained to do and what they cannot be trained to do. So that if you lay some unreasonable requirement on an operator, there is somebody there who says that just does not make sense right away.

I do not think either one of us would care if that occurred because somebody is a memeber of a committee or not, but that there be a very free flow of information and exchange of ideas. I think that is important -- I think. I think when you said you agree also it is a matter of how one implements it in your organization.

MR. KEISER: That is correct. I think we take advantage of all those facets. One we do not take advantage of is the training department is not represented on the PORC; they are not excluded, they are just not PORC members.

MR. KERR: You would have to agree that most educators spend too much time on committees.

MR. CATTON: I would have to agree.

(Laughter.)

(Slide.)

MR. KEISER: The instrument control section is responsible for preventive maintenace and corrective maintenance along with --

MR. KERR: Excuse me, Mr. Peyser. There was one thing that Mr. Kenyon or somebody promised me would be covered, and that was the connection that the STA would have, if any, with the manager of nuclear safety assessment. I do not know if you are going to tell me that or somebody else is going to.

MR. KEISER: The shift technical adviser interchanges, really, with the nuclear sa ety assessment group, and they use each other --

MR. KERR: How does he interchange? Does he have a telephone? He calls them up and talks to them on the phone or --

MR. KEISER: There are personal commuications and formal memo communications. There are three nuclear safety assessment group engineers on site, along with the seven shift technical advisers. They almost pass each other in the hall daily.

MR. KERR: So it is a fairly geographically convenient --

MR. KEISER: Absolutely.

MR. KERR: Now, do you think shift technical advisers are any good?

(Laughter.)

I mean, from what you have said, you have had a good bit of experience in the operation of nuclear power plants in some cases in which there have been problems. I just wondered if you think a shift technical adviser would be of any use to you if you had an emergency.

MR. KEISER: The shift technical adviser is put to useful work at the facility. So is he any good to me? Yes, he is. During an accident condition, if you are asking would he be helpful to me, I believe that a person on shift independent of line responsibility for the scenario is useful, provided he has some knowledge -- in other words, he is not in the way.

But someone who is not there trying to figure out which valve to open, et cetera, and instead is sitting back saying, "What should I be looking at," is useful.

MR. KERR: Well, I mean you must have given some thought to how one selects and trains and uses -- I mean I take it you do plan to have a shift technical adviser in your --

MR. KEISER: Yes, sir.

MR. KERR: Given that background, for TC&L, is it your view that the STA is likely to be useful in both normal and emergency situations?

MR. KEISER: Yes, sir. If I could just elaborate for a second. We think the operator training program is designed from a traditional standpoint for the operator to know all there is to know about a particular system and know the system limits and know which valves to open. Our shift technical adviser training program is more designed to what are the engineering limits of the system. It is nice to say the reactor pressure cannot exceed 1250 pounds and the operators sees that this does not happen; he knows which valve to open.

But the shift technical adviser knows why it is 1250 pounds. He knows if he received 1250 pounds it does not break. He knows what is behind it. Our shift -- you look in the control room. During a trip you can see a myriad of alarms coming in, and the operator is trying to react to the alarms. The shift technical adviser does not know what all those alarms are. We have trained him, but he is not concerned with all those alarms. We have told him, "I want you to worry about this one, this one, and this one," and so he is able to step back, not be concerned with the line management essentially.

MR. KERR: Now, if one has, I guess, potentially a number of kinds of emergencies, some of which might be rapidly developing and some more slowly, if it happens on the spot, the man responsible, I guess you call him the shift supervisor, wil look to the STA. The shift supervisor is someone with quite a lot of experience in operating plants. STAs in some cases are nuclear engineers who are sort of wet behind the ears still. They may not be, in your case.

MR. KEISER: That is not true in our case.

MR. KERR: So you will have people that will be able to convince a shift supervisor that they know something, so that they will be looking to them for at least assistance, if not advice.

MR. KEISER: That is correct. In my opinion, the way we are proceeding is that you make the SS reliant upon the shift technical adviser during normal operations because he has some particular information to relate to the SS, so that during accident conditions he will normally go to him. In other words, the standard BWR tech specs is this thick (indicating), and we expect the SS to know it.

And that may be helping a little too much, but by condensing it down in to Chapter 3 and Chapter 4 and demanding that our STAs know it, they review all of the tech spec surveillance procedures. They are attending all our sessions now with the Commission on the formulation of our final tech specs. They know the tech spec, and that will become valuable to the shift supervisor, and they will naturally call upon him for questions.

MR. KERR: Well, I think it is encouraging that they know the tech specs. In some senses, however, one might want to look for some assistance if situations arose that were not covered by the t... specs.

MR. KEISER: My statement was meant to imply that you can find a job description of a shift technical adviser so the SS will normally go to him for questions, so that during an accident condition he will typically -- the normal way of doing it, instead of saying, "You have always been useful to me in the past; you will be useful to me today. So I am not going to" -- his expertise is not limited to the tech specs.

MR. KERR: Okay. Thank you.

MR. KEISER: Our instrument and control system is responsible for preventive maintenance and corrective maintenance and has responsibility for overseeing the maintenance of the plant computer systems. Presently, there are 34 individuals in the system. The instrument control systems have calipered all the plant instrumentation. Consequently, this section is experienced in th types of instrumentation and repair techniques and the preventive maintenance techniques of the station's equipment.

The health physics section, this section is responsible for the radiation protection of the personnel at the facility as oppsoed to some other installations where health physics also has the responsibility for radiochemistry, this is not true at Susquehanna. Our health physics section is solely responsible for radiation protection. Presently, this section is comprised of 15 individuals.

Our managment approach to the station organization and resource levels should demonstrate the commitment, resourcefulness of our readiness of the Pennsylvania Power & Light Company to safely and successfully operate its Susquehanna nuclear plant.

Are there any questions?

MR. MOELLER: As I recall in reading some of the background information, there was a question of something about the qualifications of your senior health physicists. What are his or her qualifications?

MR. KEISER: It was not qualifications. It was the availbility of the individual.

MR. MOELLER: I see. What is the question, and what is the resolution?

MR. KEISER: The question was we did not have one permanently assigned.

(Laughter.)

And so we had enlisted the assistance of a nuclear support group and drafted an individual from that organization who reads all the qualifications of the positions, and he is on site fulfilling those duties with no other current responsibilities and will do so until such time as we find or fill the permanent position. That is the present status.

MR. MOELLER: What are the qualifications of this person, do you know, of the person that you have in the position now?

MR. KEISER: It would be best if I let him answer, Mike. This is Mike Gehring.

MR. KERR: Please come to the mike.

MR. GEHRING: My name is Mike Gehring. I am the acting HP supervisor at the station. I have had five years of naval nuclear experience and three years at the Surry nuclear power station, where I paticipated in the startup of Unit 1 and Unit 2. Fi e years with Metropolitan Edison Company, where I participated in the startup of Unit 1 and Unit 2 at Three Mile Island. And then I was in the corporate health physics section with Metropolitan Edison Company.

I was also there at the station at TMI for two months during the accident, where I was in charge of the personnel dosimetry.

MR. MOELLER: Thank you.

MR. KERR: Mr. Lipinski.

MR. LIPINSKI: You referred to your plant maintenance and information system used to help with maintenance. Are you familiar with the MIDAS system?

MR. KEISER: No, sir.

MR. LIPINSKI: Okay. At last week's ACRS subcommittee meeting a presentation was made by S. E. Siemen from the Hanford engineering development laboratories, and they are doing R&D work under the Department of Energy in support of the fast-flux test facility. And they are developing MIDAS, which is the master information data acquisition system.

So you may want to take a look at their work and take advantage of their software development, because it is supposed to be a fairly comprehensive system which will help them with maintenance. They use the word "data acquisition" in there, but there is no hardware connection with that system to the plant; is it primarily paper input.

MR. KEISER: Thank you. I will pursue that.

MR. KERR: Other questions?

(No resp nse.)

MR. KERR: Thank you, Mr. Peyser.

MR. WARD: Good morning. I am Gary Ward, manager of nuclear training for Pennsylvania Power & Light Company.

The purpose of this presentation is to provide an overview of how we plan, conduct, and evaluate nuclear training.

(Slide.)

I shall attempt to do that by reflecting our philosophy of training, explaining the work functions and organizational structure of the nuclear training group, and by providing a general overview of the training programs.

(Slide.)

To accomplish the first, philosophy, I will use two viewpoints: organizational and training. The organizational viewpoint, in my opinion, speaks well for the company. I report directly to the vice president for nuclear operations, the staff facility and equipment are dedicated to one BWR plant.

There is a demonstrated company commitment in three areas: In facilities, we have 13,500 square feet of specifically designed training space. We have 19,000 square feet of space in planning, which will include additional classrooms, labs, and lockup area. In training equipment, we have a link trainer, which simulates the control room. We have plant-specific motors, pumps, and the needed tools to work on those and teach people how to use them.

We also have a comtemporary lab. We have a good quality and quantity of audiovisual and media support. In the area of staff, which I will return to in a moment, we have a good committed staff that is experienced. The important point that I want to make here is that these decisions to support training in this nature were not made by any one key actor at any one key time, but were made over a period of years. And I think that speaks well for the company, because many different people made those kinds of decisions. I see that as a company commitment.

(Slide.)

More directly to the concept of training is our philosophy of training. First and foremost, it is learning by doing. Almost everything taught in our program must be applied. We teach know-how and know-why, skilled knowledges.

The need to ensure transfer of knowledge from situation to situation and into new situations is paramount and obvious in the nuclear industry. A learning-by-doing environment is one methodology that when coupled with foundation knowledge is in the original scientific method of problem-solving tends to address the issue of how to extend your knowledge from one situation to another.

Teaching people how to make decisions in a new and ever-changing environment is something we do not havean answer to. But we think that we do have a way to approach that.

We do not have any magic formulas on deciding how much to be taught, ratio of theory to practice, and how to cause a learner to move well in a dynamic, active, and crisis situation. But we do think that learning by doing and teaching people to make decisions in an ever-changing environment is an approach.

MR. CATTON: That sounds good. But let me ask you a question about your philosophy. As far as I can tell, there are really two approaches, and maybe a grading in between. One is where you can view the system as an energy balance/mass balance and that the operator's job is just to make these things stay intact. Another view is more militaristic, where you train him to push the right buttons at the right time. Which end of that spectrum do you fall?

MR. WARD: I do not think we fall at either end, sir. And I am not able to relate to the technical examples you gave, but let me see if I can approach an answer to that.

I think one of the problems that we have had in the traditional training programs is that we have taught people just to punch a button. I think one of the problems we have had on the other side is we have taught people just theory. A learning-by-doing approach means that you will apply what apply what you learn, you will apply it in different, ever-changing environments.

Now, that does not respond to either one of those extremes. Does that answer your question?

MR. CATTON: Does that mean, for example, that if he changes the setup of the plant, he would then do an energy balance of something to show himself that what he is doing is leading to the point that he wants to get to.

MR. WARD: Again, I cannot relate to your example, but learning by doing is a way where that person is going to apply his knowledge beforehand in many different situations. When he comes to a new situation, given the competencies of classic problem-solving --

MR. CATTON: The energy being carried away by the steam out equal to energy being put in from the nuclear force, is he going to make simple calculations to tell himself that that is indeed the case?

MR. WARD: I cannot respond to that example, sir.

MR. CATTON: Okay. I am a little disappointed, but I understand.

MR. WARD: Okay. Fine. An extension of knowledge into the realistic environment is a major point of learning by doing. We strive to do all student applied work in a situation under the conditions in which it will be done in plant, in office, on shift and so on. It is one thing to align a pump in a classroom and another to do it on the job. To address the -- how we decide what to teach, we have a curriculum development system. I will return to this in a moment for detail.

But we have a way which seems to work for us to develop curriculum which causes the instructional staff and the occupational group which we are training to interact in a formal setting to determine what is most worth knowing before we start teaching. That is linked to an instructional materials system.

The situation that I am continually faced with is whether we buy our instructional materials. Initially, we were after expertise, so in some cases we will rent, if you will, instructional programs. However, to cause the application of learning by doing, the instructional program is built around a series of units of instruction where we attempt to capture the knowledge that are involved. These units of instruction are built around measureable terminal objectives and enabling objectives. From a trainer-learner point of view, the measuring objectives approach a definition of what is to be taught.

It is a natural move from the curriculum into the application phases. We have adopted one which has proven uses. It has eight parts. It assists in generating a document to establish valid teacher tests. In a way, teaching too is a type of evaluation. We have a formative and summative evaluation scheme. We evaluate the process of our training and the goals of our training.

I would like to move to the curriculum to give a more detailed end of the program.

(Slide.)

There are two assumptins to this curriculum model. One, no one knows everything about any one particular job. Two, everything that is important should be known.

(Slide.)

To approach this, we have three boxes, if you will, that we look at in regard to each occupational group that we service. The first one is the characteristics of the occupational group. We want to know in a broad-brush fashion their ages, experience, background, and educational levels. We have that kind of data and information. That assists us in designing the program.

Secondly, we have legal professional and industrial mandates that establish points for us to do training with.

Lastly, but most importantly, in my opinion, is we have the job expectations of each particular position, and we arrive at these through job analysis, through expert opinion, and, if you will, through the philosophy of your leadership of the particular operations.

We have listing then of job competencies. This type of information is transmitted to and acted upon by a formalized curriculum committee. The outcome is a consensus on a listing of job training measureable objectives.

(Slide.)

The membership of this committee is quite important and critical. We have on it a training supervisor from the area that is germane to it. We have a responsible instructor that is going to be teaching that area. Each technical area we have an instructor for. We have a reporter, stenographer, whatever. We have the occupational line supervisor of that occupational group. We have a worker that is already knowledgeable and skilled in that area to sit on the committee.

If we are lacking skills -- pardon me -- if we are lacking that expertise, then we bring in an outside adviser that has experience in those areas. That is the group through which all that information flows. It is a formal meeting. It is recorded. A lot of pre-work goes into it. It tends to work well for us.

Well, that ties to our teaching. Teaching is what we are all about. We have some further functions to.

MR. ZUDANS: Back on that little -- if I read the composition of this committee, it seems like you may have several such committees.

MR. WARD: We have five underway right now, and eventually I expect to have 13, sir.

MR. ZUDANS: Okay.

(Slide.)

MR. MOELLER: Who really, on the committee, would have the overview sort of approach? It seems to me you have the nuts-and-bolts people, you have the occupational line supervisor and the occupational expert worker. But who, at a higher level in the organization, would look at this and make sure that some of the thinking that Mr. Catton has been mentioning, to assure yourselves that that is included?

MR. WARD: We have two ancillary members on the operators committee, which is the assistant plant superintendent and myself. Now, I look at the pedagogical side.

MR. MOELLER: Oh, the plant superintendent is in on this?

MR. WARD: Oh, yes. This is our way of communicating.

MR. MOELLER: All right.

MR. WARD: Does that answer your question?

MR. MOELLER: Yes.

MR. WARD: Thank you.

(Slide.)

The second function we perform is one of testing. We conduct entry-level testing for most craft and technical jobs at the plant site. The entry-level is a combination of standardized written tests. All the progression line tests are job-specific written or psychomotor hands-on testing. In addition to that, we do maintain the training records.

To accomplish those tasks for unit organization, we have an operations training group which handles our license, our engineering, and our managemen training. We have a technical group which handles craft, general, and technical training. We have a support group which handles instructional material development, our testing and measurements, our technical library, and our records and media. And we have clerical support systems.

All of our instructional staff are experienced in the areas in which they are teaching. In addition, they are not assigned duties beyond teaching or those related functions of curriculum and instruction and materials development. The group is well-rounded. We have a certification team for all our instructors.

Mr. Cozzo will give an in-depth presentation on our operator qualification program in a moment.

I want to point out that our plant supervisory personnel have received significant training.

MR. ZUDANS: The curriculum committee, you said you have five on board now and plan to have 13. Do they go by names in specific related areas?

MR. WARD: Yes, sir. Well, you can look right here. Maintenance, instrument and controls, health physics, chemistry, nonlicensed operators. There are some sub-breakouts in there when you start talking about dealing with your foremen. You pull that from several different areas.

MR. ZUDANS: And people that are trained, some of them will go through all of these steps in their training? In other words, a person that goes through maintenance might also go through instrument and controls and all the others?

MR. WARD: I am not quite certain I understand the question.

MR. ZUDANS: You have five such curriculum committees. If you retain a person for a certain job, is it taken care of by just one such committee?

MR. WARD: Yes, sir.

MR. ZUDANS: And he does not interface with any of the others?

MR. WRD: There may be some general courses where they would be together. But they have a specifically designed curriculum. Does that answer your question?

MR. ZUDANS: Yes, it does.

MR. MOELLER: Now, on this you are showing six different positions.

MR. KERR: Six different areas.

MR. WARD: Areas.

MR. MOELLER: Okay, six different areas. Now, any one of these is one of these five that you said of which you will have 13?

MR. WARD: Yes.

MR. MOELLER: So you really then have subtraining objectives under each area?

MR. WARD: Yes, sir, most definitely.1

MR. MOELLER: Okay. And everyone would not take everything?

MR. WARD: Oh, no, sir. We do conduct our progression line entry-level tests, and I think this is unique to this group, to most of the maintenance personnel, most of your instruments and controls, some of your health physics personnel and your nonlicensed operators are all tested.

MR. KERR: They are tested?

MR. WARD: Yes, sir. We have standardized examinations, standardized tests, before they are employed.

MR. KERR: They are tested for what? I mean to see if they can learn or if they know, if they have information?

MR. WARD: It is a combination of achievement and intelligence testing, because we do test reading.

MR. KERR: That is what I meant. Thank you.

MR. WARD: I have a list of those tests if you are interested.

MR. KERR: I would not understand the names anyway.

(Slide.)

MR. WARD: Just to point to what the training center has accomplished in the past, basically mechanics have had 5 days of general training, 10 days of theory, 36 days of skills training, 15 days of system designs. They are well trained up and down throughout the system, well trained.

(Slide.)

MR. MOELLER: Where is your training facility?

MR. WARD: We are located near the site. We are outside the defense perimeter.

MR. LIPINSKI: On that last vuegraph you nonlicensed operators. I did not see an entry for licensed operators. Did I miss something?

MR. WARD: It will be covered in the next presentation.

MR. KERR: Take a position such as instrument then or mechanics. Do these people belong to a union?

MR. WARD: Up to a certain level, and then it branches off, sir.

(Slide.)

In our operations training we will have in place an articulated model which moves from nonlicensed training through shift supervisor for replacement and promotion purposes. No matter how good we are, we always want to get better, and we think we have a good unit now, and we look forward to a better one in the future.

Any more questions?

MR. LIPINSKI: I have a question.

MR. MOELLER: Do you have an audiovisual group or graphics art group that supports you?

MR. WARD: We have a slot for a half-time media person. Now, we do have a good quantity of media equipment that is mostly a maintenance factor.

MR. MOELLER: I was looking and thinking mainly at this point in terms of preparation of slides.

MR. WARD: We have that capability inside the company, but not under my control, sir. We can make some up just like these anytime we want to. We have that kind of capability.

MR. MOELLER: What I was going to comment on, the first few slides you showed, they were simple and readable. Some of these last ones were rather full and fine-print.

MR. KERR: That is a natural progression. He first teaches you to read by using big letters.

(Laughter.)

Mr. Lipinski.

MR. LIPINSKI: I would like to go back to training of the operators. After the TMI-2 accident, one of the recommendations that came out was that the operators have training in general principles, not just rote training and following procedures, but to look at the principles and operation of a facility thermohydraulics, energy balances, mass balances, and GPU Nuclear revised their training manual.

I think it was Penn Sate that gave them a special edition to their manual to put these principles in. And then they were gong to reinforce the manual with examples that were to be sprinkled through the various sections on plant systemsto show the operators how to apply these principles.

Let me give you an example for your reactor. If the level is falling in the reactor vessel and if I do not have a hole in the system, the level has to be rising in the hot well. And I do not know if you have a condensate storage tank, but it is got to appear somewhere else unless there is a hole.

Are your operators equipped to mentally do some calaculations in terms of rate of change of mass if it is decreasing in the vessel and reappearing somewhere else, or if it is not reappearing somewhere else and there is a hole?

MR. WARD: I will have to refer that question to our supervisor of operations, Mr. Gene Carlson.

MR. KERR: Do you understand the question or would you like to have it repeated?

MR. CARLSON: I think I understand the question.

My name is Gene Carlson. I am supervisor of operations and training for Pennsylvania Power & Light. I also head up the simulator operation.

I guess the philosophy of the training that we have been trying to accomplish with the operator is that if we can take fundamental principles, which we spent 20 weeks training every reactor operator prior to him becoming familiar with these systems in the plant, expose him to the operating philosophies and characteristics of the plant, then he can make the logical extensions of his knowledge to fill in the difference between the situation or scenario that we foresaw and wrote a procedure for and the actual plant condition.

I guess I am saying that if we can envision all the different scenarios that the person can get himself into as an operator, then we have attempted to either design the equipment to handle it or write a procedure so he knows what to do.

If we -- if on the other hand we know we cannot envision all the different scenarios that a person can get himself into, we have provided him training so that the training makes the logical bridge between what we have envisioned happening and the procedures and the actual plant procedure.

Now, let us take his example: Water is leaving the reactor, water level is going down faster than we are putting it in. And we want to know whether it is a leak or perhaps a valve is malfunctioning and has put it into the condensate storage tank when it should not be. That specific example, I have not trained them specifically to do. I would expect he would have the capability to do it, though.

MR. CATTON: Do you have during your training program any simple A-equals-B-plus-C kind of calculations that he makes in order that he can make that connection? That is a very simple example you were given. It is just mass balance.

MR. CARLSON: That is correct. We do that. For example, we run surveillances continually on th simulator. And one of the surveillances thwt we run is the high-pressure coolant injection system surveillance, where steam is drawn off to run the steam turbine and yet steam leaving the reactor is still the same but the flow sensors do not sense the steam flow because it is being diverted. He has to recognize, and he does recognize, that load on the turbine is going to go down, feed flow will go down until it can recover itself because of inventory loss. That is not recognized at the steam flow system.

MR. CATTON: Does he do any simple head calculations?

MR. KERR: Mr. Catton, I wish you would quit referring to mass balance as a "simple calculation." It ain't that simple. It is important.

MR. CATTON: Important.

MR. CARLSON: I know the operator recognizes and can perform a simple -- we have 13 million pounds mass per hour leaving the reactor. We only have 11 million pounds mass coming back in, because the feed flow system does not recognize that 2 million pounds has been diverted to the HPSI system. Therefore, water level is going down and it is expected to do so during this test.

MR. LIPINSKI: Let me make a comment. You said in one of your statement there if you draw event trees and fault trees for your system when you write your procedures -- and mostly you are assuming single faults and if you start accounting for multiple faults, the number of trees that you develop become astronomical, and you are not writing procedures for every one of those.

And this is where the operator's training and understanding fundamentals becomes very important, because probably someday an event may happen in your plant that is not going to be specifically covered by a procedure because there are multiple faults.

MR. CARLSON: That is right. That is what training does. If we could envision all the different scenarios that a person might find himself in, then we could write a procedure. But that is an impossible task. So we have generated a concept that training is going to be the bridge that allows a person to get from the procedure and what we thought was going to happen and the actual condition that the plant is in. That s the purpose of training.

MR. LIPINSKI: Have you talked to GPU Nuclear to see what they have done in training?

MR. CARLSON: Yes, we have. The Mid-Atlantic training group was formed before Three Mile Island, and that committee or that group is composed of nine different utilities from New York, Pennsylvania, Maryland, and New Jersey, of which TMI is a member and we are a member. And we meet quarterly in Wilkes-Barre to discuss the approaches to training that they have taken, problems that they have run into. And that is our mechanism from learning from their experiences.

MR. LIPINSKI: Okay. In fingering through the vuegraphs I see that your shift technical adviser is going to have a good technical background. But we are talking about whether the operators themselves are going to have a basic fundamental background and not have to fall back on the shift technical adviser, necessarily.

MR. KERR: That was not a question. That was a statement. Was it a question?

MR. LIPINSKI: It was a statement. I said I recognize the fact that they will have somebody on hand that does have this technical capacity. But what I have heard in this discussion so far has not convinced me that the operator himself is going to have a fundamental background.

MR. KERR: What is your question?

MR. LIPINSKI: Oh, I have not heard that they are responding in a postiive way, saying that, "Yes, the oepator is going to have a basic fundamental background in mass balance, energy balance.

MR. KERR: Is the operator going to have a fundamental background in the laws of disappearance and nondisappearance of matter.

MR. CARLSON: Yes, he does.

MR. KERR: Okay.

MR. CARLSON: For example, in our traininig program we have graduates, masters of nuclear engineering people who are sitting for the SRO exams and senior reactor operators who have high school degrees and reactor operators who have high school degrees and extensive amounts of training. If I were to take away the name cards and the names on top of their examinations and their performances, you would not be able to tell the graduate engineer from the operator. And I am saying that our exams --

MR. KERR: Let see if that is enough. Is that enough?

(Laughter.)

MR. LIPINSKI: Yes, I think he has indicated that they do have an educational background.

MR. KERR: Okay. Please continue. Or does that complete your presentation?

MR. WARD: Well, basically, I think that based upon my review of the literature and my reviews with knowledgeable people in the industry, that some of the more important items learned from TMI or the transfer of knowledge from one situation to another and being able to group what you have and extend yourself further. And I think towards that end is what our learning-by-doing is dedicated to.

Any further questions?

MR. KERR: Other questions?

(No response.)

MR. KERR: Thank you, Mr. Ward.

MR. CARLSON: May I make one more comment that might explain a little bit better. For example, in our training program we are having the operators actually perform net positive suction head calculations on the condensate pumps, on the recirc pumps, going through the equations to demonstrate how the equations are actually arrived at and how the engineer, for example, designed the interlocks and the research systems so they did not cavitate under low water level or high reactor temperature conditions.

And the operator will not be expected to do these during an accident condition, but at least he will have an appreciation for the theory and the fundamental set of calculations so that he can appreciate what the engineer is telling him.

MR. KERR: Thank you, sir.

MR. CATTON: That sounds much better.

MR. KERR: You are geared to handle?

MR. KEISER: The training and qualification program.

MR. KERR: I have a rquest from Mr. Stark, which has to do with scheduling. Wait just a minute, let me see if I understand the question. No, it does not have to do with B. Just tell me when we get to C.

MR. STARK: That is correct.

MR. KERR: All right. Please proceed.

MR. KEISER: My name is Harry Keiser. I am the station superintendent. I would like to briefly discuss training and qualification programs at Susquehanna. The foundation of a strong training program rests with the relationship between the training organization and the organization receiving the training. Without a sound basis of communication anl mutual respect, all training programs are due to fail regardless of the size of the organization or the quality of its facilities.

Recognizing this, station and training department management have developed curriculum planning committees. The purpose of the curriculum planning committee is to establish this mutual respect and communication. As Gary has gone into lengths about the curriculum planning committees, I would just like to give you a brief summary of my view of the committee.

(Slide.)

Go the second slide, please.

(Slide.)

In the case of operations, a curriculum planning committee consists of the assistant station superintendent, the manager of training, the supervisor of operations, the shift supervisor, a simulator instructor, and the supervisor of operations training.

The purpose of the curriculum planning committee is in a phase approach initially to meet and briefly say what it is we want the trainee to learn, what is the technical criteria, what is the scope of the course, what measurements are taken to measure the trainee's performance, what standards apply? And the training department then goes away and formulates either the training course or the program, dependent upon the scope. Then they come back and make the presentation to this committee, saying, "Here is what we are going to teach."

MR. KERR: Let me see if I understand. The man who does the actual planning comes and listens to this committee and he has a fairly good idea of what he thinks the committee wisdom has produced. Then he goes away and writes something, brings it back. You look at it again. Is that right?

MR. KEISER: Yes. And that is my perspective of the curriculum planning committee. And it is an element that has been missing in previous training programs I have been associated with.

The training environment, including facilities, is yet another facet of a professional training program. Pennsylvania Power & Light's training department has its own training complex, contained within which is our own simluator that duplicates Susquehanna steam electric station Unit 1 and common control room.

(Slide.)

A contract for the simulator was awarded in October 1976 and became fully operational, with the commencement of training in October of '79. The simulator is capable of 27 different initial starting conditions, such as end of core life, beginning of core life, 100 percent full power, et cetera. It has three speeds of simulation. It has backtrack capability, a vent or transient can be stopped, and the computer can be backed up and down for up to ten minutes.

This feature enables us to conduct a drill scenario and have the operators respond to the situation. Should they perform in an unsatisfactory manner, we are able to go back in time and reinitiate the event. This is an extremely valuable training option, because an error does not void the training goal of that particular event. The simulator has built into it 225 malfunctions and 1583 "cry-wolfs," "cry wolf" being an alarm condition.

Our simulator contains a training proficiency --

MR. KERR: Does "cry wolf" mean an alarm or a false alarm?

MR. KEISER: It can be false. We can put in 1583 alarms and expect the operator to do something.

MR. KERR: I never heard the term before. So I am learning something today.

MR. KEISER: I think that is what the operators say.

MR. KERR: I would expect the real one to be called "wolf" and the false one to be called "cry wolf" but --

(Laughter.)

MR. CATTON: You are aware that there is a regulatory guide coming out on simulators, I assume?

MR. KEISER: Yes, sir.

MR. CATTON: Are you going to attempt to meet the guide or come up to the standards of the guide?

MR. KEISER: I am not capable of answering that question. I could obtain the answer.

MR. CATTON: I would like to have you do that.

MR. KERR: His answer is he does not know.

MR. CATTON: He is going to obtain the answer.

MR. KERR: Oh. Okay.

MR. CARLSON: I can answer the question.

MR. KEISER: Gene.

MR. CARLSON: My name is Gene Carlson. The simulator right now does meet all the requirements of the ANSI standard, and we do intend to meet the requirements of the reg guide, yes.

MR. CATTON: Thank you.

MR. KEISER: Thank you, Gene.

Our simulator contains a training proficiency review program. Any 10 of 50 processed variables can be selected for monitoring during a simulator exercise. If an operator task was to maintain reactor water level within a particular band for a set period of time, this simulator feature will provide information regarding the operator's proficiency in performing this task.

The information provided would include the number of times below or above the band, the highest and lowest swings in the level, and the length of time that the level was out of the band.

The simulator, being an extremely valuable training tool, has received extensive use. We have used the simulator for procedure checkout. All of our operating procedures -- startup, shutdown, normal operating, off-normal and emergency operating procedures -- have been walked through, checked out, and tested on the simulator to discover any deficiencies.

(Slide.)

This walk-through checkout will also be conducted on our technical specification surveillance procedures. Through our training programs with the use of the simulator, we have uncovered some plant design deficiencies. These design deficiencies have been corrected. We have used the simulator for human factor engineering. By walking through the procedures on our simulator, we were able to improve the layout of the control panel and to improve the sequence of the steps in the operating procedures, thus enabling us to reduce such potential errors.

The simulator has been used extensively for training, not only licensed operator training programs, but training progarms for all our station personnel, including shift technical advisers, operations personnel, plant management, plant engineering, nuclear plant engineering in Allentown have all made extensive use of the simulator.

Additionally, we have had the NRC visit our simulator and use it to verify our symptom-oriented emergency operating procedures.

MR. ZUDANS: Could you give an example on this item, "Uncover plant design problems"?

MR. KEISER: Yes. There was one case where on our main circulating water pumps, the unit was operating at 100 percent power and it was automatic trip of the circulating water pump. Here we get a runback of the reactor recirc pumps. The difficulty was if you reduce power at 75 percent and you are going to operate with three circulating water pumps and the operator went over and manually turned one off, that feature was still in there and you get a runback with the unit to 30 percent of power.

And so we uncovered the fact that there was a difficulty in the design of hte automatic and manual logic.

MR. LIPINSKI: A question. Do you have a procedure for anticipated transients with out scram?

MR. KEISER: Yes, sir. We presently have a procedure for ATWS.

MR. LIPINSKI: Is that part of your simulator training?

MR. KEISER: It will be included as part of our simulator training, the anticipated transient without scram incident, that as a matter of fact, today is a BWR owners group meeting, to review that particular procedure as a symptom-oriented emergency operating procedure.

We expect, when our member gets back from this committee meeting, that we will have to revise our operating procedure. Once that procedure is finalized, we will take it down to the simulator and train our operators.

Right now, that scenario is undergoing debugging and we cannot simulate it on our simulator today. We anticipate that that scenario will be debugged and operational around the first of October.

MR. LIPINSKI: Who built your simulator?

MR. KEISER: I believe it was Link.

MR. MOELLER: What does the simulator cost?

MR. KEISER: $10 million -- $6 million. I do not know if that was the simulator or included the facilities.

MR. KERR: That is close enough. We do not count more than the nearest million.

(Laughter.)

MR. KEISER: I don't make that much either.

(Laughter.)

I would like to move to our operator training programs.

(Slide.)

Our operator training programs consist of four major programs: training for senior reactor operators, reactor operators, nuclear plant operators, and auxiliary system operators.

(Slide.)

The training for our senior reactor operator candidates consists of training in fundamentals, math, heat transfer, physics, et cetera. Training in boiling-water reactor systems, training at a boiling-water reactor simulator, and plant-specific system training.

All these are included in a traditional senior reactor operator training program, the one major addition to that program being that we have trained on our own plant-specific simulator for almost two years now.

Other notable additions will be discussed in the reactor operator training program.

(Slide.)

Pennsylvania Power & Light was extremely selective in choosing its reactor operator candidates. Prior to the commencement of the training program, candidates for the program were subjected to a four-part selection procedure. It included academic examination, psychological examination, physical examination, interview, and final evaluation.

Of 178 personnel expressing an interest in the position, 106 were elected to enter the selection procedure. 34 individuals were nominated for the program. Those successful candidates with less than one year of power plant experience were then assigned to an operating process station for one year of combined on-the-job training and 500 hours of formal classroom training.

Upon completion of this phase, all candidates received 20 weeks of fundamentals, including basic math, et cetera. They were then assigned to the Pennsylvania State University research reactor for two weeks. They then received an additional eight weeks of boiling-water reactor systems training, nine weeks of training at a generic boiling-water reactor simulator, and eight weeks of Susquehanna systems training.

(Slide.)

To summarize, our licensed operator training, our operators receive the classing boiling-water reactor operator training courses. They completed the General Electric boiling-water reactor certification program. They were assigned to an operating boiling-water reactor for one month, and they received supplemental training on site in Susquehanna-specific material.

In preparing our personnel to be Susquehanna reactor operators, we again augmented the traditional nuclear training program. In addition to the training just outlined, we have conducted a Susquehanna certification program on our simulator.

We have conducted and are in the process of conducting a professional operator training. This is an extensive six-week training session during which senior plant management participates in the training program. This course is designed to impart to the operating staff the philosophies to use during operations.

Then we have final qualifications which will include a senior management interview with each candidate, an assessment of each individual by senior management, by which a determination will be made as to their suitability for selection as a Susquehanna steam electric station operator.

Our nonlicensed operator training programs --

MR. KERR: Excuse me. Can you give me some idea of what that selection involves? I do not mean the details, but is it objective, subjective, written, oral? What sort is it?

MR. KEISER: The final selection process is subjective. The training department, we anticipate the training department coming in and saying, "This is how the candidate has performed academically during the training program." We expect the shift supervisor to come in and say, "This is how the individual has performed as an operator at Susquehanna." And we expect from the management review that a final determination as to whether we desire this individual to be licensed at Susquehanna.

MR. KERR: Management review, who does that?

MR. KEISER: Myself and my staff.

MR. KERR: Are there ten people, three people? I do not need to know exactly who, but just --

MR. KEISER: Three.

MR. KERR: And that is independent of whether you think the individual is licenseable in an NRC sense?

MR. KEISER: That is correct.

(Slide.)

The nonlicensed operator --

MR. KERR: Let me ask one more question. You mentioned psychological testing. Psychological testing is supposed to test what? What are you trying to pick out?

MR. KEISER: Gary.

MR. WARD: I am Gary Ward, manager, nuclear training. Psychological testing is the Minnesota Multi-Phase Personality Inventory Test, a trait factor test, and identifies those people who have traits that would make them be representative of those who are not normal in their behavior. Does that answer your question?

(Laughter.)

MR. KERR: I do not know whether it does or not.

(Laughter.)

For example, it would obviously throw me out.

(Laughter.)

But that might be very good, because I have never operated a reactor in my life.

MR. WARD: There are basically four types of tests. This is the trait factor test. It was normed on people who are in institutions and it lists the traits that they have. You take the test; it has repetitive life factors built into it. If you crank out a score that indicates you have some of the same traits that people who are institutionalized have, then you are taken a look at by a psychiatrist. Does that answer your question?

MR. KERR: Let me ask another question. I will keep that under advisement. There has been some discussion -- and I will not necessarily attribute this to the NRC; I may be doing them an injustice -- but at least there has been some discussion of the possibility that psychological testing might pick out people prone to sabotage, for example. Have you given any thought to whether, in your view, such testing would have any validity?

MR. WARD: I would not say that the MMPI would help you pick out --

MR. KERR: I did not think that that would do it. But has your organization -- if you are the person whom I should be asking --

MR. WARD: You may be getting more into personnel.

MR. KERR: Has any thought -- I am not going any further than this question, because I am just asking out of curiosity -- if you thought about whether such tests exist and have any validity for this purpose?

MR. WARD: I am not aware of any tests that would help you identify someone cf that bent.

MR. KEISER: This test is not the screening test we give for security reasons. That is a different examination.

MR. KERR: Is that what one would call a psychological test or a security test?

MR. KEISER: I call it a psychological test. That test is independent of this one here.

MR. KERR: But there is such a test?

MR. KEISER: There is such a test.

MR. KERR: Do you think it is any good?

MR. KEISER: I passed it.

(Laughter.)

I really could not answer the question.

MR. KERR: It is a serious question for you because you are responsible for that plant.

MR. KEISER: I could say it is successful to us by default; that is to say, no one has attempted to sabotage our facility.

MR. KERR: That is sort of like the conclusion that you can get rid of pink elephants by snapping your fingers because I do not see any pink elephants. Do you have some basis other than that?

MR. KEISER: I do not.

MR. CURTIS: Dr. Kerr, may I step in here? I do not profess to know a thing about the characteristics of some of the tests that are being discussed here. I do have some feeling for the objectives, though, that our company established in agreeing many years ago to indulge in psychological testing.

And, more recently, as we have implemented our security program, the use of psychological testing there, we have essentially two characteristics or two tests that we are trying to apply. One objective is to turn up those people that might be emotionaly upset during crisis conditions. This is a test that we have been using now for about ten years in our system operating department and, I believe, in our fossil power plants, to identify those people that just will not take the pace during an emergency.

Speaking only for the system operating portion of it, I feel that testing is very effective. We did subject our existing organization at the time we made that commitment. The test results pretty well parallel the experience of observation that we as managers had at that time with the existing organization. And we feel it has been very successful.

When the security requirements came along, we did apply psychological testing as part of our security program, and we had rejected people based on the results of that test. We will, I think, have the manager of our corporate security group here after lunch, and, if you wish, we can ask him to address this question.

MR. KERR: Thank you.

Mr. Lipinski.

MR. LIPINSKI: Will the test uncover suicidal tendencies? That really pertains to the time the test is administered, because conditions can change in a person's behavior and motivate them differently after you have given the test.

MR. KERR: You are building up questions to ask of the security man or --

MR. LIPINSKI: This is really for the training, because there was a reactor accident in the past where it was a suicide and the reactor was destroyed. And I wonder if your testing can determine that at the time the test is administered.

MR. KEISER: I do not have that answer.

MR. KENYON: One objective of the testing is instability. Now, we recognize that that is a one-time test and the operator or an individual passes it, and then what happens.

A program that we are developing and about to implement is a program to train our supervising people to spot the characteristics of aberrant behavior or potential aberrant behavior, such that if we see something we can refer that individual to a professional for additional testing, counseling.

Included in the program is the option that we will remove that individual from his responsibilities if we feel such action is warranted until we get a proper evaluation. So we are doing an initial screening followed by a program to look at what is going on with the individual and making sure that he continues at the level we previously identified.

MR. LIPINSKI: Okay. Now, in identifying these traits, are you getting outside professional help in terms of what it is you should be looking for? Or is this just internal?

MR. KENYON: No. This involves outside help in terms of establishing a program and what the elements are in the training.

MR. LIPINSKI: To a certain extent, I believe this really applies to people who are screening individuals passing through the airport detection systems. They evidently have visual stimuli that they are also looking for rather than just a weapons test.

MR. KENYON: I cannot comment about that.

MR. KERR: Please continue, Mr. Keiser.

MR. KEISER: Our nonlicensed operator training program consists of a fundamental course which includes basic pump theory, basic physics, basic mathematics, basic heat transfer, fluid flow, et cetera. It consists of a plant systems program in which the operator is taught those systems that he will be responsible for in his job classification.

For example, the auxiliary system operator is taught rad waste building systems and makeup water systems. The nuclear plant operator is taught those systems contained in the reactor building and turbine building. The operator must complete an on-the-job training program demonstrating detailed practical and theoretical knowledge on specific systems.

I would point out that this demonstration, as opposed to shift technical adviser training program, consists of plant systems advanced nuclear theory, thermohydraulics, transient analysis, chemistry, health physics, startup testing, instrumentation, and controls, electrical theory.

The shift technical adviser at Susquehanna is not an entry-level position. On a relative scale, assuming one is a graduate engineer and seven is the plant section head level, our STAs are level five. Therefore, we are speaking of mature, experienced individuals.

The major elements of our STA training program are formal classroom training greater than 760 hours, simulator training 182 hours, an eight-hour written examination, a simulator demonstration, and an oral examination.

(Slide.)

Upon completion, we consider them to be qualified shift technical advisers.

MR. MOELLER: What happens to those who do not pass? My presumption being that these are employees that are put through this.

MR. KEISER: Yes, sir.

MR. MOELLER: Are they then moved to other places within the plant?

MR. KEISER: Yes, sir. These individuals are valuable members of the operating staff. As I mentioned, they are experienced individuals, and we would use them in our normal engineering roles.

MR. KERR: Nobody has failed the exam yet, has he?

MR. KEISER: The exam has not been administered.

MR. KERR: The exam has not been administered.

MR. KEISER: I would like to discuss our technician class training programs.

(Slide.)

All our training programs for the class -- namely, electrical and mechanical maintenance personnel, instrument and control personnel, health physics personnel, and chemistry personnel -- contain the same elements. They start with the selection process for entry-level positions in any one of those craft disciplines. Candidates are given a multiple-part entry-level test which includes reasoning ability, basic mathematics, and reading comprehension.

Successful completion of this battery of tests and other requirements, including psychological examination and security screening, gain the candidate access to a progression-line entry-level position. While in this position, the employee receives general employee training, training in administrative procedures, formal training that is job-specific, and on-the-job training.

Prior to further advancement in a professional line, a person must meet the experience requirements for that position, and then he must take a job-specific technical examination in his discipline.

Upon successful completion and a review of his work performance and if a job opening exists, the employee is promoted to the next job classification in his progression line. For a multi-level progression line -- for example, in electrical maintenance, where there are three levels of expertise -- the basic procedures continues until a person reaches the top of his progression line.

(Slide.)

At Susquehanna we are establishing a biennial training program to assure ourselves that our employees maintain proficiency within a progression-line classification. This program consists of general employee training, administrative procedure training, new technical training, on-the-job training, refresher technical training, supervisor performance appraisals.

MR. KERR: Does it include spelling?

(Laughter.)

MR. KEISER: It includes the ability to write concisely on a work order, yes, sir.

MR. KERR: I think that is an interesting spelling of biennial.

MR. KEISER: The craft men did not write it.

At the end of th. two-year cycle a review of the individual's perfor-- -- w.:l be conducted by a supervisor to determine if that emplo.ee is so qualified to perform the task assigned to that job classification.

Gentlemen, this overview of our training and qualifications program demonstrates the commitment, resourcefulness, and readiness of the Pennsylvania Power & Light Company to safely and successfully operate its Susquehanna steam electric station.

MR. KERR: Are there questions?

(No response.)

MR. KERR: Mr. Keiser, how do you motivate the people who are exposed to this to learn? This is a lot of training, and a person has to have a good bit of stick-to-itiveness to assimilate all this. What sort of motivation does one provide?

MR. KEISER: Pennsylvania Power & Light Company is an excellent company to work for. It is a large employer in that area of Pennsylvania. The company has an excellent rapport with the community. The salaries are equitable with the surrounding area. The job, the work environment at the unit is extremely high. I would say that the individuals that we are employing are just outstanding people.

The construction department, for example, is a key source of input to the maintenance section. We have individuals in the construction department that have ten years' mechanical experience, and they are tired of going from station to station to station. And those individuals are willing to take pay cuts to come into the Susquehanna and start out as helpers just to stay there.

MR. KENYON: Mr. Chairman, Harry Keiser's answer indicates that on the surface everything is terrific, and I do not want to leave you with that impression. Our operators have been in training for a long period of time. The schedule has sl:~ped out, and as a consequence their morale has suffered. They have wanted to get on with it, and there has been training and more training and retraining.

Also, the nature of being an operator in the nuclear industry, particularly following Three Mile Island, has changed considerably, and these people, many are concerned. Some have dropped out because they have said, "I really do not want this." So we have done a number of things that Harry has mentioned to try and make the human climate, if you will, for these operators as good as it is right now.

I do not feel that what we have done to this point is all that we want to do, and we are searching for other ways to make sure that we give the people who are in charge of our nuclear facilities good incentive to do a good job, that we are sensitive to the things that they need in order to do their job properly, that we are sensitive to burnout and man other things that can create a very pressure situation. And you know, perhaps it is job rotation, I think there are other things that we can do to make a situation which we feel is reasonably good.

But we want to make it better, and I think the industry as a whole has to pay more attention to this area.

MR. KERR: Thank you, Mr. Kenyon.

MR. ZUDANS: You do have in the plant a number of components that require specific training by the manufacturers of those components. How is that accomplished?

MR. KEISER: We have job-specific technical training. We have sent our employees to General Electric to see how to repair specific compoments. When we undertake a major repair evolution, we enlist the services of the vendor to come out to the plant and assist us.

We also make extensive use of INPO, with their HPSI workshops and RCSI workshops.

MR. KERR: Other questions? Mr. Lipinski.

MR. LIPINSKI: You made reference to making your salaries equitable for the area. But let us take your computer systems. You are going to be heavily computerized and have to rely on people with that talent. Their salaries are going to have to be commensurate on a national basis. Otherwise, they can move and sell their abilities to someone else who will offer, say, a higher salary.

Now, do you have a salary structure that is graded from the top down, or do you look at the position and try to adjust a salary for that position?

MR. KEISER: The answer is we adjust the salary for the position. But Mr. Kenyon would like to say something.

MR. KENYON: We have had a traditional approach, where every job has a salary that is graded. I mentioned earlier that particularly following Three Mile Island we came to the conclusion that we needed to embark on an extensive recruiting program in order to attract additional experience and talent into our organization.

We found that in endeavoring to do that, our normal salary structure was not sufficient to attract the level of talent that we felt we needed. As a result of that, we instituted what we call a market adjustment program, which basically makes the salaries that we offer sensitive or competitive with market conditions.

We have done that and we attribute a lot of our success to this policy change which allowed us to be very competitive.

MR. LIPINSKI: Thank you.

MR. KERR: Thank you, Mr. Keiser.

This brings us to plant control room. And I have a request from the staff that item 4 under C be covered first because of a scheduling problem with one of the NRC staff members. If it is agreeable to the Pennsylvania Power & Light, I would like to try to accommmodate the staff to that extent, that we cover item 4 first.

And incidentally, I would propose after we finish part C, that we break for lunch, since we are a bit behind on our schedule.

MR. CRIMMINS: My name is Thomas Crimmins, manager, nuclear plant engineering. And we will jump ahead to item 4 under agenda item C and cover the alternate shutdown capabiltity for the Susquehanna units. Excuse us a moment while we get to the right slides.

(Slide.)

I intend to address this as it relates to the comments that were made with respect to the open items this morning. The original design of the Susquehanna steam electric station remote shutdown capability, or shutdown capability from outside the control room, was based on GDC-19 of Appendix A to 10 CFR 50, which required that we have the capability to perform a controlled shutdown to hot standby conditions quickly after a scram was executed in the control room and the operators were forced to leave the control room and that the ability be there to eventually perform a cold shutdown.

During the design of the plant a number of other requirements came into place and recently, as Mr. Stark indicated, there have been some subsequent clarifications of these requirements, some very recently.

The Standard Review Plan was one, and it required that remote shutdown be accomplished in the presence of single failures in the safe shutdown systems and that controls for the safe shutdown be located on panels as opposed to dispersed throughout the plant.

Appendix K has been interpreted to require that automatic ECCS capability remain intact as the operation was shifted to the remote shutdown panel. Also, Appendix R came out requiring that remote shutdown be accomplished from another panel in the presence of a fire in the control room. PP&L's and NRC's review of the remote shutdown capability are complete and, as we see it, there are only two remaining issues.

(Slide.)

The one issue that was mentioned this morning with respect to general design criterion 19, the requirement is that in the event of a single failure, that we are still able to shut down the plant and bring it to a cold shutdown condition or maintain it in a hot shutdown condition and bring it to a cold shutdown condition from outside the control room. In the presence of a single failure, it is permissible to operate equipment locally.

In discussing this with the staff, we did identify that there were some areas where wewould require jumpering of interlocks in order to accomplish that kind of control locally. They expressed the opinion that this was unsatisfactory. We have, in a recent meeting, as of last week, discussed that. One option or one possibility would be to permanently install the necessary wiring -- jumpering, if you will -- with keylock switches or some other type of controlled mode of permitting this jumpering, so that the operator would not have to, on this occasion, perform the jumpering but would rather have it in place.

We believe that there are a few, only a few items, where this would be required. And we are presently looking at the detailed design to identify those and to identify what needs to be done to make those types of modifications.

But conceptually, we are in agreement with the staff. And we would hope to in the next few weeks be able to identify those areas and commit to making those specific modifications.

With respect to Appendix R, both we and the staff have concluded that the remote shutdown capability at Susquehanna is in complete compliance.

One final item: Most of the automatic initiation for ECCS systems is retaine when we shift control to the remote shutdown panel. There is, however, one case where the low-pressure coolant injection system, where when operation is shifted to the remote shutdown panel, this automatic feature is defeated.

We are discussing this issue with the staff and have again conceptually come to an agreement that were we to instruct the operators to maintain -- to not shift control of the LPCI system until absolutely necessarily to accomplish the subsequent cooldown conditions, that this would be adequate compliance to this requirement.

Again, there are some design details that need to be investigated with respect to this option, but we do feel confident that this will also be able to be implemented and we would expect to respond affirmatively to the regulatory staff in the next few weeks regarding this item.

So we understand that these are the only two remaining items. We believe we have a conceptual solution to them. And I think the staff agrees with this and that we would expect to be able to resolve these two issues in the near future.

MR. KERR: Questions.

MR. LIPINSKI: When you talk about permanently installed jumpers with interlocks on them, is there a question of the sequence as to whether one circuit is open before another path is closed? And if the sequence is not done properly, whether you defeat both directions?

MR. CRIMMINS: Well, there may very well be that type of sequence. The jumpers that we are discussing would be clearly specified in procedures that would be created for this contingency, and the proper operating sequence would be indicated in that procedure.

MR. LIPINSKI: It seems that the term "transfer switch" would be more appropriate where you are trying to transfer control from one circuit in one direction to a circuit in another direction, without having to concern yourself with the sequqnce of the operations. Are you electing to install a hardwired transfer switch?

MR. CRIMMINS: Let me clarify. When we shift control from the control room to the remote shutdown panel, the operator proceeds to the remote shutdown panel and does operate a series of transfer switches do shift control.

We are talking now about a subsequent contingency, wherein a single failure has occurred or some failure has occurred where that operation cannot be accomplished, or the equipment that is tied to the remote shutdown panel cannot be operated, so now we have to shift to another set of equipment that is not controlled by the remote shutdown panel and must be operated locally.

In these cases there are a few occasions where, in order to operate that equipment locally, some type of circuit must be jumpered, and these are the instances in which we are reviewing. This is really a third contingency.

MR. LIPINSKI: I got lost in the discussion. The staff made the point that you took care of this for a single train but you did not provide this for the second train where the redundancy from that remote shutdown panel. And I thought we were discussing the transfer of the second train.

MR. CRIMMINS: No, sir, we are not talking about transfering the capability. There is a single train that is connected to the remote shutdown panel which is operable from there. The backup for that, which is the redundancy to the remote shutdown panel, is local operation of the other train.

MR. LIPINSKI: I am still lost. Did you understand that?

MR. KERR: Yes. He said he cannot operate the second train from the remote panel, but he can operate it locally, I think.

MR. CRIMMINS: That is correct.

MR. LIPINSKI: Would the staff please contribute to this discussion as to where the divergency is now?

MR. KERR: Do you understand Mr. Lipinski's question?

MR. LIPINSKI: What is the staff looking for in connection with the shutdown panel?

MR. STARK: Let me try it in a couple of phases here. First of all, I am going to get the reviewer up here. We were first concerned that if there were a need, once you were at the remote shutdown panel, to go to a backup system, as was indicated through equipment failure, we found that it would involve both sending an individual to a local area and, in addition to that, requiring some jumpering of the disconnect switches or the interlock switches that have interlocked you or switched you out against that whole, let us say, Channel B system.

MR. LIPINSKI: Let me stop you and ask a question. What happens if I am up in the control room and I am operating the safety systems from the control room locations? Are the concerns you are expressing now the same that would be expressed with operation from the control room?

MR. STARK: No. You have full redundancy in the control room. Our concern is that whenever you get to the remote shutdown panel, you seem to have good access to one particular channel, straightforward access to one channel and control of that one channel, but if you have to use a backup channel, then you rely on remote operations, defeating interlocks and jumpering interlocks.

MR. LIPINSKI: Is this not the question I asked first, that you do have complete access to one channel in the remote shutdown panel, but you do not provide the same access to the second channel?

MR. CRIMMINS: That is correct, yes, sir.

MR. LIPINSKI: That is the question I asked, and you inferred you had access to both channels on the panel.

MR. CRIMMINS: I did not mean to state that.

MR. KERR: I did not think he inferred that either, but go ahead.

MR. LIPINSKI: Let me ask the question again. Based on the provisions you gave for the first channel in the shutdown panel, you are not willing to provide the same provisions for the second panel on the shutdown panel other than going through a jumpering technique at various points within the electrical systems?

MR. CRIMMINS: That is correct. The remote shutdown panel design basis provides us with a single train operable from the remote shutdown panel. Other controls are pulled together to achieve the safe shutdown condition and cold shutdown condition. The backup to that is the other train operated at various points throughout the plant by local control.

MR. LIPINSKI: Was there some misinterpretation of the staff's requirement as to what that shutdown panel should do, such that you did not account for the single failure?

MR. CRIMMINS: No, sir. We are in agreement with the staff that the remote shutdown panel have, you know, a centralized control of a single string to accomplish this cold shutdown in the event of a lack of access to the control room. It is acceptable as a backup for a failure in those systems to operate other systems locally. That is their design basis.

MR. LIPINSKI: What about the indicators on the shutdown panel, are they in single or are they redundant?

MR. CRIMMINS: They are -- let me say that they are for the train that is controlled from the remote shutdown panel. They are not for the other train.

MR. KERR: Are there other questions?

(No response.)

MR. KERR: Does the staff have any additional comment apropos of the presentation?

MR. STARK: No.

MR. KERR: Okay. Does that take care of the reviewer?

MR. ZUDANS: After all this, now I do not know what the differences are.

MR. KERR: What the differences are? Well, my interpretation -- let me see if I understand -- is that there is agreement now in principle this has to be documented and finally be formally reviewed. Is that where things stand?

MR. STARK: That is correct.

MR. KERR: Is that your interpretation?

MR. CRIMMINS: That is correct.

MR. STARK: We agree something can be worked out, and we are willing to sit down to see if we can agree it can be done and it is reasonably local. We have to do that. We started the discussion, and it looks like there were some mechanisms to achieve a level of redundancy we would be much happier with, and we need to pursue that.

MR. KERR: That is bureaucratese for "We think it can be done, but we are not going to believe it till we see it."

MR. LIPINSKI: I would be very concerned with jumper procedures where the sequence is not performed properly defeats your safety systems. And I think that is the one area that the staff should be concerned about.

MR. KERR: I think the licensee should be concerned about it, too.

MR. CRIMMINS: We are likewise concerned about that, and that will be factored into our design.

MR. LIPINSKI: Most of the errors that we see coming through now are human errors; and when you talk jumpering, you are opening yourself to human error.

MR. CRIMMINS: Yes, sir.

MR. KERR: Thank you for that slightly out-of-order presentation. And I would ask that you now proceed with your other three items, please, sir.

MR. CRIMMINS: In order to get back into order, let me introduce Mr. Steve Cartone.

MR. KERR: Thank you.

MR. CARTONE: My name is Steven Cartone, manager, nuclear support. The remainder of our control room presentation will be divided into two segments.

The first segment which I will be giving you will deal with the historic perspective of the work done by PP&L in developing advance control room concept, followed by a description of the advanced control room itself and a discussion of our most recent human factors review program.

The second segment, which again will be presented by Mr. Crimmins, will deal with the control room instrumentation as it relates to Regulatory Guide 1.97.

PP&L's efforts with regard to the design of advanced control room began in 1971, when a joint Bechtel-General Electric study was commissioned to determine the optimum control room configuration for Susquehanna.

(Slide.)

This study examined the range of control room designs from conventional hardware display to expanded control via interactive graphic display.

(Slide.)

The objective of the study was to provide a control room design that would improve operator response capabilities through a reduction of operating benchboard length and simplification of the display and control devices mounted on these boards.

Guidelines were established in support of this objective. Some examples of these guidelines are:

One, to locate the controls and indications required for normal startup, shutdown, control of unit output, and abnormal operation in a singular location, termed the "unit operating benchboard."

Secondly, the benchboards for safeguards systems shall be separated from those for normal operations.

Third, the standby displays and controls shall be provided to permit continuity of operation following component failure.

And fourth, the control room shall be designed for standup operations and sitdown monitoring.

As a result of this study, the advanced control room concept evolved. CRTs are used exclusively to provide advance graphic and alpha-numeric displays. These displays resulted in a minimization of space requirements, allow the usage of color as an operator aid, presented the information to the operator in a systemized manner that was formatted to closely relate to the required control actions, provide for the storage of supplemental displays to be utilized on demand by the operator, and present displays of processed variables in both a qualitative and quantitative manner.

The usage of CRTs along with reduced-size control hardware led to a reduction of the active benchboard length by a factor of three when compared to a conventional hardwired control room. Similarly, the active instrument service area was reduced by a factor of five.

The optimization study also included the incorporation of human engineering and control room environmental considerations. As a specific example, the location of the CRTs and the contour of the operating benchboards were based upon statistical data on the physical characteristics of man. The CRTs are located at the optimum visual scanning level. The annunciator panels located above the CRTs are bent inward so when the operator bends his head upward he maintains a constant viewing distance between himself and the materials being viewed.

Similarly, the benchboard portion of the panel is maintained to maintain a constant distance between the operator and the controls as he moves his arms. Environmental considerations, such as elimination, texture, color, air conditioning, and background noise were also factored into the design.

(Slide.)

The second major event in the evolution of the control room design occurred in 1974 when a joint PP&L-Bechtel-and-GE effort was undertaken to perform an operability analysis of the control room. Cardboard mockups of the operating panels were made, and personnel with an operating background walked through the Peach Bottom procedures in order to determine the best location and interrelationship of controls and indicators.

Emphasis was placed upon functional grouping to assure that the operator had available at a singular location all of the information he needed pertaining to a specific function.

At this point I would like to show you some slides of the AcR to demonstrate its capabilities and layout.

(Slide.)

This overhead graphic demonstrates the wraparound design of the unit operating benchboards. Thus the area and operator must cover for performance of his duties is minimized. He stations himself, essentially, in the center of this wraparound console to perform those duties. The safeguards panel for Unit 1 and for Unit 2, which includes such systems as low-pressure coolant injection, core spray, automatic steam pressurization, et cetera, are hardwired and located as such (indicating).

A standby information panel is available for refueling. Unit 1, Unit 2. This panel is hardwired and represents a backup which could be used by the operator in the event of multiple malfunctions which might render the computer system inoperable.

The instrument panels on the displays of the standby information panel are arranged in the same sequence as they are on the unit operating benchboard to assist the operator in location should he have to shift from one system to another.

While the two physical units appear to be arranged in opposite hands, the controls themselves are not. The controls are left-to-right in Unit 1 and are also left-to-right in Unit 2. There will be three operators located within the control room, operators stationed at the unit-monitoring consoles for Unit 1, one stationed at the unit-monitoring console for Unit 2, and one at the plant-monitoring console. Each of the unit operators will have CRTs located on his desk where he can pick up all of the information available within the computer.

The individual at the plant-monitoring console will monitor those systems common to both units, as well as have the capaility of monitoring the information specific to both units.

(Slide.)

This slide shows the unit operating benchboard. It points out the extensive use of CRTs. There are a total of ten CRTs located on this benchboard. It also points out the contour of the panel, the alarm, the cant of the alarms, the cant of the benchboard itself. Also, what can be picked up is the functional grouping.

This end of the board is for reactor water cleanup. These are the controls associated with reactor water cleanup, which are presented in mimic form, the CRT which displays those formats for reactor water cleanup and the alarms associated with reactor water cleanup.

MR. CATTON: Can the last CRT pick up information from other portions of the control room?

MR. CARTONE: Yes. The CRTs can back each other up.

MR. CATTON: Okay.

(Slide.)

MR. CARTONE: This is our safeguards panel from here to here (indicating). And then we have plant operations benchboard beyond that. These pictures, by the way, were taken in our simulator building, and the actual control room, the Unit 2 panel would continue on beyond this point.

Additionally, what this slide shows are the CRTs located on the unit-operating console, which is monitored by the Unit 1 operator. Aside from having the CRTs, he also has a keyboard to interface with the computer where he can call up required calculations stored within it.

(Slide.)

This is a graphic display used to monitor turbine generator operation. It has on it metal temperatures, varying vibration levels, indications of lube oil coolant performance. The display has a schematic of the turbine generator and is arranged such that the indication are directly above that portion of the turbine generator which they refer to.

You will note the indications are both qualitative in nature, in that the height of this band can be considered with respect to the total scale to determine where you are in a range, and quantitative in that the actual varying metal temperature is printed out at the top of the scale.

(Slide.)

This is the same display, only now shown in alarm condition. The set point has been reached for these two bearings with respect to vibrations. This little hatch mark represents the alarm set point. So the color of the display has changed to red to quickly bring the operator's attention to this is a problem area. You have the annunciator. You now look at this, and he is immediately brought to the point in question.

MR. KERR: Are your operators tested for color-blindness?

MR. CARTONE: Yes, they are.

MR. ZUDANS: Is this display you just showed permanent or on call?

MR. CARTONE: That particular one is on call.

There is a permanent panel for monitoring main steam in that turbine, and it has certain information on it, but not everything. What would happen, an alarm would annunciate, and then the operator would call up that particular display to home in on the problem..

MR. ZUDANS: Alarm does not initiate recall on CRT of this picture?

MR. CARTONE: No.

(Slide.)

MR. LIPINSKI: Does he have a menu in front of him as to how many different displays he has available for a particular CRT?

MR. CARTONE: Yes, he does.

MR. LIPINSKI: How many are there per CRT in terms of selection?

MR. CARTONE: Is it eight, Bob? I will ask Bob Felker to answer that question.

MR. FELKER: My name is Bob Felker, senior project engineer, nuclear plant engineering.

In the DCS system, which is part of the plant computer system, through rotary switches the operator can recall up to any of the 100 stored PMS formats through the keyboard. The operator can call either the DCS 1 up again or another set of formats, the PMS format, of which there is another roughly 64 formats. Total systemwise, we can have up to 230 formats actually implemented. Right now we have about 164.

MR. LIPINSKI: This is per scope, per display, any one of the -- I am talking about a single display. If I am at the plant-monitoring position, how many monitors are in front of that particular operator?

MR. FELKER: There are two displays.

MR. LIPINSKI: Two displays. Okay. How many displays can he call up on any one of those monitors?

MR. FELKER: At one time?

MR. LIPINSKI: Yes.

MR. FELKER: One display.

MR. LIPINSKI: But the selection, I have a selector in front of me where I am either going to split the switch or press a set of buttons and it is going to give me a display by whatever information I use to call up that display. How many different displays come up on one of those monitors in that position?

MR. FELKER: The menu to select format contains the titles of ten formats per menu. There are 23 pages to the menu, of which it has to page through if he is not already familiar with the CRT format number to require that particular format.

MR. LIPINSKI: At any one of these positions, then, he can call up to 230?

MR. FELKER: On any CRT, any format can be displayed, yes.

MR. LIPINSKI: Okay. Does he have one button to throw the menu up and the 23 pages will then appear?

MR. FELKER: That is a true statement.

MR. LIPINSKI: He also has buttons on the console to make the selection?

MR. FELKER: Two rotary switches and two buttons, yes.

MR. LIPINSKI: How do I get 230 called up?

MR. FELKER: Excuse me. The DCS formats which are normally displayed on the unit-operating benchboard are brought up directly through the rotary switches. That is the first 100 formats. The remaining PMS displays can be brought up through the rotary switches, although there is only one PMS format assigned at any point in time to a DCS CRT. All of the formats can be called up to the menu, which we discussed previously.

MR. LIPINSKI: Okay. Thank you.

MR. KERR: Mr. Zudans.

MR. ZUDANS: My question was answered.

MR. KERR: Thank you, sir.

MR. CARTONE: This is a display of power level.

(Slide.)

One concern that has occurred in several recent events throughout the industry deals with a loss of an instrument bus. I particularly selected this slide to show you what would happen should an instrument bus be lost.

(Slide.)

In that case, the instruments themselves would go downscale and out of range. The computer system would sense that the instruments have failed out of range and would turn the colors of those instruments to white. However, it would not drive the indications to that out of range condition but rather would continue to illustrate what is considered to be the last valid piece of information. So the operator maintains a history presented on that display of the last valid piece as well as an acknowledgement that that instrument presently is in question.

(Slide.)

This is a format of a reactor water cleanup system. It includes a graphic display of the system as well as indication of open valves versus closed valves, a running pump versus a shutdown pump, and again the qualitative and quantitative display of data.

Each main system would have a format display on one of the CRTs in front of the operator in a unit-operating benchboard.

(Slide.)

This is our standby information panel, the one I referenced earlier. It is available in the event of multiple malfunctions of the computer system. Again, it is arranged in the same sequence as the unit-operating benchboard, plus it utilizes color to highlight key parameters to be monitored by the operator.

(Slide.)

One of the tremendous advantages of our system is that it is a dynamic system. We are not locked into a control room that we cannnot change, but rather we always have the ability to update our formats to better help the operator. And this is an example of some of the work we are doing today.

We are trying to come up with a better way to present to the operator a clear demonstration that he has adequate core cooling or he is departing from it. In this particular slide we are showing a normal situation with water level up into the steam separator; the trend has been constant over the past 20 minutes. We also show some additional information that would be important to the maintenance of core cooling.

(Slide.)

This is that same display that would exist, only if the case the water level was trending downward and had decreased to a lower set point. Not only do you see the downward trend but again the change in color, which graphically demonstrates that the operator is getting control. The parameters are available to him to help him assess what he can do to get out of a situation.

In 1908 we performed a human factors engineering assessment of our control room. This assessment met the requirements of NUREG-0660 and 0694. It utilized criteria from NUREG-1580 and an engineering checklist to provide standards for assessment of all properties in the control room. An outside consultant experienced in human factors assessments assisted us in our efforts.

The scope of the evaluation consisted of an operator questionnaire along with a specific evaluation of various elements of the control room. The operator questionnaire proved to be a most valuable tool, in that it gave us a clear assessment of our control room by the user group.

The questionnaire was designed to specifically identify those displays in the control room which were most difficult to comprehend and those which were most difficult to operate. The general conclusion of our evaluation was that the Susquehanna control room favorably addressed human factors engineering criteria in its original design.

We did uncover several areas in which enhancements would be appropriate to aid the operator in the performance of his duties.

(Slide.)

These enhancements generally consisted of color coding and lines of demarcation. There were a few instances of minor functional regrouping which were recommended, and it is interesting to note that some of these were on panels that were not available at the time we conducted our operability analysis in 1974.

In early 1981 the NRC performed its own human factors engineering assessment of our control room. The team comprised of members of the human factors engineering branch, along with some human factors consultants -- this was at Susquehanna -- for approximately one week. They covered areas similar to that in our own assessment and reached similar conclusions.

They praised the extensive use of CRTs that display information to the operator and the use of color to aid him in his duties. Likewise, they identified areas where enhancements could be made in both the short-term and long-term sense. We have studied both the NRC's report and our own reports, to put together an action plan to implement the short-term enhancements by fuel load and to study and determine the resolution of the long-term items.

In summary, our control room was originally designed with the operator in mind. Advanced graphics and alpha-numeric displays were extensively used to present the information to the operator in a clear and concise form. Human engineering principles were followed throughout the control room evolution. And lastly, our control room is a living feature of the plant. Display systems are capable of being modified to always meet the need of the operator.

At this point, unless there are further questions, I would like to turn the presentation over to Mr. Crimmins.

MR. KERR: Are there questions?

(No response.)

MR. KERR: Thank you, Mr. Cartone.

MR. CRIMMINS: My name is Thomas Crimmins. This portion of the presentation is aimed at discussing three specific topics with relation to instrumentation and controls. Those are instruments available in the control room for accident response. Our status of plans with respect to Reg Guide 1.97 and discussion of instrumentation used to demonstrate adequate core-cooling.

(Slide.)

As Mr. Cartone indicated, within the control room a majority of the instrumentation that is required for accident response is located on the reactor core-cooling system's benchboard and on the unit-operating benchboard. And the computers are backed up by the standby information panel.

But the standby information panel and the reactor core-cooling system's benchboard consists of hardwired information that does not rely on the computer. So the operator has available to him in this center core of instrumentation panels 95 percent of all the information he would need to respond to an accident and all the information he would need to respond to the initial stages of an accident.

As I indicated, the majority of the instrumentation for accident response or emergency situations is displayed on the front panels.

(Slide.)

All of the safety information that is displayed on these panels is hardwired instrumentation. Computer indications and CRTs provide nonsafety information on the unit-operating benchboard. All of the systems information is functionally arranged by systems and therefore much easier for the operator to relate to during either normal or emergency operations.

Additionally, the instrumentation is the same type and format that is used for normal operations and therefore there is not any major shift in the operator's instrumentation types in order to shift from normal operation to emergency.

Finally, the other 5 percent of the information which may be needed is displayed on that panel and its general characterization is HBAC information and rad monitoring information. However, all of that information is brought forward or a majority of the information is brought forward on computer display formats for the operator and all of the important parameters within that information set are alarmed on the front panels for the operator's use during emergency conditions.

If there are no questions on that point, I will proceed to our status and plans on Reg Guide 1.97.

MR. LIPINSKI: Question. What about the safety parameter display panel? Do you have such a panel?

MR. CRIMMINS: We do not have a safety parameter display panel at this time, but we will have one in accordance with the requirements and the future schedule for that display.

MR. LIPINSKI: Okay.

MR. CRIMMINS: Reg Guide 1.97 was not available at the time the control design was created. However, we are considerably in conformance with the requirements of Reg Guide 1.97. 93 percent of all the variables required to be displayed in the control room are in fact displayed in the Susquehanna control room, the exceptions being core thermocouples and off-site real-time environmental monitors.

38 percent of the variables comply in all regards to the requirements of Reg Guide 1.97. That is, in range,

in equipment qualifications, both in the instrumentation channel and the power supply. Redundance is hooked up to emergency supply. 55 percent of the instrumentation channels are in some degree in noncompliance, even though the information is available in the control room.

Generally, they are in nonconformance in only one or two of the design criteria, typically in equipment qualification areas, sometimes in redundancy or in the qualification of the power supply.

(Slide.)

We have underway several detailed assessments to determine with specific detail what our compliance is what needs to be done in order to be in compliance with Reg Guide 1.97. Specific action plans are planned to be developed by the first quarter of next year, at which time we will be discussing our plans for the staff and intend to implement as equipment and time are available and consistent with the 1983 requirements for compliance with Reg Guide 1.97.

(Slide.)

If there are no comments on that portion, I will proceed to a discussion of instrumentation for adequate core-cooling.

MR. KERR: Questions.

MR. MOELLER: On the control room, are we going to hear anything about protection of the people inside the control room? And I do not see it offhand, so could I ask a question, if it is appropriate? In terms of the control room, of course, you have charcoal filters and particulate filters to clean up the air and so forth. I am wondering what range of options you have on recirculating the air versus using makeup air. In other words, can you go from totally outdoor air in any series of changes to total recirculation? I mean not every minute amount, but do you have that full range of capabilities? Do you know?

MR. CRIMMINS: I am not sure I understand the question. But we do have the capability of shifting to complete internal recirculation.

MR. MOELLER: All right. But do you have the capability, if you wanted it, for complete outside air; you know, totally bringing in outside air as the air supply?

MR. CRIMMINS: Could somebody pick that one up for me?

MR. KERR: I guess I do not understand that question. What do you mean by "totally outside air"?

MR. MOELLER: In the LER that was filed a couple of years ago at one of the plants, they found that they could not go to 100 percent outdoor air supply to the control room, they were limited to no more than 10 percent outdoor air and 90 percent recirculation.

I wondered if you could --

MR. KERR: 100 percent outside air in how long? I mean you cannot go immediately from the air in the control room to outside air.

MR. MOELLER: I mean to have the air supply to have 100 percent from outside air.

MR. CRIMMINS: The normal mode of operation is 100 percent makeup air from outside air to the ventilation system.

MR. KEISER: That is correct. One of the design bases for the control room was to be able to detect chlorine and isolate the control structure. Under that condition, we totally isolate from outside air and go to recirculation.

MR. MOELLER: On this particular LER, this system did that, it totally isolated from the outside air and was on recirculation. And this was not what was best to do. The better thing to have done was to have brought in lots of outside air, because this plant's cleanup system was not handling the contaminant that was present.

So I simply want to know two things: Can you go from total recirculation to having all the fresh air coming in be from the outside? That is one of my questions.

MR. KEISER: We have that capability, but there are interlocks in the system. It would depend on the unique circumstance.

MR. MOELLER: That is my second question: Can you override, can the control room operator, in case he knows something better than your instruments are telling him, can he override the system and put the room on whatever air-circulating mode he chooses?

MR. KEISER: Let me check with someone.

MR. CRIMMINS: Can we take that question and answer it after lunch?

MR. LIPINSKI: Normally, you have 90 percent recirculation, 10 percent outside. And if you draw full outside air in in the wintertime, the heating coils have to be sized to preheat that air. Otherwise, you get that control room down to outside temperatures.

MR. CRIMMINS: I think we can address that issue. We understand the general question. Let us take it and discuss the design basis for it when we return.

MR. ZUDANS: Was it at this point that you promised to tell us more about core thermocouples?

MR. CRIMMINS: Yes, sir, that is coming up.

MR. MOELLER: One other thing, then, a separate question. And it is not necessarily in Reg Guide 1.97, but it pertains to instruments in an accident situation.

At several BWRs there have been LERs issued wherein the HPSI system was isolated for extended periods of time, for days, I mean a day or two, because the ventilation fan in the compartment through which the steam lines that feed the turbines that drive the pumps on the HPSI, because that fain failed, the temperature rose and the instrument said that the line, the steam line, had broken or, you know, had a break in it, not realizing that what truly happened was the fan that ventilates the area had failed and therefore the HPSI was isolated.

What kind of an instrument do you have on the compartments to detect a break in the steam line that feeds your steam-driven turbine pump on the HPSI?

MR. CRIMMINS: Sir, we are aware of this LER and do have really two systems that isolate for the purpose of sensing a steam break and therefore isolating the steam discharge for either HPSI or RCIC.

MR. MOELLER: What are those?

MR. CRIMMINS: The two instrumentation systems, one is a differential pressure measurement of flow, and there has been some experience in that case with a spike flow on the initial startup, which the circuitry has been modified to put in a time delay so that the steam break is expected. If it is a long steam break, it will isolate. If it is a short spurt, it will not.

The temperature detection uses a number of different temperature detectors, and throughout the spaces and we find that the circuitry that is installed at Susquehanna is subject to the type of isolation event you are discussing, and that circuitry is currently under review to see what modifications can be made to avoid that degree of unreliability.

MR. MOELLER: Okay. Thank you.

MR. KERR: Mr. Crimmins, there may be people who want to eat lunch, and I have an idea that the discussion of core thermocouples is going to take more than ten minutes. Would you strongly disagree if we broke now for lunch for an hour and continued this?

Let us do that then. We will reconvene at 2:20.

(Whereupon, at 1:20 p.m., the committee recessed, to reconvene at 2:20 p.m., this same day.)

AFTERNOON SESSION

(2:22 p.m.)

MR. KERR: We come to item C, something or other, that has to do with core thermocouples.

Mr. Crimmins.

MR. CRIMMINS: My name is Thomas Crimmins.

Sir, one piece of unfinished business. We owe Dr. Moeller a response on control ventilation. We plan to provide that later in the afternoon.

MR. KERR: Thank you.

MR. CRIMMINS: Recently, a study has been done by the BWR owners group and the General Electric Company to walk through the instrumentation necessary for adequate core-cooling. And it started off with a definition of what adequate core-cooling is.

(Slide.)

In the case of a BWR, it is that the active fuel is covered either by liquid or by a two-phase mixture, that there is some sufficient ECCS flow to provide makeup and at the same time sufficient steam flow to remove heat from the core.

The instrumentation in the Susquehanna unit as well as current-day BWRs were indicating adequate water level. Of course, as the water level instrumentation, I will go into a little bit of a description about that system, but were there to be no water level instrumentation, analyses have shown that the flow of at least one low-pressure ECCS system would be adequate to maintain core-cooling, it is sufficient makeup to maintain core-cooling.

Therefore, backup instrumentation to the water level is flow indication on the low-pressure ECCS system, either core spray or LPCI and backup to the flow instrumentation on the core spray system is the pump discharge system on the core spray pumps.

The water level indication system consists of 25 differential pressure instruments, either transmitters or switches.

(Slide.)

These provide indication to the control room and input to the reactor protection system. Six indicators read out water level in the control room, and there are also five recorders which record reactor water level. These are in addition to the computer displays which utilize inputs from several of the channels and display water level in the reactor.

The backup -- by the way, this information is located in the control room on either the standby information panel or on the reactor cooling systems panel. ECCS performnance instrumentation is located on the reactor core-cooling system benchboard and indicates performance characteristics of the lkow-pressure core spray system as a backup to the water level instruments, should none of those be present.

The symptom-based procedures for BWRs which have been developed and have recently been tried out on the Susquehanna simulator utilize these specific inputs as a basis for action on a loss-of-coolant accident or reduced inventory accidents.

We also mentioned earlier the special CRT display that shows water level trend and a multiple-input display, including water level and reactor pressure. Both the staff and PP&L have reviewed the instrumentation available to demonstrate adequate core-cooling at Susquehanna. Based on the instrumentation installed and the symptom-based procedures as well as the walk-through at the plant, they have concluded that there is adequate instrumentation.

However, they did suggest and have indicated they will add a condition to our license to add core thermocouples in addition to the requirements of the schedule of Reg Guide 1.97. I would like to discuss that briefly.

MR. LIPINSKI: I have a question on your level instruments. Do any of the level instruments penetrate the inner shroud to measure the water level on the reactor fuel?

MR. CRIMMINS: Yes. There are two instrument channels which measure what we call a "fuel-zone measurement." They take the variable leg measurement from the discharge of the jet pumps, which is essentially the bottom plenum of the vessel and therefore are seeing the head of water at the shroud.

MR. LIPINSKI: But they are not mechanically connected to the shroud at two points, a low point and a high point?

MR. CRIMMINS: No, they are not. The reference leg for that is connected actually to the annulus of the vessel, but there is clear communication up within the separators and dryers.

MR. LIPINSKI: That depends on what the flow conditions are.

MR. CRIMMINS: That is correct.

MR. LIPINSKI: The top point is where?

MR. KERR: I am sorry. Why does commuication depend on what those flow conditions are?

MR. LIPINSKI: Because you have delta Ps due to flow.

MR. KERR: I do not see that the communication depends on the flow.

MR. LIPINSKI: The delta P --

MR. KERR: The delta P may depend upon the flow, but I do not see that the communication does.

MR. LIPINSKI: I am referring to the delta P, that the instrument illustrates.

MR. KERR: His statement was that there is communication, and I thought you said that depends on the flow. And I was trying to understand what you meant.

MR. LIPINSKI: The communication, to me, implies that as an operator I am going to look at a reading, and I am going to try to make some inference in terms of the reading I see, and that involves the delta P due to the flow that may be present.

MR. KERR: Okay. I see you too are using communication in a different sense.

MR. LIPINSKI: Now, could you repeat what you said the top tab is at?

MR. CRIMMINS: The top tab, which is the reference leg tab, taps into the side of the vessel in the space outside the shroud in the steam space above the --

MR. LIPINSKI: Above the recirculation injection space.

MR. CRIMMINS: That is correct.

MR. LIPINSKI: And the bottom part is below the recirculation plate, at what level?

MR. CRIMMINS: Precisely what level, it is at the very bottom, very low in the jet pump outlet at the bottom.

MR. CATTON: That is some distance then below the bottom of the core?

MR. CRIMMINS: Yes, it is below the bottom of the core; that is correct.

MR. KERR: Other questions?

(No response.)

MR. KERR: Continue.

MR. CRIMMINS: The regulatory staff has indicated that BWR core thermocouples should be installed as a diverse indication of water level, for one reason.

(Slide.)

And secondly, they should be an indication of the potential breach or actual breach of fuel cladding, essentially a direct indicator of fuel conditions. We agree with the merit of these objectives and are willing to evaluate options to see what can be done to improve information available under these even though very extreme conditions.

The NRC position has recently been clarified, as was indicated earlier today, in the supplemental SER for the LaSalle project.

MR. KERR: I would say that the requirements have been clarified. The supplement does not clarify their position to me, but that may be a point of view. You have studied the LaSalle SER?

MR. CRIMMINS: We have, sir. Of note in that is that the NRC did conclude that the most, if not the only, practical location to put thermocouple in the BWR core is in the power range monitor thimbles.

MR. CATTON: Where would the thermocouple be located with respect to the top of the fuel boxes?

MR. CRIMMINS: The specific location, as I understand -- maybe somebody can confirm this -- is about 80 percent of the height of the core. So it would be about two feet below the top of the core.

Can somebody confirm that for me?

MR. CATTON: That is close enough. Thank you.

MR. LIPINSKI: Let me verify your use of the term "power range monitors." Are these the fixed in-core?

MR. CRIMMINS: These are the fixed in-core.

MR. LIPINSKI: 64, 16 locations at four levels?

MR. CRIMMINS: You got me. You mean of in-core monitors?

MR. LIPINSKI: Yes. There are 16 thimbles with in-core monitors, and these are the thimbles that have detectors at four different levels.

MR. CRIMMINS: I know they have detectors at four different levels. I cannot confirm the number. Can someone confirm that?

MR. LIPINSKI: I am just trying to establish what thimbles we are talking about.

MR. CRIMMINS: They are the power range monitors installed in the core. We are not talking about anything new.

MR. LIPINSKI: Okay.

MR. CRIMMINS: The existing power range monitors that are installed in the core.

MR. LIPINSKI: And this is about a foot and a half down from the top of the core where the end of the thimble is at?

MR. CRIMMINS: No. I do not think that is correct. I think the location, the practical limit in the height of the core at which the thermocouple can be installed within that thimble is about two feet from the top of the core.

MR. LIPINSKI: Is that because that is the top of the thimble?

MR. CRIMMINS: No. I believe there is some physical restriction in the thimble. I could not tell you what.

Let me point out that I understand that General Electric will be making a presentation on this subject and their position on this matter tomorrow at the ACRS. We were informed of that this morning. Maybe the specifics of that, your questions can be answered at that time.

MR. KERR: How many thermocouples do you think the staff wants you to install?

MR. CRIMMINS: To my knowledge, that has not been specifically specified, although there was some discussion, and I do not recall whether it is documented, but they were interested in four per quadrant.

MR. KERR: Does the staff have a position on the number that will be required?

MR. PHILLIPS: Four per quadrant is correct. I believe that is specified in Reg Guide 1.97.

MR. KERR: And the location is also specified in 1.97?

MR. PHILLIPS: The elevation is not specified. We discussed that with General Electric, and I believe it said staggered elevations.

MR. KERR: So you would not put all in one tube?

MR. PHILLIPS: The feasibility of putting more than one in an instrument tube, that is the limit, the feasibility limit. So it would be in four instrument tubes at staggered elevations.

MR. KERR: Thank you.

MR. CRIMMINS: As I indicated, the NRC also placed a licensing condition or intends to place a licensing condition on the Susquehanna unit. The BWR owners group, with General Electric, has presented a position to the NRC staff in a meeting within the last couple of weeks, and I understand that is a presentation to be given to you tomorrow.

We have also conducted some independent analysis to try to understand the validity of core thermocouple readings in these locations within the core. The preliminary results of our evaluations tend to confirm those of General Electric that there is some time delay in the response of the thermocouples to actual core conditions. However, they would indicate that core temperatures are increasing, however not in any time to provide any significant information to the operator for action purposes, and only under the extreme very low probability conditions of complete core uncovery.

Prior to that situation, the core thermocouples would not be valuable in terms of their output.

MR. CATTON: How did the GE analysis compare with the analysis that was given with respect to LaSalle?

MR. CRIMMINS: The similar analysis was performed, as I recall, the GE analysis resulted in somewhat of a longer time delay than the NRC, but measured in hundreds of seconds, not significantly more.

MR. CATTON: I think, if I recall, this supplement to LaSalle says one to 1.5 minutes. The NRC analysis that I saw before was two to three hundred seconds. I gather GE conceived of it as longer.

MR. CRIMMINS: My recollection is that the GE analysis was on the order of 500 to 600 seconds.

MR. CATTON: Okay.

MR. CRIMMINS: We find ourselves in a rather difficult position with respect to this licensing condition. We do, as I said, agree with the merits of having some additional indication of core conditions under the circumstances, but are faced with the practicality of such an installation and such an instrumentation system.

We do not feel at this time that sufficient engineering evaluation has been done to substantiate the validity of the requirement, nor do we feel that sufficient engineering has been done to substantiate the point that these will not work at all and not be useful.

In addition, insufficient information is available on what might be the cost and, for that matter, what might be the options to core thermocouples to achieve the same objective.

So we are not at a position to make a commitment to conform to this requirement. However, we recognize the need to be responsive to it and are initiating work to try to decide what could possibly be done to the Susquehanna unit in this regard.

MR. KERR: Questions?

(No response.)

MR. KERR: Now, have you looked at it in enough detail yet to have some at least rough estimate of what it might cost to install the system? Are we talking about $50,000 or $5 million or --

MR. CRIMMINS: There was an estimate in the GE analysis, and I do not recall the number. Is there anyone who can help me with that? It was more on the order of a million rather than $50,000. But I do not recall the exact number.

MR. KERR: Does anyone on the staff remember?

MR. PHILLIPS: That is my recollection, a million. I would not hang my hat on it.

MR. KERR: Do you think that is probably a reasonable estimate?

MR. PHILLIPS: Yes. Well, whether it is reasonable or not, I could not say. I think they made a bona fide attempt to make an estimate on it. So I would assume it is reasonable.

MR. LIPINSKI: What is the status of your in-core thimbles now? Are they loaded with the six detectors installed at the present time?

MR. CRIMMINS: I do not know. Is someone familiar with whether they are already instal ?

They are not as yet installed.

MR. LIPINSKI: The thimbles are empty?

MR. CRIMMINS: The detector itself, which is the thimble element, apparently is not installed.

MR. LIPINSKI: All you are going to have to do, if you are going to have thermocouples, you install thermocouples and neutron detectors.

MR. CRIMMINS: I would be careful. I do not think it is a matter of just installing thermocouples in the tubes. It is a major modification to the design of the power range thimbles, including additions to the bottom where they come out of the vessel. My understanding, it is a signific[illegible] design and engineering problem. It is not just a matter of installing additional thermocouples.

MR. LIPINSKI: They would have to be supported, but the thermocouple sizes we are talking about are not the same as the neutron detectors.

MR. KERR: Is one of the requirements that these be safety-grade, or has that been decided?

MR. CRIMMINS: I have not heard.

MR. KERR: Has the staff decided on whether these should be safety-grade?

MR. PHILLIPS: It would be the same requirements as core-exit thermocouples in PWRs which are spelled out in NUREG-0737. Yes, they are safety-grade. I am sure if in all aspects but --

MR. KERR: Would the systems have to be tested somewhere before they were installed? Would one expect that one would set up a prototype fuel element somewhere in a reactor and do some test work before they were installed in operating reactors? Or is the staff's feeling that in order to meet the schedule, they would probably have to be installed without testing and go from there?

MR. PHILLIIPS: Well, essentially, thermocouples have to be qualified for the environment they are going to be in.

MR. KERR: I am not talking about thermocouples. I am talking about the system.

MR. PHILLIPS: The system itself, I would rather not address environment qualification requirements.

MR. KERR: My question is whether the staff would expect that this would be installed only after it had prototype testing in an environment similar to the one it will encounter in an operating reactor, the system, or whether one would expect that one would take thermocouples and leads and stuff and install it and assume since it just a plain old thermocouple it will work?

MR. PHILLIPS: I believe the requirements for -- the design requirements for thermocouples that will meet environmental qualifications are known.

MR. KERR: We are really not just talking about thermocouples, I think; we are talking about a system which involves a thermocouple and leads and fits into a rather unusual situation and has to have terminations and so on.

It would strike me that it is not your common, garden-variety application of thermocouples. I was just wondering if you expected, wtih the schedule that is being proposed, that there would be time to do the testing that one would normally anticipate would be done before one puts some new instrumentation system in a reactor.

MR. PHILLIPS: Well, that is an aspect of it that I say I think the design requirements in order to meet the environmental qualifications, is known because it would be no different than the same requirements on a PWR in-core thermocouple.

MR. KERR: PWR?

MR. PHILLIPS: Yes.

MR. KERR: It is not a question of what the requirements are that I am talking about, Larry. It is the question of whether thething will work.

MR. PHILLIPS: I understand the question. But what I am saying is that I believe that the design requirements for thermocouples that will work and can be qualified under those conditions are known.

MR. KERR: So you would conclude that testing is not necessary.

MR. PHILLIPS: That is the part I do not want to address because I do not know what the status of our environmental qualification is.

MR. KERR: Somebody on the staff must have thought about this when you set up the requirement.

MR. PHILLIPS: Environmental qualification is known requirements, are known by somebody on the staff.

MR. KERR: Who would I ask to find out if the expectation is that this will go through a testing period or that it will separately meet the design assuming the environmental qualifications are known?

MR. GARGIN (phonetic): Equipment Qualification Branch. Right now there is not a requirement for environmental qualifications.

MR. KERR: There is no requirement for environmental qualifications.

MR. GARGIN: Right.

MR. KERR: But it is expected to be safety grade.

MR. GARGIN: I am not aware of that if it is.

MR. KERR: You are nodding. It is expected to be safety grade?

MR. PHILLIPS: I would call it safety grade. The requirements that are outlined in NUREG-0737 are essentially all aspects of safety grade equipment.

MR. KERR: Can you answer my question about whether the staff would expect that it would be tested before it is installed as a prototype system?

MR. GARGIN: If it is a prototype system and it is used for the mitigation of accidents, then it has to be environmentally qualified. In that case they have to be tested before it is installed.

MR. KERR: And you think, considering the length of time it takes to do this kind of testing, that the schedule that you are requiring can be met?

MR. GARGIN: Well, there is a schedule given in 0737. I think they have to meet that schedule.

MR. KERR: I beg your pardon.

MR. GARGIN: I think there was a schedule in 0737. I think it should be met by a particular date.

MR. KERR: You mean the fact that the schedule is written down somewhere automatically means it is possible to meet it.

MR. GARGIN: Unless there is some indication to the contrary that there is a problem meeting the deadline. I had not seen anything.

MR. KERR: I do not think I am making my question very clear, but maybe I do not know how to ask questions.

MR. LIPINSKI: Mr. Chairman, there is one difference between these thermocouples and those in a PWR. These will be run through the entire length of the core. If they start from two feet from the top, there is going to be ten feet of thermocouple exposed in the highest flux regions of the core, so the NDTs on these thermocouples will be higher than those in a PWR.

But there is one thing to be said. The cabling that is in there for these in-core probes has been qualified and the materials problems are equivalent except for the junction on the thermocouple.

MR. PHILLIPS: Dr. Kerr, let me point out the schedule on this as specified in Reg Guide 1.97 is June '83 for that installation, and I believe 0737 testing is supposed to be completed in June '82, environmental qualification, whatever is required.

MR. KERR: Yes.

MR. MOELLER: I guess I am mixed up on specifying a date in a reg guide.

MR. KERR: This is a NUREG. There are reg guides, NUREGs. This is reg guide.

MR. MOELLER: I missed it.

MR. CATTON: It is a special NUREG, isn't it? Everybody writes NUREGS.

MR. KERR: This is 0737. It is the explanation of the previous Lessons -- Action Plan, I think, isn't it?

MR. PHILLIPS: Reg Guide 1.97 actually specifies the date for the thermocouples.

MR. KERR: Okay.

MR. MOELLER: He is saying Reg Guide 1.97 specifies the date. Now, a reg guide gives you an acceptable approach. Now, what is the alternate to a date?

MR. KERR: Well, I would guess that applicants are being asked to commit to Reg Guide 1.97. They are, aren't they?

MR. PHILLIPS: Yes.

MR. KERR: And I use the word "ask" loosely, and if an applicant commits to 1.97, then it is treated like a regulation.

MR. MOELLER: But you follow my point. Normally a reg guide spells out one acceptable approach to solving a problem. Now, if it had a date -- and if the licensee or applicant can come up with something that is equivalent and does the same job or attains the same goal, then they can do it, and I am mixed up on what would be an alternate equivalent to a specified date.

MR. KERR: Can you help Mr. Moeller?

MR. PHILLIPS: Yes. Essentially on any reg guide that they are asked to commit to, they are supposed to either indicate that they will commit to it or justify why they are not or cannot commit to certain aspects, and if that justification is acceptable to the staff, well, it is accepted.

MR. CATTON: Isn't the date on the ICC inadequate core cooling, is that not January 1982?

MR. PHILLIPS: Not for BWR thermocouples. They are not included in that.

MR. CATTON: Okay.

MR. ZUDANS: The reg guide normally would address the method, not the date.

MR. PHILLIPS: The reg guide in this case includes -- reg guides normally include implementation, and that is where the date --

MR. ZUDANS: That means the method in the reg guide is only good with the date. Is that what you are saying?

MR. PHILLIPS: No. It is an acceptable date proposed in the reg guide for the implementation.

MR. ZUDANS: Very good.

MR. PHILLIPS: That is the general practice in reg guides now. Implementation dates are specified when the reg guide guidelines are to become effective.

MR. ZUDANS: If the licensee says I shall not do that because this is just one acceptable method, are the dates wiped out then, too?

MR. PHILLIPS: If the licensee says that he cannot do it by the date and he gives a good reason why he cannot and reasons why it should be postponed, then the staff reviews that and may accept his alternate approach.

MR. ZUDANS: NUREG-0737 does not have this item, does it?

MR. CLARK: NUREG-0737 does not specifically require the BWR thermocouples. It nonspecifically, in terms of inadequate core cooling instrumentation -- the staff has now taken the position that BWR thermocouples would be required to provide adequate instrumentation and that installation in accordance with Reg Guide 1.97 would be acceptable.

MR. KERR: In my reading of the LaSalle supplement, it was not clear to me whether the thermocouples were being required in order to provide diverse indication of water level or whether they were being required because it was felt they would give some indication on inadequate core cooling, or neither or both.

Could you help me? What --

MR. PHILLIPS: They are being provided to give a diverse indication of water level, which is considered to be an indication of inadequate core cooling. The staff also pretty well accepts the definition that was given by the applicant that when the two-phase level drops into the core, that that is the point of inadequate core cooling, that is, above the two-phase level.

They are also there to monitor the core cooling effectiveness. That is, even if the core is uncovered and you have core spray, that still can be cooling effectively, and it is good to know that your spray is coming in even though you may have flow and so forth, indications to know that it is actually getting there.

So it is also providing a monitor for operability of your spray system.

MR. KERR: What would you do differently if you discovered it was not gettng there?

MR. PHILLIPS: We agree with the applicant and with General Electric that in the case of the procedures they have provided, they have taken all steps necessary to do everything they can to get water to the core. So for stylized scenarios we cannot really say anything that you would do differently. It is an additional piece of information.

The guidelines and procedures are symptom oriented. It does pr' 'de you additional indication of the symptoms, and we feel that under conditions of degraded safety injection where you would have inadequate coolant to the core and there would be no difference from a TMI-type situation, and that anybody in that sort of a situation would certainly want to have the thermocouple information available --

MR. CATTON: How about the emergency plan? Wouldn't you use that information maybe to implement --

MR. PHILLIPS: Yes, yes. Of course, that does not appear in the emergency procedures, but as far as larger magnitude decisions on evacuation and so forth, of course that is very useful from that standpoint.

MR. ZUDANS: What sort of thermocouples are they in the primary coolant system. They already exist, some thermocouples?

MR. PHILLIPS: In the primary coolant system.

MR. KERR: You mean on a BWR?

MR. ZUDANS: Yes.

MR. PHILLIPS: Well, you have your feedwater inlet temperature measure.

MR. CATTON: Steam temperature? The thermocouples are up at the top somewhere?

MR. PHILLIPS: Actually I have forgotten. I cannot recall whether we have other than feedwater temperature, what we have in the system itself. I am not sure there are any.

MR. KERR: Is it considered that this would be valuable if the level indicators were working properly?

MR. PHILLIPS: It is a diverse -- we feel it would be a diverse indication and would be a confirmation to the level indicators and from that standpoint would be valuable. Two pieces of information are better than one.

MR. ZUDANS: Has anyone --

MR. CATTON: How can you measure -- If the level is below the thermocouple, you are measuring saturation and you have no idea where it is below it as long as you have some --

MR. PHILLIPS: We are saying it would only work as a diverse level measurement in cases where your core spray is not coming in so that you are getting superheat. But if your core spray is going over the top of it, it is going to measure saturation. So it will tell you you have cooling.

MR. CATTON: You are not going to have any boiling up to the bypass region if you do not have the core sprays on.

MR. PHILLIPS: If you don't have the core sprays -- yes, you will also get superheat reflected from your clad temperature. That is what the calculations --

MR. CATTON: I looked at the calculations. The calculations only tell you something if you actually are well into inadequate core cooling, and there are lots of circumstances where the level could be partway down in the core. You could have adequate cooling. And those thermocouples are not going to tell you anything as long as you have adequate cooling. They are not going to tell you anything about the level because it is at saturation. I think that is what you are driving at, isn't it, that it is really not diverse, it does not do anything.

MR. KERR: Well see, I do not have a thing about diverse. To me the important thing is reliability. It is other people who worry about diversity.

MR. CRIMMINS: But your analysis is correct. The ohly time a thermocouple would indicate something different is when steam cooling or two-phase mixture is inadequate to cool the core at the location of the thermocouple.

MR. CATTON: It has to be single-phase steam cooling before they are going to begin to indicate anything. Then you have to have some pretty good delta t's in order to drive them across that temperature. Don't get me wrong. I get the idea of thermocouples.

MR. PHILLIPS: That is right, and essentially that is what the analysis that was done was for, and there is some delay in response and it is going to lag 300 or 400 Kelvin behind the fuel temperature, and your froth level will have to be below the thermocouple elevation and below the fuel elevation.

MR. KERR: It strikes me that it is possible that this information could be ambiguous.

MR. PHILLIPS: Well, all I can say is that we have performed calculations and our analyses show that it [illegible] not perfect but that with some delay it will give you an indication, but General Electric has more or less confirmed that although we feel the response is somewhat --

MR. KERR: Don't you perform a calculation by proposing a scenario, and given that scenario, then you can predict what the significance of the thermocouple reading is. But can you predict that the thermocouple reading should not -- cannot have an ambiguous interpretation. What other combinations of situations might give you the same thermocouple reading?

MR. PHILLIPS: Well, that is true. In this case a certain condition was assumed for the scenario. It was on 2 percent decay heat, et cetera. There may be other scenarios but I would think in any case if you have superheat, rather it would indicate superheat as it should be indicating inadequate core cooling. Maybe there are some areas where it would not indicate superheat even though you did have inadequate core cooling.

MR. ZUDANS: Okay. Now, if you have superheat, wouldn't that also be indicated by everything downstream from the reactor? You have to have someplace thermocouples to measure --

MR. CATTON: You could have water over the top and youy could have CCFL occurring on the top where the support plate is, and you could have water up there.

MR. KERR: I have a suggestion. This is extremely fascinating and interesting to me, but since we are going to get the final word from G.E. tomorrow, I am told --

MR. CATTON: Is that part of the Fermi presentation?

MR. KERR: I assume so.

MR. CATTON: Could we make sure the staff people are here who have taken this other position?

MR. KERR: Which other position?

MR. CATTON: Well, they have a strong position in here.

MR. KERR: Yes.

MR. CATTON: The people who are taking that position, if we can get them here too.

MR. KERR: They had better be here to defend their viewpoint. I am sure they will be.

MR. PHILLIPS: That is essentially my responsibility, to defend what is in there. I can tell you now that we have nothing to add to what you will find in the LaSalle SER.

MR. CATTON: I understand, but I have calculations done by somebody named Wheeler, I guess, and Johnston.

MR. PHILLIPS: Wheeler is at BNL.

MR. CATTON: It would be nice to have the person here who understands the details of the calculations so we don't get into these kind of wishy-washy discussions.

MR. KERR: It is hard not to be wishy-washy if you have two-phase flow.

(Laughter.)

Mr. Phillips understands.

MR. PHILLIPS: He is in Seattle and it would be kind of short notice.

MR. CATTON: Johnston is in Seattle?

MR. PHILLIPS: No, Wheeler.

MR. CATTON: The last time we had a meeting on this discussion, I spoke with Johnston. He was here prepared to say something if he asked. Maybe we could be here tomorrow prepared to answer if asked.

MR. PHILLIPS: I think I can present the same thing that he would, but what I am saying is what he was prepared to present the last time was what you see in the LaSalle SER with a little bit more detailed backup to the curves that were presented there. They are basically a summary or an explanation of those curves. But he had no information in addition to that.

MR. KERR: May I declare a temporary moratorium? Please continue, Mr. Crimmins.

MR. CRIMMINS: I had nothing further to say on the subject.

(Laughter.)

Except that I did want to point out that your discussion of the nature of a reg guide as opposed to some other regulatory requirement, a reg guide does obviously provide you with some options to achieve an objective. The elevation of this core thermocouple requirement in our docket to licensing condition seems to have the nature of precluding an exercise of those options to achieve the objective. That is a problem for us that we are going to have to resolve.

MR. KERR: You could always sue, I guess.

MR. CRIMMINS: I suspect we could, yes, sir. That completes our presentation on the instrumentation and control systems.

MR. KERR: Thank you, sir.

Mr. Cantone. This says he is going to talk about emergency planning. Is that correct?

MR. CATTON: I understand the G.E. people were here, and both Walt and I would like to ask a question about calculations they have made of the hydraulic stability, the circumstances where they have a partial ATWS, if they have done the calculations or what.

MR. KERR: Would you write down the question you want to raise and pass it around, and I will see if I can get it to the G.E. people.

MR. CATTON: They are gone?

MR. KERR: I don't know. I did not ask.

MR. CATTON: Oh.

MR. KERR: It would be helpful if it were down on paper.

MR. CATTON: Okay.

MR. KERR: I will see that Mr. McKinley -- I think I can enlist his offices to get it to the right people.

MR. CATTON: Okay.

MR. WORTHEN: I am Tom Worthen, General Electric, and I am not the thermocouple person who will be here tomorrow on the Fermi docket. If you will get me the question, I will certainly pass it on.

MR. CATTON: Okay.

MR. KERR: Thank you, sir.

Mr. Cantone.

MR. CANTONE: This presentation deals with PP&L's philosophy on emergency planning, the support facilities utilized to carry out our emergency plan responsibilities, and the current status of our emergency planning efforts.

Central to PP&L's approach to emergency planning is a clear delineation of the authority to those managers participating in our emergency response efforts. Our approach dictates a succession of responsibility for non in-plant activities from the shift supervisor through the emergency director to the recovery manager, thereby leaving plant personnel with the singular responsibility of establishing and maintaining plant stability.

Additionally we are committed to provide the necessary facilities to efficiently carry out emergency management responsibilities. These facilities must provide sufficient separation between complementary portions of the organization so as to avoid congestion and confusion. However, they likewise must include adequate communication links so as to assure the ability to function as a singular unit with the overall single purpose goal of achieving unit stability while maintaining the health and well-being of the public.

(Slide)

PP&L's efforts begin with a policy statement signed by our president which clearly establishes the role of the emergency director and the succession of responsibility for the emergency director's duties from the shift supervisor to the plant superintendent. To quote that policy, he -- meaning the emergency director -- shall have the authority to act on the behalf of PP&L in all matters concerning an emergency.

(Slide)

Our approach to emergency planning is divided into four phases. The first phase deals with the initial recognition of an emergency condition, the immediate steps to combat that condition, and notificaion of appropriate external agencies. This phase is conducted by our on-shift organization.

The second phase, the establishment of the emergency director's organization, is achieved through the use of call-in procedures by the on-shift organization. The emergency director and his staff will bring to the station an ability to perform technical analyses and radiological assessments. Additionally they will relieve the shift organization of the responsibility to communicate with external organizations, thus leaving them with the prime responsibility to respond to plant conditions.

The third phase is the establishment of the recovery manager and his organization. The recovery manager, along with his organization, will bring to bear resources capable of providing in-depth technical analyses and support as well as radiological projections and assessments.

Concurrent with the establishment of his organization, the main communicating responsibility will shift to the recovery manager. He will likewise be responsible for interfacing with the press and other forms of media. However, at no time will the recovery manager relieve the emergency director of the responsibility for establishing and maintaining plant stability. That will always be the responsibility of the emergency director.

The last phase, one that begins after total plant stability has been achieved, is one of restoration. The goal of this phase is to return the unit to service.

(Slide)

MR. KERR: The word you really wanted was "resurrection."

(Laughter.)

MR. CANTONE: In order for our various organizations --

MR. KERR: There was a question.

MR. RAY: Are you going to touch on it, or can you tell us how you will manage the information as it is assembled on the status of the plant ad the developments? You will recall that there has been an indictment indicating a confusion existed at TMI because potentially the information was not organized nd controlled.

MR. CANTONE: Yes, I will be addressing that point.

MR. RAY: Thank you.

MR. CANTONE: In order for the various organizations I have described to function, it is mandatory that we provide adequate facilities.

(Slide)

This transparency shows the location of those facilities keyed to this effort. The control structure located at the heart of the main plant contains the control room, the technical support center and the operations support center. Our emergency operations facility is located approximately one-half mile from this structure. As our emergency operations facility may not be available at the time of fuel load, an interim emergency operations facility will be located at our simulator building.

(Slide)

Our on-shift organization is comprised of 11 individuals headed by the shift supervisor. He has on-shift technical resources through the shift technical adviser. The emergency director's organization is established along functional guidelines. Technical support consists of individuals knowledgeable in reactor engineering, thermal hydraulics and other related subjects.

Operations activities, that is, plant monitoring, accident assessment, corrective actions and damage control are coordinated through a singular individual. Both on-site radiation monitoring and off-site dose projection and assessment are carried out under the radiation protection coordinator. Additionally we have people to assist in security, administrative and communication functions.

(Slide)

As discussed in an earlier presentation, all safeguards instrumentation is hardwired and primarily located on a singular panel to allow for ease of accessibility and evaluation. During the initial stages of the incident, the shift supervisor, assisted by the shift technical adviser and in concert with the control room operators, will be performing their initial assessment, corrective actions and communcations activities from the control room.

The operations support center is located at the same level and adjacent to the control room. On-shift plant personnel will report to this center in order that they may be assigned monitoring or damage control activities as deemed appropriate by the shift supervisor.

(Slide)

The technical support center, which I have overlaid over the control room, is located one level above the control room. Voice communication links exist between the technical support center and the control room. The front windowed area of the technical support center will allow for reinforcement of these verbal communications througy visual interplay.

In the event direct face-to-face contact was desired, access between the technical support center and the control room is afforded by stairwells at either end. This arrangement allows both an ability to have intimate contact when necessary but yet clearly establishes separate work areas so as to avoid confusion and conflict.

MR. CATTON: Can you read the instruments from those windows?

MR. CANTONE: It is difficult to read the instruments. What we do have in the technical support center is a CRT that is capable of displaying all the information that the operator has available to him.

MR. CATTON: Good.

MR. LIPINSKI: You have drawn those windows right across the so-called back panels. Is there an interference problem?

MR. CANTONE: The technical support center is physically one level above.

MR. LIPINSKI: We are looking at a cross-section in vertical.

MR. CANTONE: The control room at the back end, I guess, is about 20 foot high. The technical support center is now on top of it.

MR. LIPINSKI: Okay.

MR. ZUDANS: And this is an empty space in front of the windows.

MR. CANTONE: That is correct. This would all be empty here (indicating).

MR. ZUDANS: They can look through the windows and see all the boards except they cannot see, but they do have their own CRT so they can recall it.

MR. CANTONE: That is right. But it would allow the operator to physically point to something and the man in the TSC to at least appreciate what he was pointing to, and if necessary, as I said, through the stairwells they could come down and make a direct --

MR. ZUDANS: They also have the same instruments in the SPDS, isn't that right?

MR. CANTONE: That is right.

(Slide)

This slide shows a little more of the detail of the technical support center. Approximately 2200 square foot in size, it is designed to have 25 individuals. It has been assumed that five of these individuals would be representatives of the Nuclear Regulatory Commission. We have provided a conference area for the Nuclear Regulatory Commission as well as a conference area for plant personnel. The work areas have been arranged so as to provide for visual interplay with the operators and direct access to the monitoring area of the TSC.

As I said earlier, the monitoring area of the TSC will have a CRT with the same capabilities to draw information as the operator has in the control room. The technical support center will be activated during all alert site and general emergency conditions.

MR. LIPINSKI: What about the ventilation? Do you share that with the control room downstairs?

MR. CANTONE: Yes, we do. The same is true of the operations support center. It shows just off to the side of the control room.

The recovery manager's organization, like that of the emergency director's, has been established along functional guidelines: technical support, site support and contact. Administrative support and radiological management activities are all provided for. Additionally, public information is the responsibility of the recovery manager. A general office manager will head up our home office effort to provide the design and calculational support activities required to supplement the on-site capabilities of the technical support manager's organization.

Now, there will be a direct communiations link, in response to your question about emergency information management, between the public information manager and the recovery manager. We do intend to provide a technical individual to the public information manager who will be conversant with the actual conditions within the plant and how they are progressing so that the public information manager is speaking on a purely factual standpoint.

MR. RAY: I presume you are going to have releases of the information so that you will know what information has already been released.

MR. CANTONE: That is right. The releases will generally be approved by the recovery manager and the public information manager, and they will be participated in by the Pennsylvania Emergency Management Agency and the NRC.

My presentation has hit an emergency.

MR. ZUDANS: I can ask a question in the meantime. I recall when you discussed the accident response and mitigation phases, four phases were indicated and you had to activate the emergency organization, the recovery organization. Do you have a time scale for these functions and where do you get the personnel from?

MR. CANTONE: Our time scale for activating the emergency director's organization, which is the second phase, is a 30 to 60 minute time frame, and these are personnel that perform the normal plant management activities. They live in the surrounding area of the plant. The recovery organization, those personnel would be individuals who normally work out of our general office in Allentown, and we will establish the EOF as a functional entity within four hours.

(Slide)

The recovery manager's organization will function out of the Emergency Operations Facility. This facility will include office space, general work space, kitchen, eating-type facilities, storage facilities, and we have accommodations for sleeping facilities if necessary. The general work area will be divided into three sectors. One sector will be used for administrative support, that is, the call in of personnel, logistic support, procurement and clerical services.

This particular area will be soundproofed with respect to the other areas in recognition of the high amount of noise that will take place. The other two areas represent our technical support and our radiological assessment. Status boards will be maintained on the front wall to indicate radiological conditions, technical interplays as well as procurement activities.

Along the side and back walls we will establish the various area maps that are necessary for the full tracking, dose projection and dose assessment activities. The EOF is approximately 16,500 square foot in size and will easily accommodate 50 people. We have a backup to the EOF which is located in our Hazelton service center, which is approximately 13 miles from the site should for some reason this building become uninhabitable.

(Slide)

As I said earlier, adequate communications are imperative to the proper functioning of our emergency management activities. We have five distinct types of communications within our emergency management system. The first is the normal telephone system. We have two separate PBX's located on site and numerous hotlines for communication for both within our own facilities and with local, state and federal agencies.

We also have a public address system and a maintenance test jack system located within the plant. The public address system has five channels of communication. The maintenance jack system is a system that allows for plug-in of headsets at various locations within a plant and for communication with a similar headset in the control room. Additionally we have two radio systems, a UHF radio system which can be utilized for local on-site communications related to the security, emergency activities such as damage control, and also for the call-in of personnel located on-site.

We have a VHF radio system which will be utilized to call in personnel off-site as well as to communicate with our emergency monitoring teams as they are dispersed to the local areas. It also will serve as a backup communications vehicle with personnel in the general office in Allentown.

I would now like to address the status of our emergency planning software activities. In May we submitted Revision 4 of our emergency plan. This revision has been reviewed and judged satisfactory pending the inclusion of some additional information and resolution of the manning time requirement at the Emergency Operations Facility.

We have met with the staff and agreed upon what additional information is required. This information will be provided in Revision 5 currently slated for the September time frame. We are meeting with the staff in the near future to resolve the manning time problem for the Emergency Operations Facility within our ten-mile EPZ.

MR. KERR: What is meant by manning time?

MR. CANTONE: The NRC has indicated that they would like to see the EOF manned within a one-hour time frame, and we have proposed a four-hour time frame.

MR. KERR: Thank you.

MR. CANTONE: Within our ten-mile EPZ there are 29 local municipalities located within two counties. Twenty-seven of these twenty-nine municipalities have complete emergency plans. Of the remaining two, one is almost complete and the last one is being pursued at this moment. Both counties have submitted their plans to the Pennsylvania Emergency Management Agency for review and that review is slated to be completed by mid-August, at which time the plans would be submitted to FEMA for the informal review.

We have targeted completion of that review for the beginning of October. Following the completion of the reviews and the necessary changes to the plant to address the comments generated, we will test our plan as well as the plans of all the local and county agencies during a full-scale drill.

This full-scale drill is scheduled for mid-March, 1982. Final approval of our emergency planning efforts awaits successful completion of that drill.

That concludes my presentation unless there are any further questions.

MR. KERR: Thank you.

Are there questions? Mr. Moeller.

MR. MOELLER: I had a couple of questions. You have answered many of them. The warning system, the alerting system has been installed.

MR. CANTONE: It is not quite complete. It will be complete by the fall of this year.

MR. MOELLER: Well, I have a question on it. Is it seismic Category I?

MR. CANTONE: No, sir, it is not.

MR. MOELLER: We have asked this question several times because under the final emergency planning rule that the NRC issued, as I interpreted it, the rule says that emergency planning is to be considered on an equal basis to siting and good reactor design operation and so forth, and I just wondered if you had given any thought to that. Of course, you are not in a very seismically active area.

MR. CANTONE: We are in a relatively stable area, plus in the unlikely event something were to happen, there are backup means available through the local municipalities' plans. They have provisions for the usage of town and county vehicles and, if necessary, backup by the state police to notify the public to get them to turn on their TVs or radios to hear the messages being broadcast.

MR. MOELLER: Thank you.

Well, now in terms of the water users downstream, I gather Burwick is seven miles and Danville is 31, and in your response, I guess, to consideration of any problems there, you mainly pointed out that if liquid waste were released on site and traveled through the groundwater, there would take so much time that everything would be fine.

Is there no way that you could have a spill that would gain access directly to the river?

MR. CANTONE: I am not aware of any way. I could not categorically answer that question.

MR. MOELLER: Do you have information on how long -- what is the time of flow to Burwick and to Danville?

MR. CANTONE: No, I do not; but I think one thing I should point out, Danville is the source of water for a large area and we have installed an in-line radiation monitor at the uptake to the Danville reservoir.

MR. MOELLER: You will maintain that, then, for them?

MR. CANTONE: We are working now with Danville on exactly how we will interface on that particular monitor.

MR. MOELLER: That is a very good piece of information. Do you know, does Danville have a raw water storage so if you did, through something that we cannot project at the moment, if you had a serious spill, they could live off their raw water storage until it passed by?

MR. CANTONE: The reservoir itself.

MR. MOELLER: They have a reservoir? What, they pump the water from the river into a reservoir?

MR. CANTONE: That is what I understand. Is that correct?

MR. MOELLER: I would simply like to know do they have raw water storage and how many days.

VOICE: Two days capacity.

MR. MOELLER: Okay, thank you.

In your last question, in excavating and backfilling around the reactor, of course you put soil and dirt back in. Was any consideration given to whether this soil would hold fission products in case you had a very serious accident and there was considerable leakage of fission products into the soil beneath the plant, to either plant?

MR. CANTONE: I would have to look out for an answer. I do not know.

MR. KERR: Is the question clear?

MR. MOELLER: Well, we can hear that one later. I have one last question.

MR. KERR: Do you have an answer?

MR. MCNAMARA: My name is Ray McNamara, Civil Group supervisor, PP&L. In our FSAR submittal we addressed all of the postulated paths for leakage of radioactive material. The main power block buildings are all on hard sandstone rock foundation. We excavated into that rock and we backfilled around those buildings with sand, cement, flash, backfill material, which was relatively impervious. So in answer to your question, we designed around it and we addressed the flow paths.

MR. MOELLER: Do you have any idea how good this backfill material would be for the retention of radioactive materials?

MR. MCNAMARA: No, sir. We have not tested it, but I would say it would be similar to a very weak concrete.

MR. MOELLER: Okay. Does the staff look at that aspect at all?

MR. STARK: I would like to --

MR. KERR: Do you understand the question, Mr. Stark?

MR. STARK: Yes, I think I do. What I would like to point out is that we in the FES in Chapter 6 address releases to groundwater in general, and I will read a statement that appears. It says the staff conservatively estimated that the travel time in groundwater to the river to be 9.2 years. At the time we were looking at the consequences of a Class 9 accident, but I believe it includes what you are interested in also.

MR. MOELLER: Well, the statement is there but it does not answer my question. I mean if you are going to backfill, why don't you backfill with something that would retain radioactive material if you have an option?

MR. KERR: Are you suggesting that they ought to reexcavate or is the statement being made for the future?

MR. MOELLER: It is being made for the future.

MR. ZUDANS: It is a quasi-concrete backfill.

MR. MOELLER: What would be your estimation, Zenons?

MR. ZUDANS: It is better than sand.

MR. MOELLER: Do you know if it is comparable, say, to clay?

MR. ZUDANS: It is not watertight.

MR. MOELLER: It is not watertight.

My final comment was -- sometime when some has the time I would like to be shown how to read Figure 2.3-1, which is the windrose for the site, which is some new type that I am not familiar with.

MR. CANTONE: Would you like us to go over it now?

MR. MOELLER: I will talk to someone.

MR. KERR: It is in the FES?

MR. MOELLER: SER figure, page 2-8.

MR. RAY: The response to the effect that it takes 9.2 years for groundwater to reach the river, is that from the plant site?

MR. STARK: That is correct.

MR. KERR: That is slow water.

MR. RAY: Yes.

MR. KERR: Other questions?

(No response.)

MR. KERR: On the conclusion of the Applicant's emergency plan as found in Supplement 1 to NUREG-0776 there is a statement that the following items require additional clarification, and one of the items is the development of procedures and an on-site stockpile of thyroid blocking agents for distribution to emergency workers. I presume what I read that that is not a point at issue, it is just that you have not done that yet. Is that correct?

MR. CANTONE: That is correct.

MR. KERR: Where does one find the rule that applies to this? Is it part of the emergency planning rule that applies to the thyroid blocking agents and their use?

MR. CANTONE: I am not sure where one finds the actual need for that. What we have done is we discussed this issue with our radiological people and asked their opinion, and in fact if you recall earlier it was discussed about the radiological advisory committee. We also brought that matter up and it was a joint consensus of our advisers tha we could use the thyroid blocking agent on the basis that the emergency existed, it was a sufficiently high dose, was going to be received by an individual, that we did whenever possible precheck with a physician prior to doing it, and that we have available an antidote. Apparently one of the side effects of taking KI could be a reaction similar to someone allergic to penicillin.

MR. KERR: Is this a requirement of the staff, this number 6, or is it something you suggested?

MR. CANTONE: We had originally in our plan that the emergency director be responsible for determining the usage of KI tablets. The staff asked for some clarification wih respect to what guidelines were utilized in giving out that medication.

MR. KERR: Is it a staff requirement that this be available or is this something that they suggested and you said if you are going to do that, let us see the guidelines?

MR. CHESNUT: NUREG-0654 contains -- which is essentially like a reg guide as far as the staff is concerned, this is guidance for protective measurements for emergency workers, both for the on-site emergency workers and for the off-site emergency workers, and it includes provisions for potassium iodide or other radioprotective drug. The words "potassium iodide" do not appear in the regulation 10 CFR 50.

MR. MOELLER: Did you say NUREG-0654 recommends these or requires them of the licensee? What is the answer?

MR. CHESNUT: NUREG-0654 is a guidance document and it just merely contains a staff position.

MR. MOELLER: What is the staff position?

MR. CHESNUT: It is that emergency worker procedures should be devloped and an on-site stockpile should be maintained.

MR. MOELLER: Okay, thank you.

MR. KERR: Or some sort of blocking agent. It does not say what.

MR. CHESNUT: Well, we have interfaced with the Food and Drug Administration, who is developing some guidelines, and EPA also and protective action guidelines. Potassium iodide is a current licensed drug. There may be some other drugs that appear.

MR. KERR: It appears to me I read somewhere in the past that if one were exposed to radiation, it would be helpful if one were saturated with alcohol. Do you suppose this is a possible blocking agent?

MR. MOELLER: No, but being a Southern Baptist --

(Laughter.)

-- what I would prefer is to eat several lobsters. You can get your iodine that way.

(Laughter.)

For matters of the record, I think there is much more to be done here. They have not had their drill, FEMA has not reviewed it, the NRC has not reviewed what FEMA will say and so forth. So what we are close to, nine, ten months away from wrapping up emergency planning.

Didn't you say March or something would be your drill?

MR. CANTONE: March will be the drill. We hope to have a review of the plans finalized by the fall of this year, but the actual drill will take place in March.

MR. MOELLER: And I presume the drill has to be observed before the final approval of your emergency plan.

MR. CANTONE: That is correct.

MR. MOELLER: Okay.

MR. KERR: Another requirement. The staff is asking for the applicant to provide them with drafts of public education/information material for review. Tell me, what is the purpose of this review and what guidelines does one use for review of public education/information material?

MR. CHESNUT: Yes, sir. In order for an emergency plan to be effective the public has to be aware of what the range of protective actions are and what they should do in the event when they hear the sirens and how to get additional information and be aware in general terms of the problems caused by radiation, and this is also directly related to the emergency planning regulation in 10 CFR 50, 147(b). There is a planning standard for emergency plans to include this type of information for the general public within approximately ten miles of the reactor site itself.

We have some guidance in NUREG-0654 which contains the types of information that we look for, as I stated before, basic information on radiation, what to do in the event of an emergency, possible evacuation routes or whatever, to take shelter or whatever. So we asked for this type of information from the licensee in a draft form even though -- you know, before we had finally approved the emergency plan, we like to know what they put out to see if that information is adequate.

MR. KERR: How do you measure adequacy?

MR. CHESNUT: Well, I think --

MR. KERR: Is it up to the individual reviewer, his judgment, or is there some set of guidelines to be followed?

MR. CHESNUT: We have three or four or five items in NUREG-0654 which we consider as elements to be included in the public information, and beyond that there is no further guidelines.

MR. KERR: So the public education/information material to which you refer here is that that deals specifically with emergency planning, not any other information or education information that they might use.

MR. CHESNUT: That is correct.

MR. KERR: Thank you.

Are there other questions?

(No response.)

That's it. Thank you, sir.

MR. CANTONE: Thank you.

MR. KERR: That gets us to the 1:30 p.m. part of the presentation, which is on station electric power, and which I show Mr. Curtis leading off.

MR. CURTIS: My name is Norman Curtis. We are sensitive to the fact that we are running about two hours or more late behind the agenda schedule. We have taken steps to abbreviate portions of the remainder of our presentations. Each of our presenters will identify, if he has taken that liberty, just what he is eliminating or shortening and will describe the character of the steps he has taken, so if you want to probe him further, please do so.

MR. KERR: Don't eliminate anything that you consider relevant, because I can stay here until whatever time is necessary to listen to you. I think my colleagues can also.

MR. CURTIS: It is our intention to address the remaining agenda items completely and thoroughly, but some of the details may be struck at this point.

The next subject is station electrical power, and in introducing that subject we would like to cast a flavor with regard to the discussions to follow. The subject of reliability of electrical power supply at Susquehanna has been a continuing concern to PP&L. In presenting an assessment of the safe shutdown capability of our plant, it was essential to consider the physical arrangement and the operation of equipment both within the plant and external to the plant.

Our presentation will cover the following subjects. First a description of the transmission facilities supplying the plant, including transients and analyses performed for the Susquehanna plant itself. Second, operation of the PP&L power supply system. Third, design and operation of the plant AC and DC power system. And then finally, a variety of subjects related to station blackout and testing of the plant under blackout conditions.

With regard to testing the performance of plant systems under actual or simulated power conditions, we are extremely concerned about the potential to do damage to equipment or setting up unsafe operating conditions during the test. Our studies are not yet completed, and until they are we will be very cautious in committing how we will perform major loss of power tests. We will go into further detail on that later.

You may have detected from some of my introductory remarks this morning that buried somewhere in my background is a little experience with the system operating function, and we had planned to digress a little bit to try and stress the importance of operation of the bulk power supply system. This is one of the areas that we will be striking from or presentation this afternoon. It is not directly instrumental in coming to conclusions with regard to the safe operation of Susquehanna.

MR. KERR: Let me ask a couple of questions, then, if you are going to strike that. First, have you made a calculation from which one could get some information about the probability whether you would lose all off-site power for a period of two hours.

MR. CURTIS: I will ask Dave Cole, who will follow me, whether or not systems planning has performed such studies. Certainly probability analysis is part of the normal planning function. Putting on my system operator hat, I would argue that it is immaterial from the ope tional standpoint whether or not those studies have been completed.

The argument would go on to say that irrespective of the facilities that had been provided, the system operator does have the ability to substantially enhance the performance of the system. He does this by going into a variety of emergency modes, including not only exercising equipment that is on line and operating, but continually preparing for contingencies, and part of that preparation is the preparation to drop customer load so that as facilities are lost, he continually matches the available supply with a demand on hand.

MR. KERR: Mr. Curtis, I find invariable that people who operate utilities, I have a lot of respect for them, look me in the eye when I ask this question as if it is absolutely incredible to think about losing power for a period of two hours. On the other hand, I find that this happens occasionally and I just wondered if anybody had made an effort to estimate that probability.

Most recently I think it happened to the city of New Orleans. I don't know for how long, but apparently it was for an appreciable time, and the last report I read was that nobody really quite understood why it had happened. Now, if nobody understands why it happens, then it is difficult for people to anticipate what to do to prevent it, it seems to me, and I know this is not likely to happen in Pennsylvania because things are different than New Orleans.

MR. CURTIS: I will back into an answer without using probability studies. Pennsylvania Power and Light is one of the few utilities in the country that has had a total blackout, at least within the memorable past. That occurred in 1967 and I was involved in that situation. I was in the control room at the time of the happening, and the people hours afterwards when we restored the system -- I guarantee you that it will never happen again.

I think we learned from that experience and other similar conditions around the country. We have developed a rash of new criteria for not only designing and operating our system -- I think conditions have drastically improved. I think it certainly can and probably will happen again, but I do not consider it to be a high probability event.

MR. KERR: I would hope it would not be also. I was just trying to get some idea of how low a probability event it is.

MR. CURTIS: I understand. Dave, would you address this when you get up?

MR. RAY: Question. A question following up on Dr. Kerr's. Let's assume there is an area blackout. Do you have a restoration procedure that favors Susquehanna to get back as quickly as possible from sources in the Susquehanna in preference to other loads?

MR. CURTIS: We have a firm commitment from our system operating department that Susquehanna gets number one prioririty for restortion. Their first objective will be to restore one or more or as many sources back to the plant as they can, and in as reliable form as they can, and then behind that, PJM, the Pennsylvania-Jersey-Maryland interconnect with which we have an agreement, has a similar arrangement with regard to all their plants.

MR. RAY: Have you done any analysis that indicates how quickly you can get back in an extreme situation?

MR. CURTIS: Yes. This is a regular practice. Susquehanna has not been specifically factored into the analysis yet, but the estimate is that a reliable source would be back into the plant following a total blackout in the time frame of 30 minutes to two hours, and there will be specific procedures in place for that purpose.

I might point out that it is a normal practice of our system operators to go to a regular training and simulation process, demonstrating and training for these restoration procedures.

MR. RAY: One of the traps that system operator can fall into very easily which could lead to cascading of lines and embarrassment from the system's viewpoint is whether or not he concentrates all this reactor generation in one source or a limited area. What is the PP&L policy for spreading this around the system from the viewpoint of area protection?

MR. CURTIS: We do have a requirement that the control of voltage is high in the priority in the actions of the system operator. He does monitor voltage control. He does distribute the reactor power supply, and there are criteria for that purpose although I cannot quote them today. Part of the monitoring is through a real-time computer system where the computer is continually scanning nd then going through a simulation process where the next contingency, that is, the tripping of a line is simulated and the results are determined and passed on to the system operator.

MR. RAY: So he would redistribute his reactor generation to meet that anticipation.

MR. CURTIS: And if he cannot satisfy the criteria,, he must take corrective action.

MR. RAY: Thank you.

MR. LIPINSKI: The plant is designed to meet seismic requirements, but what about the rest of your grid system external to the plant? Are there any seismic requirements for distribution towers, substations, et cetera?

MR. CURTIS: I am not aware that there is.

MR. LIPINSKI: If a seismic event occurred, the plant might survive but you might not have outside power for some extended period of time.

MR. CURTIS: That is a possibility. I am not sure that we have anybody who can address that. If you can, would you please identify yourself.

(No response.)

Let's get an answer to that question, please. I hesitate because there might have been special requirements set up at the time the transmission system additions were designed for Susquehanna.

MR. LIPINSKI: Professor Kerr, you got to see the report with the photographs. There was a report prepared by Purdue University on photographs of electrical systems throughout the country on earthquake conditions in terms of what happens because there are not any requirements placed on the placing of transformers, the towers, the insulators and they do not survive during the earthquake.

MR. KERR: I do not think anybody doubts that earthquakes can displace electrical equipment.

MR. CURTIS: At this point I would like to introduce David Cole, who will pick up the transmission design portion.

MR. COLE: I will try to answer Dr. Kerr's question right at the top. We have done a brief probability analysis of the loss of supply to both offsite sources. You threw one curve at us whenever you said for up to two hours. Our probability calculation looked at what was the probability of losing both offsite sources concurrently regardless of the duration. So whenever you put an additional resriction on it as to whether it is going to last ten minutes or two hours --

MR. KERR: I will take that probability.

MR. COLE: It is on the order of 10^{-5}. If you are looking at a frequency, that frequency is on the order of 10^{-3}. That would be occurrences per year.

MR. KERR: 10^{-3} per year.

MR. COLE: Yes.

MR. KERR: Thank you.

(Slide)

MR. COLE: My part of the presentation would deal with a review of the stability studies, including a worst condition of loss of the largest unit on the PP&L system. What we will be discussing here is the electrical stability of the system, not any boiler stability. Basically the electrical stability of the system, the ability of the generating units of the system to maintain synchronous with each other.

(Slide)

Before going into the actual stability, the stability of the system is inherently tied into the strength of the transmission system, which is interconnected. Therefore, I would like to review very quickly the transmission system related to Susquehanna. Unit 1 is tied into the PP&L PJM grid at the 230 kV voltage level at the Susquehanna 230 yard. This yard has eight 230 kV lines emanating from it, one of those lines being a yard tie between the 230 yard and the 500 yard. Unit 2 is tied into the grid by two 500 kV line, the Susquehanna to Sudbury, Susquehanna to Siegfried. It also ties into the 230 system by that same 500 kV yard tie.

This provides a very strong system both from a thermal capability viewpoint and a stability viewpoint.

(Slide)

MR. KERR: I am sorry, what was the first word, thermal capability?

MR. COLE: Thermal capability. That is the ability of any line not to become overloaded.

MR. KERR: Thank you.

MR. COLE: Part of this analysis was the supply to the main startup transformers. The system was designed and planned so that no single transmission event would take both startup transformers out of service at the same time. In addition, it is supplied in such a manner that we have four substations supplying the two startup transformers, Montour switch yard, the Susquehanna switch yard and the 500 kV switch yard. The complete loss of any one of those transformers will not interrupt permanently the supply to either one of those startup transformers.

If we were to completely lose, say, Montour, we would get a short interruption to this transformer until that fault was isolated. Once that fault was isolated, both transformer would be back in service. So that we feel we have a very strong supply of those startup transformers.

Moving to the stability question.

MR. RAY: Question. The restoration of these transformers is manual?

MR. COLE: They can either be manual or automatic, but depending on what cost problem, if it is an intermittent ground on the line, it would be automatic. If it was the case of a conductor falling down, laying on the ground, then it would involve coming out here, isolating at this point.

MR. RAY: In other words, you do not have automatic sectionalizing in those lines.

MR. COLE: Not sectionalizing, no, sir.

MR. KERR: In the experience that you have had at PP&L, have you had a situation in which you have had a direct strike on a transformer bushing or on a transformer, a directly lightning strike?

MR. COLE: On a bushing of the transformer? Not to my knowledge. We have had transformer fail with bushings, et cetera. We have lightning arrestors on the bushings, so it is coming in from the transmission line.

MR. KERR: I recgognize the design -- I mean I think the design is likely to preclude this but I just wondered if you had had any experience at all which you had even though your design protection and so on was such that you had direct strikes on something like a transformer.

MR. COLE: I am not aware of any at all, and I think typically the way a substation is built, it would be almost impossible for a lightning strike to hit that without some other structure being higher.

MR. KERR: I do, too.

MR. COLE: In our history I do not recall it.

MR. KERR: Thank you.

MR. RAY: Well, you have lightning masts at all your substations, don't you, and switch yards such as this one?

MR. COLE: I am not sure of the term "lightning masts," but we do have overhead ground protection which is there for lightning protection, that is correct.

MR. RAY: So if it is a rod to attract the strike instead of hitting the line or the transformer, it is in the form of wires from the ground to the stop of the structures.

MR. COLE: That is right. In the substations we have additional grounding. During normal operation, stability is not a primary concern. It is only when some sort of disturbance appears at the system. One of the things we are concerned about in stability is the generation-transmission system interaction.

(Slide)

As I indicated, at Susquehanna we have deliberately planned that system to be very strong and therefore we feel that this is not a particular problem. We have cases to demonstrate that we meet it. An important feature to realize in stability is the time frame that we are discussing. We are talking on the order of 4 to 15 cycles.

Various items which influence stability are the load level. We at PP&L test for stability under the worst load level for that particular generator. Being part of PJM and a fairly utility ourselves, our worst load level for stability is light load considerations. The transition system which ties up here again, what type of disturbance affects stability, the duration of disturbance, how long is that disturbance on your system; is it clear to normal, clearing, 4-cycle or some for a backup, which may be as long as 15 cycles

Location of disturbance. Again, at PP&L we take the worst location, we locate it almost directly at the generation but representing it as taking out the line which we want it on.

(Slide)

Typical system disturbances which can be tested for, in order of increasing severity are loss of a large block of load -- again, I want to qualify this and say a system similar to PP&L, a fairly large company interconnected into a strong grid. This is something which we generally have no problem whatsoever accepting on our system.

Large loss of a major generating unit, phase two ground fault with normal clearing, phase two ground fault with delayed clearing. This is on the order where now the system is generally started to be stressed. Three-phase fault with normal clearing, and then a very unlikely three-phase fault with delayed clearing.

At PP&L we have published reliability criteria and guidelines which we plan our system by and we also have gone over them with the Public Utility Commission, and part of those addressed the stability of the system. It specifies that we must remain stable for any three-phase fault with normal clearing. Also we must remain stable for any phase two ground fault with stuck breaker or other reason for delayed clearing. It also specifies we must review for adverse consequences in a three-phase fault with delayed clearing.

For Susquehanna, recognizing the importance of the system and those units, we had planned a transmission so we could accommodate even this more severe three-phase fault with delayed clearing.

(Slide)

Out of the approximately 100 cases which were run to test the stability of the system, we have highlighted these seven cases to address the topic of this discussion. The first three address the sudden loss of a generating unit to do something within the plant, not out on the transmission system. It indicates that we are stable for each of these, including the simultaneous loss of both Unit 1 and 2.

The next two cases, which are actually more severe, are the worst location of a transmission line fault for both Unit 2 and Unit 1, and again, these are stable. These are three-phase faults with delayed clearing.

The last two cases say, okay, even with these transmission problems, what happens if we concurrently lose one of these units due to some sympathetic fault or reason but not electrical related and it indicates likewise that we are stable.

In summary, we feel we have a very strong system.

We have tested it very strongly from a stability viewpoint.

MR. ZUDANS: When you make this stable statement, what does it really precisely mean? You have a fault. You cannot leave that there running because you would not be able to feed it. You need an infinite power.

MR. KERR: A clear fault means a normal clearing. You clear in 4 cycles.

MR. ZUDANS: Delayed?

MR. KERR: 15 cycles.

MR. COLE: Now, at Susquehanna we have put in relaying to shorten that time. We do not want it to stay on the system that long. But what it does recognize is the primary relays for some reason are not functioning, so our backup relays now have to take that disturbance off the system.

MR. KERR: If it does not clear in 15 cycles, the line melts and it clears anyway.

MR. ZUDANS: It just melts, then, someplace; right?

MR. COLE: If the fault stays on without any protection clearing it, eventually it would have to burn itself out.

MR. RAY: Yes, but if this sustained condition persists beyond 15 cycles, your system may go unstable and you break it up. That is why he wants to hold it. You have lines tripped remotely and so on.

MR. ZUDANS: Okay.

MR. RAY: But 15 cycles is long enough for even average backup relay to be effective. But the designs are better than that.

MR. ZUDANS: But you need backup relays.

MR. RAY: To switch either behind a breaker that is stuck or to take over the role of the primary relay which failed for some reason.

MR. ZUDANS: Then your question whether they have sectionalized lines, they said no, where would they shut it off.

MR. RAY: Well, if it is a stuck breaker, you reach into the bus beyond that breaker or you reach out on the lines to the other end and trip the fault by different sets of relays, and 15 cycles is enough for that sort of transfer tripping to take place. So you isolate the fault either by segmenting it within the station, or that in combination with a remote trip on the other end of the line that had a fault on it.

MR. ZUDANS: A system as strong as this one, an interconnected, then I have to cut two circuit breakers out? If you eliminate one, it will feed from the other.

MR. RAY: This depends on how reliable his circuit breaker design is and the details of the bus.

MR. ZUDANS: That is what you do?

MR. COLE: Okay, yes. What he described is exactly it. What makes the difference now is what your switchyard arrangement is. We have utilized a breaker and a half arrangement so that if one breaker fails to open, it would involve tripping a breaker deeper into the substation, and it will take a second line out of service in order to get rid of that fault because the breaker did not open, and we represent that in our studies.

So each time we have to go back and layer in protection, we end up taking more of our system out.

MR. KERR: Any more questions?

(No response.)

MR. KERR: Thank you, Mr. Cole.

(Slide)

MR. KAISER: I would like to make a very brief presentation on the station blackout. I would like to go in briefly on outline of our AC and our DC distribution systems, review our response to Generic Letter 81-04, discuss in brief the station blackout event, and then discuss in brief a simulated station blackout test that we will be performing.

(Slide)

To review what Don showed, the startup power for Unit 1 comes off of the Montour mountain tie-line. The Unit 1 is connected to the PJM power pool via the 230 switchyard located across the river. Unit 2 startup power comes from a tie-line that runs from the 500 kV substation via an auto transformer over to the 230 substation, and the Unit 2 main is connected to the PJM power pool via the 500 kV substation located on the plant site at the Susquehanna.

(Slide)

Shown in blue, this is station auxiliary buses. The on-site station power consists of 13.8 kV distribution system shown in red. The 4160 volt distribution system. It also consists of 120 volt AC and also 240 volt AC. The onsite distribution system is composed of a symmetrical distribution system.

The station auxiliary buses are connected by a transformer to the respective generator output for Unit 1, for Unit 2 (indicating). As previously mentioned in red, the startup buses receive power from offsite. Startup transformer 10 on Unit 1 side, startup transformer 20 on the Unit 2 side.

During normal operation the unit auxiliary buses receive their power from the respective main generator. During startup operations they will receive their power from the startup bus. The station-engineered safeguard buses are supplied 4160 volts via the startup buses through a transformer.

There are four 4160 volt engineered safeguard buses for each unit, four buses in Unit 1, four buses in Unit 2. Each bus has a preferred and alternate source of power. Upon loss of the normal source of power, the bus would automatically change from via circuit breaker line and be fed from the alternate source of power.

Should an engineered safeguard bus lose power from a normal and alternate source, it would be fed from a diesel generator. There are four diesel generators for the station. Each diesel generator is connected to one engineered safeguard bus on Unit 1 and one engineered safeguard bus in Unit 2.

Each standby diesel generator is rated at 4000 kilowatts of power, and there is sufficient capacity of diesel generators assuming one diesel generator fails to supply the engineered safety feature loads of one unit and those loads necessary for concurrent safe shutdown of the other unit.

Any questions on AC distribution?

MR. KERR: Questions.

(No response.)

MR. KERR: Continue, please.

MR. KAISER: The distribution system supplies 250 volts DC, 125 volts DC, and 24 volts DC. The system is designed to provide power to system loads in earthquake conditions and to provide power with a single failure of any component of the system that is required to handle all DC loads during an accidental loss of the battery charger.

In a 250 volt DC distribution system, each unit has two subsystems. Each subsystem consists of a battery, a distribution center and a battery charger.

(Slide)

There are four 125 volt DC distribution subsystems for each unit. Each 125 volt distribution system consists of a battery bank, a battery charger and a load center. Our 25 volt DC is utilized for control power in the station. The 25 volt DC is used for large loads, your mode of operators, your emergency DC lube oil pumpts.

There are two 24 volt DC subsystems that provide direct current for the process radiation monitoring system and startup neutron monitoring systems. Each direct current system consists, again, of a battery, a distribution load center, and a battery charger. Each Class 1A DC subsystem battery bank is located in a separate room of a seismic Category I control structure. The battery rooms are ventilated by the battery room exhaust system. That is designed to preclude the possibility of hydrogen accumulation in the room.

Each DC battery bank has sufficient capacity without its charger to sufficiently supply the required loads for four hours. Briefly our DC distribution system.

MR. RAY: Question. You mentioned your 250 and your 125 volt. Suppose you have a fault on a DC bus supplied by one of these DC sources. Is there redundancy in supply to the loads t' .t are thereby lost or do you have automatic switching all the way to another source.

MR. KAISER: There is not automatic switching. There is the possibility of in the 125 volt control circuits to, via a manual switching operation, to supply power from an altered battery.

MR. RAY: So when you lose a bus like this and you depend on the substation to emphasize to the operator that he is trouble, thereby he initiates that switching so as to restore supply to his tripping equipment and so on.

MR. KAISER: He does receive DC trouble alarms, and upon investigation and analysis he can make provisions, yes, sir.

MR. KERR: Other questions?

(No response.)

Would you put the slide that shows the two 250 volt battery system back on, please?

(Slide)

I think you said you were in a position to have an accident and then take a single failure and still have your system operate, something like that. Suppose that the accident is loss of one of the batteries. It blows up for some reason, and then postulate as a single failure the loss of the other battery. Where does that leave us?

MR. KAISER: With two failures.

(Laughter.)

MR. KERR: The first failure was an accident.

That is the accident. Now, your system is supposed to be able to handle an accident given a single failure.

MR. KAISER: The 250 volt DC distribution, like I mentioned, supplies the motor operated valves which can be manually operated. Are you asking me is there another --

MR. KERR: I am trying to understand how you interpret the single-failure criteria. I mean, for example, if you have a LOCA you get a break in a pipe. A single failure could be a break in another pipe which occurs randomly. Here I am postulating an accident in which the accident is loss of one of the batteries, and now I am going to postulate as my single failure the loss of the battery.

It seems to me that sort of leaves you without any 250 volt system.

MR. RAY: Mr. Kaiser, on this point aren't your battery charges capable of carrying the entire DC load in the absence of a battery?

MR. KAISER: That is correct.

MR. RAY: Do you have any idea how long you can do that?

MR. KAISER: Indefinitely.

MR. KERR: Don't you have to have AC in order to --

MR. KAISER: To operate the charger. The chargers are AC/DC.

MR. ZUDANS: What do you do to test the batteries, load testing of the batteries?

MR. KAISER: We do a periodic test discharge of the battery.

MR. ZUDANS: How do you do that?

MR. KAISER: We have a variable load resistance machine. You can put into it up to eight sequence stamps. They do a test discharge on the battery. In other words, we go into the FSAR, look at the load profile of the battery and simulate that. For 30 seconds you can draw x amount of amps, you can draw x amount of amperage for ten hours, etcetera.

MR. ZUDANS: Afterwards how do you connect it in the circuit here? Do you take one battery out?

MR. KAISER: In general to the battery room.

MR. ZUDANS: I this circuit here you would have to disconnect it from the green area, right?

MR. KAISER: Yes.

MR. ZUDANS: And then you are staying with one.

MR. KAISER: Yes. The test discharge is done normally during a refueling outage with the unit not on line, and the tech specs then allow the battery to be taken out of service for a longer period of time.

MR. KERR: While they are conferring, on what basis did you decide on a two-train battery as contrasted with a three-train?

MR. KAISER: I could not answer that question.

MR. KERR: Can anybody? I ask because I have gotten the impression that PP&L does not just look at NRC requirements but also does some independent looking at reliabilty, and I wondered if you did a reliability study which convinced you that two batteries is enough, you do not need three.

MR. OHEIM: My name is Vernon Elheim, electrical supervisor within the nuclear organization.

The primary analysis was done to match the system requirements of HPRCIC.

MR. KERR: The system requirements are that you have a reliable system, I think. How reliable did you want your system to be? Did you use any reliability considerations in choosing two versus three or four or whatever?

MR. OHEIM: We considered two to be reliable enough.

MR. KERR: What was your measure of reliable enough?

MR. OHEIM: I really cannot answer that. It goes back long into the job. I just do not have an answer for you.

MR. KERR: If you were looking at it today you might reach a different conclusion, or how would you go about reaching that conclusion today?

MR. OHEIM: We would do a reliability study today if we had to do it all over again, but like I said, the system requirements were such that, you know, we are looking at a 250 volt DC system as a backup to an AC system.

MR. KERR: Have you reviewed the NUREG-0666, I think it is, isn't it triple six, which describes an NRC study of battery system reliability?

MR. OHEIM: Have I read it?

MR. KERR: Have you reviewed it? Not necessarily you personally, but has someone in your organization reviewed it?

MR. OHEIM: Yes, to my knowledge.

MR. KERR: Do you agree with that analysis?

MR. OHEIM: I cannot answer that for you right now on a personal basis.

. KERR: Because it indicates the reliability of the two-battery systems is not very good, it would seem to me, and I was just curious as to how you decided on the two-battery system.

(No response.)

MR. KERR: Thank you.

Other further questions?

(No response.)

MR. KAISER: I would like now to review our response to Generic Letter 8104 on procedures and training for station blackout events. We are using a three-phase approach to the generic letter. Phase one consists of the development of training and procedures necessary for the event. This would include the evaluation on system responses of a total loss of station power. It includes the assignment of DC load priorities, which loads are most important to us. It includes a station restoration plan, i.e., given that we have lost all our offsite power and all our onsite power, how do we go about returning the system to normal, the system being the in-house electrical and also our plant systems, and a review of contingency actions to take to mitigate the course of the event.

Phase two, then, consists of the engineering evaluations that would be required to support the analysis done under phase one and also the ac isition of test data from a simulated station blackout event. And phase three would be the completion of training and the approval of those procedures on the completion of phase one and two.

(Slide)

I would like to talk about our approach to the station blackout event. I would like to couch my words by saying that this is preliminary evaluation. Again, in the station up to this point we have evaluated what loads are lost, the priority of loads, what information is available to the operator, but the initiating conditions assuming it is a simultaneous loss of power to both startup transformers with subsequent failure to start the onsite diesel generators.

In other words, all four diesel generators have failed to start. We have lost the Montour mountain tie-lines. We have lost the 500 and the 230 kV substations. We have lost Unit No. 1 generator and Unit No. 2 main generator, eight failures so far. The automatic actions would be a load reject, a main turbine, main generator trip. It will be a reactor vessel and containment isolation. The safety relief valves would actually be in the relief mode, HPCI, high pressure coolant injection system, and RCIC, reactor core isolation cooling, which at Susquehanna are two turbine-driven systems, would automatically actuate on level two, which is a low reactor water level.

Load shutting on our 4160 volt and 13.8 kV buses would occur. AC operated and air-operated equipment would fail to the failed condition.

MR. KERR: Excuse me. Back to the earlier slide. Load shedding on those buses occurs automatically. Does it require that the DC battery still be available in order that the switching take place? I am trying to get an understanding of what station blackout means. Does it imply that you still have the batteries or that the batteries are gone too?

MR. KAISER: We have just lost AC.

MR. KERR: Okay. For what purpose in those things that I see does one need the battery? I mean which ones would require a battery and which ones would not?

MR. KAISER: The containment isolation, for examplel. The DC valves would shut HPCI and RCIC, start speed control. The turbine controls would require --

MR. KERR: So a number of things would require an operable battery.

MR. KAISER: Yes, sir.

MR. LIPINSKI: Do you have a direct wire on your transformer or is there a breaker?

MR. KAISER: It is hardwired.

MR. LIPINSKI: Okay.

(Slide)

MR. KAISER: That concludes the automatic actuation. Our planned response in operation proves this event. We would control reactor water level using the HPCI and RCIC systems. After 15 minutes the RCIC turbine alone is adequate to supply the necessary cooling water to maintain adequate level. I would initiate a controlled pressure reduction of the reactor. We would secure DC loads not essential to the transient in order to preserve power.

We would set up temporary monitoring of plant parameters not available in the control room. We would make necessary preparations for contingency operations, and when critical parameters reached their define limits, we would initiate contingency actions. We would initiate corrective action to restore onsite AC power. We would determine the projected availability of offsite power, how long are we going to be without offsite power. Is the loss of offsite power unique to Susquehanna or is it the power pool itself? And then once AC power becomes available, we would restore in-house loads on a priority basis.

That summarizes our approach to the event.

MR. KERR: Are there questions?

MR. ZUDANS: I have one question. Are there any parameters that you would denote "critical" that you cannot monitor from the control room?

MR. KAISER: There are some temperature parameters: the dry well temperature, the wet well temperature, the temperature in the turbine rooms, being the HPCI and RCIC rooms that we would need to go to the local instrument panels to determine their temperature.

MR. ZUDANS: In what way are the critical?

MR. KAISER: Critical was a poor term to use.

MR. ZUDANS: Ah.

MR. LIPINSKI: What is your biggest AC load when you try to restart a plant, the biggest pump that you have to put on line in order to get restart. Your diesels do not get you back up; you have to have outside power. I am questioning what you have to have in capacity on that power line to send to your plant in order to get started.

MR. KERR: What do you mean by started? Do you mean to handle decay heat or do you mean actually get the plant --

MR. LIPINSKI: To get the plant back up on line. The plant is not capable of getting itself on line. In requires external power to start these pumps.

MR. KAISER: Are you speaking of recovery from this evnent?

MR. LIPINSKI: Yes. Your last line says once AC power becomes available, restore in-house loads on a priority basis.

MR. KAISER: I do not recall. Does anybody recall which one it was?

MR. ADAMS: Lee Adams, supervisor of operations. Service water pump and normal station service water.

MR. KAISER: Those are powered off 4160 engineered safeguard buses.

MR. ADAMS: That is correct.

MR. KAISER: I was trying to remember the amperage on them. I do not recall the horsepower.

MR. KERR: Other questions?

MR. RAY: One.

MR. KERR: Mr. Ray.

MR. RAY: You said at the outset, Mr. Kaiser, that this was a preliminary viewpoint. I gather, then, this is not your official stature yet.

MR. RAY: That is correct. In the plant we have done an analysis, accumulated some information that we are transmitting to the Engineering Department for further data reduction.

MR. RAY: Finalization. Have you reached the preliminary idea yet as to how long you could operate this way without the offsite power.

MR. KAISER: No, sir.

MR. KERR: Are there questions?

(No response.)

MR. KERR: Mr. Kaiser, do you consider this activity worthwhile, or should you be spending your time doing something else?

MR. KAISER: I consider this a subset of the previous I&E circular 7927, which said to evaluate the plant response to loss of one instrument bus.

MR. KERR: I recognize it is a requirement, but what I am asking you is whether if NRC had not made this a requirement, you will would consider it to be a worthwhile activity in your responsibility for protection of the plant and of the health and safety of the public.

MR. KAISER: Yes. I do the evaluation of what happens in a control room on a loss of all the instrumentation, and even taking them one at a time was useful, very beneficial.

MR. KERR: Thank you.

Are there other questions?

(No response.)

MR. KERR: Does that complete your presentation?

MR. KAISER: No, I have --

MR. KERR: Good. Good. It has been very interesting so far. I do not want to stop you.

(Slide)

MR. KAISER: My last one would be outline of station blackout test. This would be a simulated test. The purpose of the test is to simulate the loss of AC power only to selected systems. It would only be simulated to the reactor. The primary containment and heard of the HPCI, RCIC rules. The purpose would be to monitor the resultant system performance, the rate of heatup in those rooms, the rate of heatup in the primary containment.

MR. KERR: Excuse me. When you say simulate, do you mean your simulator permits you to do this or do you mean simulate some other way?

MR. KAISER: We are going to do the test on the facility, simulates to our containment.

MR. KERR: Okay, I understand.

(Slide)

MR. MOELLER: In those rooms the HPCI and RCIC rooms are on emergency power then.

MR. KAISER: They are turbine driven. A brief description. We would operate at least 85 percent power for at least seven days or at least shut down to the poitn where the main generators would be separated from the grid, initiate actions that would cause a blackout to be be experienced by the reactor, primary containment, HPCI and RCIC systems, monitor the plant parameters. When cu' points are reache we would initiate predefined contingency actions.

The test would terminate when either of the following occurs first: a cut-off point is reached, which requires terminating the test or sufficient that it has been collected. Again, we just take selected component a simulate to it that we have lost all AC power.

Thank you.

MR. KERR: Thank you, sir.

Are there questions?

(No response.)

Mr. Lipinski.

MR. LIPINSKI: When you say you are going to simulate the loss of AC power in selected components, that means you are going to have a list of things that are engergized, and in your mind it would not make any difference as to whether these energized have been lost or not.

In terms of the purpose of conducting this test, let's take control room ventilation. You are not going to turn up the control ventilation. You are going to keep the contro. ventilated. You are going t keep the panels energized and collect your data.

MR. KAISER: We would only, like in the case of the high pressure injected room, that has cooling fans and is supplied with cooling water. We would just turn the fans off, turn the cooling water off so that that room and that equipment now thinks it has lost AC power.

I would do the same thing with the dry well. Turn off the dry well cooling fans and turn off the cooling water supply to the drywell, therefore it thinks we have lost underarm pwer. So it is very specific components that we would turn off. It would just be areas of the plant tht thin we have lost all AC power.

MR. LIPINSKI: How long do you think you are going to do this at most in time?

MR. KAISER: I could not answer that. We have not evaluated it.

MR. LIPINSKI: Two hours? There are other areas you could end up with problems, such as the control room. If you are talking about having control room ventilation for two hours and only having DC in there.

MR. KAISER: We would only do the areas I mentioned.

MR. LIPINSKI: I know that, but in a true station blackout, many other things are going to happen to you, and that is why I said there is a list of things that will be energized, and the question is should some of these that are on your list of being energized be turned off in terms of trying to evaluate a station blackout.

MR. KERR: I believe Mr. Curtis commented earlier that they were going to approach these tests which considerable trepidation and forethought. I certainl agree with him. I would want to be rather careful about running tests like this on a plant.

MR. LIPINSKI: Yes. But what I am concerned with is when they get through and they say station blackout is not a problem. It may not be a problem based on the fact that they get certain things energized. but in a true station blackout they very well may be a problem.

MR. KAISER: At the conclusion of the test we could not make the statement you just made.

MR. KERR: You would not believe them if they did anyway.

MR. LIPINSKI: That is why I am making the comment now, because it is a partial test, not a complete test, and there is a question of the selection process.

MR. KERR: What one can hope is that they learned something. They are not going to demonstrate that station blackout is not a problem.

MR. LIPINSKI: What is the purpose of the test?

MR. KERR: To learning something.

MR. LIPINSKI: About station blackout.

MR. KAISER: About the response of selected components to a station blackout and not the entire facility.

MR. ZUDANS: Do you black out the reactor, the primary containment, the HPCI and the RCIC? These are the four items. I an just really wondering what is the purpose of the test.

MR. KAISER: To gather some additional data.

MR. ZUDANS: On what, how fast the room heats up?

MR. KAISER: Also in the case of HPCI and RCIC, for example, they are designed to operate on DC power without the availability of AC. This test would clearly demonstrate that.

MR. ZUDANS: You can do that without blacking out anything else at the same time, you know, instead of blocking these four items out. I think your results equally could have been gotten one by one separately and with less risk.

MR. KAISER: I agree we could break the whole test down into a subset of many little tests.

MR. ZUDANS: Easier to control and you learn the same thing, which is essentially not much.

(Laughter.)

MR. KERR: Other questions?

(No response.)

Comments? We do not offer advice like this for free very often.

(Laughter.)

Thank you, Mr. Kaiser.

I am going to declare a ten-minute break, roughly, and we will start again at quarter of five.

(Recess.)

MR. KERR: My agenda shows that Mr. Crimmins probably went somewhere to get a coke. Well, we'll wait.

(Pause.)

MR. KERR: I show decay heat removal capability. I have the wrong name down, obviously. Let's go.

MR. KEISER: Normal decay heat removal, all systems available, the heat water system provides makeup water and water level control. Heat is injected into the cooling tower via the water circulating system.

With the unit in the hot standby condition, we use the main steam bypass valves to reject to the cooling towers via the circulating water system. We could cool down the unit using the main steam bypass valve and enter the shutdown cooling mode of RHR, residual heat removal system, at the appropriate pressure, and at that mode the heat would be rejected to our spray pump by the RHR service water system.

If it was elected to stay in the hot standby condition, we could remain in hot standby by utilizing the RHR system in the steam condensing mode, and in the steam condensing mode the heat is rejected to the spray pond via the RHR service water system.

So our normal methods of cooling the plant on line reject the heat to the circulating water system, cool down the plant, normal operation cooldown by the main steam bypass valves rejecting to the circulating water system. When you get cooled down in the shutdown cooling mode of RHR, utilizing the spray pond via the RHR service water system. If you desire to remain in a hot standby condition, you utilize the RHR system in a steam condensing mode, and again the heat is rejected to the spray pond via the RHR service water system.

MR. KERR: What does "hot standby" mean in a BWR? It does not mean you are operating at pressure, does it?

MR. KEISER: No, sir. It is a name I have from my PWR experience. I was referring to the time when the unit tripped and the system is at pressure and temperature and you desire to maintain yourself for a period of time because whatever caused the unit outage could be corrected very shortly. We could be connected to the steam condensing mode of RHR.

MR. KERR: In order to go to the shutdown cooling mode of RHR, you are now at low pressure or --

MR. KEISER: Low pressure requires approximately 100 pounds.

MR. KERR: That is what I was thinking. Okay. Now, when the other branch remains in hot standby, that is also at low pressure, isn't it?

MR. KEISER: That could be at operating pressure.

MR. KERR: RHR steam condensing mode?

MR. KEISER: Residual heat removal system.

MR. KERR: I thought you just told me in order to use RHR you had to be at about 100 pounds.

MR. KEISER: In the shutdown cooling mode, the reactor coolant flows through the shell side of the heat exchanger. It does that at 100 pounds of pressure. The steam condensing mode, you are taking steam from the reactor vessel and putting it on the shell side of the heat exchanger through a series of pressure-reducing valves such that it sees the pressure.

MR. KERR: Thank you for the clarification.

MR. KEISER: It is designed for low pressure operation.

MR. KERR: Now, is there any -- I mean, if you were really jury-rigging things, if you did not have the feedwater system but wanted to stay at pressure -- aha, I see you anticipate. I am your straight man. Go ahead.

(Slide.)

MR. KEISER: The degraded mode of decay heat removal, the feedwater and our normal heat sink is not available. However, a high pressure coolant injection and our reactor core isolation coolant systems are available, the turbine-driven systems.

MR. ZUDANS: What is your normal heat sink? What do you mean, heat sink?

MR. KEISER: Main condenser, main condenser. With that heat sink -- in other words, the main steam isolation valves are shut, but the HPCI and RCIC turbines are availale. You would operate the HPCI and RCIC for level control. These two turbines exhaust their steam to the suppression pool inside the wet well, which we would align the RHR cooling system in the suppression pool cooling mode to remove that heat.

This steam exhausting would naturally remove some decay heat. At that time we could go into the hot standby steam condensing mode of RHR, which I just described. In that case the heat is now rejected to the spray pond. And then we could reduce pressure via this mode and then into the shutdown cooling mode of RHR and heat would be rejected to the spray pond.

So if you will, if the plant was at power, a unit trip, feedwater, normal heat sink not available, you get automatic action, start the HPCI and RCIC pumps. They would start to maintain level control, remove heat to the spray pond. You can stay there. You can go to hot standby mode, condensing RHR.

(Slide.)

If we take the mode, a degraded mode of decay heat removal and our HPCI and RCIC systems are not available along the the feedwater system and our normal heat sink, the reactor is isolated from normal heat sink, we would initiate the core spray system, initiate the low pressure coolant injection system, depressurize utilizing the ADS system.

When conditions were stabilized, this would cause a rapid blowdown refill. Once conditions were stabilized, we would be able to enter the shutdown cooling mode of RHR and reject the heat to the spray pond. In this interlude, decay heat is rejected to a suppression pool which is cooled by the suppression pool cooling mode of RHR.

MR. KERR: That operation or series of operations requires at least onsite AC.

MR. KEISER: Yes, sir, because we made this assumption, these were not available.

MR. KERR: You mean, yes, sir, it does require it, onsite AC, in order to go through this?

MR. KEISER: The assumption is that HPCI and RCIC are not available. At that point in time we could depressurize the system, right. That does not require AC. But the initiating of the core spray pumps and low pressure pumps would require AC. And so it was yes sir, no sir, yes sir.

(Laughter.)

MR. KERR: I understand perfectly now. Thank you.

(Laughter.)

(Slide.)

MR. KEISER: Just a few words about the ultimate heat sink, our spray pond. The ultimate heat sink consists of a concrete-lined spray pond. It covers approximately eight acres of land. It contains 25 million gallons of water. The ultimate heat sink is capable of providing enough cooling water without makeup for a design base LOCA in one unit with a simultaneous shutdown of the other unit for 30 days.

Are there any questions on our heat removal system?

MR. KERR: The ultimate heat sink is that pond?

MR. KEISER: It is that pond, yes, sir.

MR. KERR: Other questions?

(No response.)

Please continue.

MR. KEISER: Next.

MR. CRIMMINS: My name is Thomas Crimmins. My next presentation is on the environmental qualification program and our status.

(Slide.)

I had planned on going through a little bit on the issue and where we -- some of the comments about it. But I know, recognizing your knowledge of that information and our desire to move along on the agenda, I will skip over that if that is all right with the Chairman.

MR. KERR: After those comments about my knowledge, if I did not tell you to skip over it, I guess --

(Laughter.)

MR. CRIMMINS: We are aware that you had extensive discussions on this in the last few days.

MR. KERR: Okay.

MR. CRIMMINS: I would suggest proceeding with our status.

MR. KERR: Let's do that.

MR. CRIMMINS: At this time the Susquehanna equipment qualification program has concluded 25 percent or slightly more than 25 percent of the equipment is fully qualified and has documentation to support that. The program is continuing in a number of areas. There is considerably more information available, but we have not as yet established a complete set which identifies more than that 25 percent qualified.

Our program is a rather aggressive one. It includes several parallel paths, including document search to determine what if any documentation is available to substantiate the original environmental qualification, as well as the new extensive qualification requirements, analysis to try to expand the basis of that original qualification testing program, to substantiate the qualification of equipment to the new requirements and, if we are unable to qualify the equipment on those bases, to replace the equipment.

The program is proceeding in parallel on many of those areas for -- because of the time constraints with the program. I would point out that there are some issues here in terms of difficulties in the program in meeting the final date. Concise identification and understanding of the requirements continues to be a problem, and even as of last week there was a very extensive meeting with the NRC staff to discuss further requirements and expansion of the program to mechanical components.

This continuous redefinition of the requirements has caused us some difficulty.

MR. KERR: I do not understand. You are not suggesting that qualification of electrical components is being extended to mechanical components, but rather there may be a program of qualifying mechanical components?

MR. CRIMMINS: That is correct. In addition --

MR. KERR: Do you have a list of the equipment and systems that have to be qualified.

MR. CRIMMINS: We do not have it with us, but yes, sir, we identified each and every one of the components which needs to be qualified.

MR. KERR: How did you do that? Did you send in a list and then the staff commented and then they sent it back to you? I mean, what -- how did you know what went on the list?

MR. CRIMMINS: Well, the basic definition of the equipment that needs to be qualified is that which is class 1, safety-related. And we did in one of our submittals identify all the equipment.

MR. KERR: So you are qualifying class 1 equipment?

MR. CRIMMINS: Class 1 electrical equipment.

MR. KERR: And that is it?

MR. CRIMMINS: That is correct to this point. That is the scope.

MR. KERR: Okay.

MR. CATTON: Do you walk through the plant and look at the different equipment and try to assess whether you could get into any trouble because of the harsh environment, or is it all done based just on reading drawings?

MR. CRIMMINS: The areas in which a harsh environment can exist are identified in accordance with the possible breaks or possible scenarios that could lead to a harsh environment. So we do identify all of the areas in the plant where harsh environments could exist. Then it is a matter of identifying the equipment that is required, safety-related equipment that is required to be responsive to that type of an event that exists in those areas.

We do it both by drawing reviews, by walk-downs, all sorts of -- whatever method is necessary to identify the equipment.

MR. CATTON: So you actually do go in and say, gee, if the top of this pump blew out it would catch that piece of equipment, therefore I have to protect it. Its harsh environment is harsher than another might be.

MR. CRIMMINS: We identify --

MR. KERR: A flying pump head is not part of the environment, is it?

MR. CATTON: What comes put of it is, once it is --

MR. KERR: Oh, okay. But they do not have to protect against -- that is a missile.

MR. CATTON: I assume they already did that.

MR. CRIMMINS: That is another program.

MR. KERR: That is what I thought.

(Laughter.)

MR. CATTON: What comes out of the hole once the missile is created.

MR. CRIMMINS: Basically the answer is yes. The area that would be affected by that environment and identifying the equipment which would be affected in those spaces, and they have to be qualified to those requirements.

MR. CATTON: So you have more than one type of environmental qualification, one where it might just be pressure, temperature and humidity, another one might be temperature, humidity and flow rate, and velocity.

MR. CRIMMINS: Certainly. Flow rate and velocity --

MR. CATTON: Are the same.

MR. CRIMMINS: Well, no, they turn out to be inputs to jet impingement process. The flow rate or jet coming out of a pipe is evaluated as part of the jet impingement. Now, that would also create a harsh environment, which is a set of humidity, temperature, steam environment, humidity and radiation, which the component needs to be qualified for.

So yes, the answer is that all of these are considered as an effect on safety-related equipment.

MR. CATTON: So here is testing aside from just autoclave?

MR. CRIMMINS: Can I get an answer to that? The testing --

MR. KERR: I am sorry --

MR. CATTON: I am just asking the question in another way to see if I get the same answer.

MR. KERR: But you asked a different question. You said there was jet impingement testing, but that was another program.

MR. CRIMMINS: I did not say there was jet impingement testing. I said there was a program which looks at the potential jet which could be created as a result of pipe breaks. Safety-related equipment which is necessary to respond to the event, the pipe break must be either shielded or located in another area so it is not affected by that jet impingement.

That is a separate issue from the fact that the jet also creates a set of environmental harsh conditions for which all safety-related equipment necessary to respond to that event must be qualified.

MR. CATTON: You could be just outside of the jet that is created and the environment is still far more harsh than it would be strictly from the pressure, temperature, humidity. Is it accounted for? For example, if you have a doorway, you have a break in one room, you have a doorway, just the other side of that doorway you could have fairly high vibrations induced in whatever is sitting around.

MR. CRIMMINS: Can someone comment on that? I think the conditions are --

MR. RHODES: My name is Walter Rhodes.

To answer your question, for each case of a pipe break where you have a jet impingement we actually go through a temperature profile or generate a temperature profile. That temperature profile then becomes an input into the qualifion of the various equipment in the room.

MR. KERR: What about vibration profile, which is what Mr. Catton was asking about?

MR. CATTON: There is more to the environment than simply pressure and humidity. That is what I am driving at. If you have a release of steam or high pressure water or something somewhere, at some distance from it not in a direct line of the jet you can still see a harsh environment, the pressure fluctuations from the flow, the vibrations and so forth. And I am wondering if you do that, and I think the answer is no.

MR. RHODES: I think we do relative to temperature, but we do not do it relative to vibration.

MR. CATTON: So your harsh environment is not as harsh as the manufacturer's.

MR. ZUDANS: Most of his equipment is also subjected to vibration testing in those respects. They are --

MR. CATTON: If they include temperature when they do those vibration tests, then it is okay.

MR. ZUDANS: Then it is --

MR. CATTON: That is --

MR. KERR: One, for example, has to demonstrate that the part will take a 70-pound snow load at 70 degrees Fahrenheit --

(Laughter.)

MR. KERR: The vibration presumably is also included, the seismic testing. Maybe not enough, but at least that is vibration testing in that part of the --

MR. CATTON: If you take some -- if you take a piece of cable and you heat it up and vibrate it simultaneously, that is going to be a lot more severe than if you either vibrate it or heat it.

MR. KERR: But that is what they have to do in this seismic testing.

MR. CATTON: Heat it up and vibrate it?

MR. ZUDANS: Together?

MR. CATTON: No, they don't do it together.

MR. KERR: Are you sure they don't do it together? They don't do it cold. That is aging, isn't it?

MR. CATTON: Aging --

MR. KERR: Aging is done -- but now wait a minute. The staff, it said -- let's see, in this reg guide it said something about normal operating temperatures had to be -- now maybe you do not get it up to the temperature of the accident, but you certainly have to get it up to some temperature.

MR. GARDIN: Yes, they have to envelop the total profile, whichever is the limiting conditions for that equipment, which may include LOCA, whichever is the limiting condition.

MR. KERR: For example, do you have to show that it can withstand the vibration of an earthquake and the temperature of a LOCA simultaneously?

MR. GARDIN: No, that is not the requirement. But there is a requirement if there is a known effect that has to be considered, and if that is the case the particular piece of equipment, then they have to consider it.

MR. KERR: I do not know whether this would be called synergistic or not. The fact that cable insulation is somewhat degraded because it is hot, would that be synergistic, if you heat and vibrate it? I am not sure.

MR. GARDIN: I am not sure.

MR. CATTON: It might survive either one alone, but probably not both.

MR. ZUDANS: Well --

MR. GARDIN: The reason the requirement has been put up is they have those -- they apply the OBE requirements. They have to -- the OBE during the life of the component, and then after the have tested the equipment for environmental and seismic conditions, then they have to apply the SSE and the LOCA, MSLB, whatever is the limiting environment.

MR. KERR: I think the best answer to your question is you shut that door that you talked about, that these things are outside of.

(Laughter.)

MR. CATTON: It will probably blow it open.

The reason I raise the question, a number of years ago the HTGR reactor containment building in Germany where they were doing testing of steam isolation valves, and it just tore everything out. It ripped insulation off walls that were far away, it loosened pipes that penetrated the concrete.

When that steam starts to flow around inside of a room, it is not just time and temperature. It does not have to directly impinge upon it. It can be in an adjacent room and the environment is much more severe in temperature and pressure and humidity.

MR. GARDIN: The seismic requirements include the loading requirements based on MSIV, whatever is there.

MR. ZUDANS: As far as I remember, there is no requirement that you consider such loads, except in the case of jet impingement.

MR. CATTON: Directly.

MR. ZUDANS: Directly.

MR. GARDIN: No.

MR. ZUDANS: There is a vibratory environment to be considered in aging. If there is not -- you know, a component sits on a piece of pipe and vibrates. That is considered. But we are talking here, I don't know how you would describe it, but certainly.

MR. KERR: Yes. I think what I have seen in the reg guide, I do not believe that this is enveloped, the thing you are talking about.

Why don't you continue, Mr. Crimmins.

MR. CRIMMINS: Okay. I wanted to point out also that this program is somewhat hindered by vendor responsiveness in our experience. Vendors in many cases for the equipment we have in the plant may no longer be in the business or are not particularly interested in qualifying the product lines that we have installed. They would much rather sell new equipment than get it requalified to new qualifications.

Finally, the availability of manpower and the availability of qualified replacements should we not be able to qualify existing equipment is also a hindrance in getting this program done.

We have -- I mentioned we feel our program is rather aggressive, and I wanted to give you some statistics to try to demonstrate that. We currently have within our own organization, PP&L and our architect Bechtel, 30 technical people working full-time on equipment qualification. I would expect them to be committed for a year and a half for a total of about 45 man-years, which does not count any time that might be spent by testing laboratories or vendors, including the General Electric Company, who is doing a substantial amount of work in this area.

The total cost of our program is expected to exceed $20 million, which includes only a small component for replacement equipment. It would be considerably increased should there be a major requirement to replace equipment that we are unable to qualify.

As indicated earlier, we expect to be in a position to have sufficient equipment qualified and data available to permit the NRC to conduct an audit of our program late this year, and are intent on our objective of meeting the environmental qualification program for getting equipment qualified by next year.

MR. KERR: Did I understand you to say that of the $20 million a fairly small fraction is allocated for actually new equipment, that most of it is required for qualifying or upgrading or whatever the word is?

MR. CRIMMINS: That is correct, sir.

Other questions?

MR. KERR: Other questions? Mr. Catton?

MR. CATTON: One of the ACRS fellows called something to my attention, namely that a large number of scrams and other plant upsets result because equipment outside of the control room is not well labeled. We saw a lot of what you are doing within the control room. What are you doing outside of the control room to make sure that various components and valves and lines are easily identified, so that mistakes are not made?

MR. CRIMMINS: I think there is an answer for that.

MR. KERR: Are you talking about environmental qualification or something else?

MR. CATTON: No, just if you see a valve how quickly can you determine what valve that is? How well are they labeled and marked?

MR. ADAMS: I think I can answer that for you. Four weeks ago we commenced a program of labeling all pipes, components and valves.

MR. CATTON: Very good. Thank you.

MR. KERR: I am tempted to ask another. I will ask it. This week I heard of a situation in which a construction worker dropped a large plank near a relay cabinet and the plant was at that time testing one channel of their scram system. This kicked another one out and the plant was scrammed.

What are you going to do to keep construction workers from dropping planks?

MR. CRIMMINS: Sir, that is not a unique problem. That is not the only instance that occurred in the last week.

MR. KERR: I am sure it isn't.

MR. CRIMMINS: The major efforts in power plants like Susquehanna -- and the way we would handle it at Susquehanna is to make sure that any activities of construction or a modification nature that are not normal, routine surveillance, that the operators at the plant are involved in, the actual procedures in the installation effort get reviewed, the actual procedures get reviewed as the plant operations review committee reviews that operation, and it is the --

MR. KERR: But this guy takes a shortcut and he does not know about that review. Do you have someone to follow him around?

MR. CRIMMINS: Those types of construction activities would be controlled by the plant staff to ensure that at least those situations are minimized.

MR. RAY: The solution is very simple. You just train him to drop it gently.

(Laughter.)

MR. ZUDANS: Anybody with a plank on his shoulder would --

MR. KERR: I shouldn't have started this.

(Laughter.)

MR. KERR: Please continue, Mr. Crimmins. Could you give me some idea of how you are keeping these records? Are you stacking up paper or are you putting this on computer or what?

MR. CRIMMINS: I think currently we are doing both.

MR. KERR: How tall is the stack of paper? About so high (Indicating)?

MR. HENRIKSON: I have no estimation.

MR. KERR: How many file cabinets? Ten?

MR. CRIMMINS: We would expect it to be on the order of dozens.

MR. KERR: Thank you.

MR. KEISER: Mr. Chairman, I believe we can provide an answer to the previous question on the control room air flow.

MR. KERR: Yes, sir.

MR. KEISER: Mr. Detamore.

MR. DETAMORE: My name is Mike Detamore. I am the plant engineering supervisor.

I believe there was a question this morning from the Committee concerning control room ventilation and I would like to try to repeat that question and answer it. Question: With the ventilation system which supplies the control room in a recirculation mode of operation, can it go to an operating mode where you are supplying 100 percent outside air to the control room? Is that the question or at least part of it?

MR. MOELLER: Yes.

MR. KERR: Yes.

MR. DETAMORE: At Susquehanna we cannot.

MR. MOELLER: What is the maximum you can have from outdoors?

MR. DETAMORE: Normal outside makeup is 500 cfm.

MR. KEISER: Of a total air flow of?

MR. DETAMORE: Normal flow to the control room is about 23,000 to 26,000 cfm.

MR. MOELLER: And it is what percent, then, roughly?

MR. DETAMORE: It is roughly about one percent, I believe.

MR. CATTON: Half a percent.

MR. KERR: Does that respond to your question, sir?

MR. MOELLER: Yes, I guess.

MR. KERR: Did you want to ask any follow-up?

MR. ZUDANS: This is normal, but what is the maximum? He said that was normal.

MR. MOELLER: Oh, okay. Did you say that was normal? And the question would be what is the maximum?

MR. DETAMORE: The maximum outside air that could come in is probably 6,000 cfm, but that would require some manual damper realignment.

MR. MOELLER: And can you over -- can the operator override? My second question was whether they could override this? For example, because of high activity in the intake the control isolated and was on recirculating alone. Can you do anything to change that?

MR. DETAMORE: At Susquehanna, with a high isolation on outside air you would go to normal recirculation from the outside air duct and you would get operation of what we refer to as control room emergency fresh air supply fans. These are taking a section of the outside air, but through your particulate and charcoal filters, so you would be maintaining the same outside air in the scenario you just cited. It would still be maintaining the 500 cfm to the control room, but you are going through these series of filters now.

MR. MOELLER: The question is, can the operator override the automatic isolation system and do what he wants?

MR. DETAMORE: No, sir.

MR. KERR: He cannot open the door and let in fresh air?

MR. DETAMORE: No.

MR. MOELLER: Well, let me offer the following suggestion to both the staff and the applicant. I do not know whether it was five years ago, but in that ballpark, at one plant they were mixing caustic and acid or they were filling acid in caustic tanks in a room below the control room, and the tanks ran over and these reacted on a concrete floor and put fumes up into the control room.

At that plant the numbers, at least as I recall them, were as follows: that you could have ten percent outside makeup air and that was the maximum they could have. And they found that that was not enough to sweep out or dilute these fumes that were seeping up into the control room.

So as I understood it at the time, they redesigned the air system on that control room so you could have more air from outside and take care of such a situation.

And I just assumed this had been looked at generically and that some of the lessons learned there had been passed along to other groups.

MR. DETAMORE: Well that -- we did look at that specific case for Susquehanna, primarily from preventing it from happening. As far as our acid and caustic storage tanks, we looked at the physical separation barriers, the dikes around these tanks.

In the scenario that you just stated, if this were to happen at Susquehanna, we have some of what I referred to as smoke exhaust fans where we can manually align and start these fans up anywhere within the control structure and take a suction off of that area and get the smoke or in this case the fumes outside.

MR. KERR: Do you have Scott air packs available that operators could use?

MR. DETAMORE: Yes, we also have Scott air packs.

MR. MOELLER: In the case I was citing, in the LER it pointed out that the exhaust fan for the acid-caustic compartment or room, whatever you call it, was out of commission, and that of course was one of the reasons that the fumes were not exhausted.

MR. DETAMORE: In that case, as in the caustic tanks, they are in a room right below the control room also.

MR. MOELLER: Are they that way in your plant?

MR. DETAMORE: No, sir, they are not. It is a separate ventilation system.

MR. MOELLER: They are in a separate area, then?

MR. DETAMORE: Yes.

MR. MOELLER: Okay, thank you.

MR. KEISER: I would like to briefly discuss Susquehanna's capability for the onsite storage of spent fuel.

(Slide.)

Susquehanna Steam Electric Station is a two-unit nuclear facility, with each unit sharing a common refueling floor. Each unit has a spent fuel pool containing a spent fuel storage rack. The racks are high density spent fuel storage racks and they have 2,840 storage locations. Each unit's spent fuel pool can be connected via the shipping casks storage pit.

Consequently, spent fuel from the Unit 1 reactor can be stored in the Unit 2 spent fuel pool and vice versa. Without taking credit for this cross-connection option, each Susquehanna reactor has ten years of spent fuel storage space assuming a 12-month refueling cycle and still retaining full core offload capability. Ignoring full core offloading capability, each reactor would have 14 years of spent fuel storage space.

This overlap summarizes Susquehanna's capabilities.

(Slide.)

MR. CATTON: Is your spent-fuel pool, does it have auxiliary power? What happens if you lose AC power?

MR. KEISER: With respect to the spent-fuel pool, nothing; unless you are alluding to the capabilities for spent-fuel pool cooling.

MR. CATTON: I thought I said pooling.

MR. KEISER: I am sorry, I did not hear you.

MR. CATTON: What happens? How long do you have before you get into trouble?

MR. KEISER: That, of course, would depend on the amount of spent fuel stored in the pool.

MR. CATTON: Let us just pick five years from now, five years from startup.

MR. KEISER: You have the capability for connecting fire water to the system, and we have a diesel-driven fire pump that could take a suction from the cooling tower.

MR. CATTON: Okay.

MR. MOELLER: In adding more spent fuel to the pool than might have been planned ten years or so ago, you are depending on boron, you know, in the high-density fuel racks; are you not?

MR. KEISER: The high-density fuel racks contain boron, yes.

MR. MOELLER: How do you know they have boron? Do you have a test that checks?

MR. KEISER: Yes, sir. The term is "blackness" tests are performed.

MR. KERR: On every one of those plates.

MR. MOELLER: It is. Thank you.

MR. KEISER: Any other questions on our spent-fuel storage capabilities?

(No response.)

MR. KEISER: If not, I would briefly move to our capabilities for low-level radioactive waste storage. At the time Susquehanna was planned, low-level radioactive wastes from operating power reactors in the eastern United States was packaged and shipped to a low-level waste disposal facility operated by Chem Nuclear, Inc. This facility was located in Barnwell, South Carolina.

However, in recent years, as you gentlemen know, low-level radioactive waste disposal has been hampered by the unavailability of shipping casks, transportation problems, and restrictive disposal quotas.

Space for waste disposal is expected to become increasingly scarce in the next few years as operators of all three operating disposal sites -- Barnwell, Hanford, Vidi -- have placed a limit on the amount of low-level waste they are willing to accept. This low availability of off-site disposal has become a pressing problem for operating plants and a severe problem for near-term operating plants.

As a consequence, Pennsylvania Power & Light Company is establishing on-site low-level radioactive waste holding facilities, with the capability to store low-level radioactive waste for up to eight reactor-years of operation. The facility would only be necessary if off-site disposal were not available. Permanent retention of these wastes in the facility is not planned.

The only waste to be temporarily stored in this low-level rad waste area are those incidental to the operation of Susquehanna. Acceptance of any off-site generator waste for this facility is not contemplated.

MR. MOELLER: What are you doing to minimize the volume of low-level waste that you produce?

MR. KEISER: We have conducted studies to see how we can better reduce our rad waste generation rate. We are maintaining ourselves with contact in utility organizations and with utilities to see what they are doing and trying to stay abreast of the industry.

MR. MOELLER: Are you looking at incinerators?

MR. KEISER: Not to my knowledge, no, sir.

MR. KERR: Other questions?

(No response.)

MR. KERR: Thank you, Mr. Keiser.

MR. CRIMMINS: My name is Thomas Crimmins. The next subject on the agenda is the discussion of two points referring to the control rod drive system. First of all, NUREG-0785, which addresses the NRC's evaluation of a potential scram discharge system break and the following scenario and the Browns Ferry failure to scram.

(Slide.)

I am making the assumption that the subcommittee knows the background of the NUREG report and the scenario of the event that follows.

MR. KERR: I think that is a safe assumption.

MR. CRIMMINS: The recommendations that came out of that report are five in number: upgrading of the CRD control unit system to a higher class, code class; providing redundant reliable break detection instruments in the area of the potential break; developing emergency operating procedures and training; improving the reliability of the design of the scram exhaust system; and improving the maintenance practices.

There are really two steps in the response to this concern that have been dictated by the Regulatory Commission. As was indicated this morning, they are about to issue another NUREG document which provides additional or changed direction on how to respond to this. We have not had an opportunity to see this and therefore will not be addressing that today.

However, originally, the steps were to submit a generic report on this issue. That has been done by the General Electric Company and BWR owners group and was submitted earlier. We intend to stick with our schedule on evaluating the plant-specific aspects of this incident and filing a report in August, which is in accordance with the original NRC action plan. The GE generic --

MR. KERR: August 1981?

MR. CRIMMINS: August of this year, yes.

The GE generic report concluded that this event is unlikely, that both technical and quality requirements on BWR scram systems are essentially those that are required today and provides sufficient quality in the scram discharge system to preclude this event from being a very high probability.

Additionally, the probability of the whole sequence is below that which is normally considered for a design-basis accident. They also conclude that alarms and operator inspection would provide adequate warning and procedures provide proper response for this type of an event.

Makeup supplies, both emergency and nonsafety, are available and that the consequences of this break are well within the design capabilities of normal and emergency core-cooling capability.

With respect to Susquehanna specifics, we are in the process of doing this evaluation and have not as yet completed it.

(Slide.)

But we would like to point out a couple of points that do point out some differences between the evaluation that was done by the staff and the Susquehanna design.

(Slide.)

Susquehanna uses a MARK-II containment, which has an inherent design improvement over the MARK-I containment concept, which was the one considered in the NUREG report. Our design includes watertight ECCS pump rooms, improved separation between the location of the break and the scram discharge volumes or the instrument volumes and the location of all ECCS pumps. The control rod drive makeup pumps are located in the turbine building and therefore are affected by the conditions generated by this break.

And additionally, our design includes 250-gallon-a-minute reactor building sump pumps, which is a considerable improvement over those used in the MARK-I design.

(Slide.)

With respect to the recommendations of the NUREG, many of the older BWRs were built to earlier code issues. Susquehanna CRD system and the scram discharge volumes were built to ASME Class 2. The recommendation is to improve it to ASME Class 1.

It is a minor incremental jump compared to what the time requirements used to be. We have not concluded the merits or significance of making this type of a design improvement. Multiple break detectors should be available in accordance with the NUREG. There are a large numnber of opportunities for the operator to be warned of this event: radiation monitors, sublevel alarms, CRD high-temperature alarms.

MR. KERR: Does "multiple" refer to break or detection?

MR. CRIMMINS: Multiple detection methods are available to indicate the presence of problems indicated by this or resulting from this break.

Reactor building ventilation alarms as well as automatic isolation of high radiation and operator observation, either through walkdowns or through the noise generated by such an incident. Emergency operating procedures which are under development address actions necessary for the operator to take on breaks which occur outside containment. The general issue of breaks was to be covered, and the specific aspects of this break will be factored into the procedures.

Scram exhaust valve is specifically designed with a fail-open design. And that is important to the fail-safe features of the scram system.

Two changes in the way to improve its reliability in the closed direction is somewhat of a design trade-off, and in light of the fact of the upstream restrictions of the CRD system itself and the operator action to depressurize the system, we are approaching the conclusion that no changes should be made in this area.

Maintenance practices, it was suggested that these be upgraded to ensure that they are consistent with the problems which might exist in this type of a scenario. Our maintenance practices already were in conformance with the suggestions of NUREG-0785.

As I say, we have not yet completed our full analysis of this event for Susquehanna, but are on schedule to do so in mid-August and will be addressing the recommendations and specifics for the NRC.

MR. KERR: Thank you, Mr. Crimmins.

Mr. Lipiski.

MR. LIPINSKI: How many drives are there in your reactor?

MR. CRIMMINS: 185, is it?

MR. LIPINSKI: And there are two lines for each drive and inlet and an exhaust?

MR. CRIMMINS: Correct.

MR. LIPINSKI: So there are 370 lines total. What is the probability that not one of these lines ruptures? You said it was low?

MR. CRIMMINS: No. I do not have a probability number for not one of those lines rupturing. I think that is not the scenario that we are talking about. However, the break of one of those single lines is a rather small break relative to what has been suggested in this case, which is a rupture of a scram discharge volume and then subsequent discharge from a number of different scram lines.

MR. KERR: Does that complete --

MR. CATTON: Yes. I guess in terms of the way he used the term "low probability," I thought he was referring to any one of the 370 lines.

MR. CRIMMINS: I do not remember the exact number. No. I used the term "low probability" in response -- in terms of the sequence of events that were postulated in the NUREG document as one of the results of -- and also a conclusion of the General Electric report which has been filed with the Commission. I do not recall what the number was.

MR. KERR: Have you seen the numbers that the staff calculated?

MR. CRIMMINS: I do not recall them.

MR. KERR: It might be worth looking and making a

comparison. I just wondered what you meant by "low."
MR. CRIMMINS: Does anyone?
MR. ELGAWILA: (Inaudible.)
MR. KERR: My impression was that the PRA people came out with about the same result that Michaelson's group did, but using rather different methods. I thought that it was closer to 10-4 or -5 than it was 10-6.
MR. ELGAWILA: The 10-6, that has been used for that scenario, and that would result in core damage.
MR. KERR: Okay. What did GE get? About 10-18?
(Laughter.)
MR. CRIMMINS: My recollection is on the order of 10-7 for the scenario to core melt.
The other issue we were asked to address is the Browns Ferry 3 failure to scram or incomplete scram.
MR. ZUDANS: Could I ask a couple of questions on this? In your case, what is the scram discharge volume discharge? Where does the pipe go, the scram discharge instrument volume, where does that go?
MR. CRIMMINS: Where is the drain?
MR. ZUDANS: And how big is that drain?
MR. CRIMMINS: You have the size of the drain.
MR. GOTTSHALL: Jack Gottshall, mechanical engineer, PP&L. We have a two-inch drain. It is positively slipped all the way to the reactor building sump and it

exits submerged.

MR. ZUDANS: A separate drain for each of the two sites of your scram discharge volume?

MR. GOTTSHALL: No.

MR. ZUDANS: They come together in a single line?

MR. GOTTSHALL: That is right. The two-inch lines connect.

MR. ZUDANS: One two-inch drain line?

MR. GOTTSHALL: That is correct.

MR. CATTON: A separate scram discharge volume.

MR. ZUDANS: They come back together and go in one line.

MR. GOTTSHALL: That is right. The drains tie together, and then there are common isolation valves.

MR. ZUDANS: Fermi 2 has two lines.

MR. CATTON: Is the scram discharge volume considered part of the reactor coolant pressure boundary?

MR. CRIMMINS: No, it is not. Your question earlier today was whether it was consistent with general design criterion 31 in terms of the fracture toughness application rules being applied to it. And the answer to that is "No," that it is not for that purpose considered part of the reactor coolant pressure boundary.

MR. KERR: I thought his question was whether the staff was going to require that the GDC be followed?

MR. CATTON: Yes.

MR. KERR: I can answer that one easily, but maybe this question also is relevant.

MR. CATTON: That sort of answered it too. He said they are not going to consider it part of the reactor coolant pressure boundary. I am wondering why there is a period of time where it is.

MR. CRIMMINS: For a very short period of time, it is considered part of the reactor coolant pressure boundary, but it is isolated by valves.

MR. CATTON: Upstream?

MR. CRIMMINS: It is isolated. It has isolation valves from the reactor coolant pressure boundary. The valves act as the pressure boundary for the large percentage of the time.

MR. CATTON: Is there not some regulation or guide or something that says you need isolation valves and there should be two of them?

MR. CRIMMINS: I think, in terms of the scram discharge system, the historical --

MR. CATTON: I am not interested in the history; I am just really curious why this particular reactor coolant pressure boundary is treated different than all others? Maybe the staff ought to answer that.

MR. ELGAWILA: Yes. We considered --

MR. KERR: Would you identify yourself, please?

MR. ELGAWILA: Elgawila.

The staff, based on GDC 55, gives you option not to have two valve. You can design system with other design bases, and if you can justify no having two valves, you can go with one valve only. The additional two valves on the scram discharge volume will degrade the reliability of the system, you know, because you are adding, everytime you add additional valve with actuator, you add another failure mechanism.

So the staff viewed it as just the manual valve is fine.

MR. CATTON: There was a study done to demonstrate this? I would like to see it.

MR. ELGAWILA: The NUREG has just been issued. It will be issued at the end of the month.

MR. ZUDANS: Is there not another valve after scram discharge instrument volume that closes it all after you --

MR. ELGAWILA: After the scram discharge volume?

MR. ZUDANS: Right.

MR. ELGAWILA: There are drain valves.

MR. ZUDANS: That is closed.

MR. ELGAWILA: They are closed.

MR. ZUDANS: They are normally open but then it becomes primary coolant boundary.

MR. ELGAWILA: That is correct.

MR. CATTON: That is what I am --

MR. KERR: He said that.

MR. ELGAWILA: I said we are considering that part of the containment pressure boundary.

MR. KERR: What he said was at this point he quit being a lawyer and became an engineer and he looked at the system and decided it would be safer with this manual valve. Ivan wants to see the analysis.

MR. CATTON: Right.

MR. KERR: It exists, apparently. You will get a chance to see it.

MR. ZUDANS: Maybe this is off the subject. But I understand that on the MARK-III the scram discharge volumes, the scram discharge instrument volumes no longer exist.

MR. ELGAWILA: They are inside the containment. That is the difference.

MR. ZUDANS: They discharge into the suppression pool; do they not?

MR. ELGAWILA: I cannot answer that question.

MR. CATTON: That is the logical thing to do.

MR. ZUDANS: That was what I was told in the --

MR. KERR: Please continue. I will put these guys in a room and they can talk to each other.

(Laughter.)

MR. CRIMMINS: The other subject we were asked to address is the Browns Ferry incomplete scram.

MR. KERR: I think this item is on partly because of me, and what I wanted to discuss was not the Browns Ferry scram but what you are going to do about a possible ATWS.

MR. CRIMMINS: About?

MR. KERR: I have heard the Browns Ferry incident discussed.

MR. CRIMMINS: The next presentation addresses ATWS and what our plans are.

MR. KERR: I personally do not want the Browns Ferry scram. Now, wait a minute, you wanted something about the Browns Ferry scram discussed tomorrow, but that is not today. That is with GE.

MR. CATTON: It is not, in particular, Browns Ferry but Browns Ferry is the example that I would like looked at.

MR. KERR: Do we want the Browns Ferry scram discussed or failure to scram? You would not feel bad if we skipped that; would you?

MR. CRIMMINS: No, sir.

MR. KERR: Okay, we are interested in hearing about your ATWS plans.

MR. CRIMMINS: Yes, sir.

MR. KERR: I am sorry, I guess we did not make it clear.

MR. CRIMMINS: The purpose of this presentation is to discuss our status with respect to ATWS analysis and mitigation devices and our plans in the future. PP&L has made plans to make Susquehanna units tolerant of an ATWS event. We are addrressing the various elements of the ATWS issue and have and will continue to make decisions on this issue based on overall plant safety, proposed NRC rulemaking, and the benefits of proposed modifications.

Four actions have or will be implemented by fuel load to assist in making the plant design, overall design, as ATWS-tolerant as possible at this time. The modifications are two. One is the addition of a diverse redundancy safety-grade recirculation pump trip for the plant and an upgraded instrumentation package on scram discharge instrumentation volume.

Two other actions involve improved operator procedures and training to deal with an ATWS event and a plant-specific analysis which takes into account the Susquehanna plant parameters and a potential ATWS-mitigation system.

(Slide.)

The goals of the plant-specific analysis which we have underway are to assure the radiological consequences of projected ATWS event are well within the guidelines of 10 CFR 100; also, that the pr:.ary system does not exceed established pressure limits; primary containment design conditions are not exceeded; that fuel integrity is maintained at an acceptable level; and that long-term cooling and shutdown capability is not impaired.

Also, the efforts of various ATWS fixes are being evaluated in this analysis as to their effect on normal operating and other abnormal operating conditions which do not involve a failure to scram.

MR. CATTON: Before you take this off, this would be a place to ask a question. Do you plan to do a weather stability analysis?

MR. KERR: Do you understand his question?

MR. CRIMMINS: Evaluation of the neutron oscillation.

MR. CATTON: You have half the core where you have a scram --

MR. CRIMMINS: The effect of the oscillations on neutron power and stability --

MR. CATTON: It goes back to the whole column you have on that side, the fuel integrity.

MR. CRIMMINS: Yes, sir. The objective is to ensure that the fixes, as they are established, do not result in any neutron oscillations.

MR. CATTON: Your position is you are going to ensure that the ATWS never occurs so you do not need to do that analysis?

MR. CRIMMINS: No, I did not say that. I said the intent is to do an analysis which demonstrates that oscillations do not occur even in the presence of an ATWS. And therefore, the effects of that type of stability --

MR. CATTON: The stability analysis, very good.

MR. CRIMMINS: A comparison of the latest proposed rule -- and this, I should point out I guess, is not the latest proposed rule -- I am not addressing that -- which was submitted in the last few weeks, created by Dr. Hendrie. I am talking about the rule before that, 80-409 versus the Susquehanna plant design has been requested. Nine topics were identified which affected BWRs.

(Slide.)

Plant-specific analysis is underway, as I indicated, and we would expect to complete that by the later part of this year. The redundant diverse safety-grade recirculation pump trip will be implemented. The design of this modification has been reviewed by the staff and found acceptable and will be installed in the plant prior to fuel load.

Plant procedures and operator training are in development. These are symptom-based procedures, as was discussed before. Simulator training will be part of this program. An upgraded scram discharge instrumentation design will be implemented, and I will discuss that in a moment.

Containment isolation issue is inherent in the BWR because of its inerted characteristics and the fact that it remains isolated. This issue has to do with BWRs and the potential for purging at a time when an ATWS event occurs.

PP&L is participating in the generic efforts to study the upgrade of the HPCI reliability improvement program. Alternate rod insertion design and procurement --

MR. KERR: How much improvement do you think you can get, and how will you know when you have got it, or you are just studying it?

MR. CRIMMINS: I cannot specifically address that. The evaluation is in its early stages.

MR. KERR: Okay. Thank you.

MR. CRIMMINS: Alternate rod insertion design and procurement is underway. The actual need to implement this modification will be determined by our ongoing analysis as well as the outcome of the rulemaking.

Implementation of the logic changes, including all facets of the MSIV closure and feedwater runback, will also be determined by our plant-specific analysis. Decisions to implement these must consider all factors of overall plant safety, and this is the specific area in which we are concerned about the potential effects of these added safety control circuits on other normal operations or abnormal operating conditions in the plant. Our analysis will address what the implications of these are.

Automatic initiation of standby liquid control system will also be determined by our plant-specific analysis, or at least a need for that. Specific concerns over the flux oscillations and liquid control system flow and timing of poison injection will be addressed.

MR. LIPINSKI: On the last item, given you do have an ATWS and the auto standby liquid control goes in, do you have an estimate as to how long it will take you to clean it up and how much replacement power will cost?

MR. CRIMMINS: No, I do not. We could try to get that for you. I do not believe we have made an estimate, although I think GE has.

MR. ‘‘PINS‘I: They did for different plants. The numbers have a range. I wonder where you fell within the range of their initial presentation numbers.

MR. CRIMMINS: We have not made that specific calculation for Susquehanna.

(Slide.)

The planred schedule for implementing the known ATWS changes are as indicated here. The plant specific analysis will be done by the end of the year. The recirc pump trip and the operator training will be accomplished by fuel load.

The scram discharge volume modification includes two pieces. One is a relocat'‐n of the already existing safety-related float switches in such a way as to have a much more direct communication with the scram discharge volume. Initially the design had the line to these float switches from the drain line and it is being reconnected directly to the volume to have a more direct path. That portion will be completed by fuel load, and that is what is meant by the partial.

In addition, on our own initiative we decided to make the safety circuits level within the scram discharge volume redundant and diverse -- they are redundant at this point, but diverse also -- by adding differential pressure detectors, switches to signal the various levels.

Prior to fuel load we will install the necessary taps to accomplish this, and as the equipment becomes available during 1982 install it and install this additional alarm and indication.

In summary, we believe the addition of these recirc pumps trips and the plant modifications to the scram discharge instrumentation volume and the specific application of the ATWS procedures in training provides sufficient margin from ATWS events for the startup of the plant.

In addition, our plant specific analysis will establish the need for any further changes or modifications, as will the ongoing rulemaking effort which will proceed next year.

MR. LIPINSKI: On that last viewgraph, you did not have the auto standby liquid control on the list. When will that be implemented?

MR. CRIMMINS: As I indicated --

MR. CATTON: You had the three asterisks, but there were not any dates.

MR. CRIMMINS: On these items the schedule has not been dictated. As I said, we have not -- those are issues that we are studying. Those are portions of the generic fix as outlined in the NRC document. We are saying that we are evaluating with our plant specific analysis the need for those, and we will conclude whether or not they are needed and if so what the schedule will be as a result of that analysis.

MR. ZUDANS: Do you ever seriously consider auto standby liquid control?

MR. CRIMMINS: Do we ever seriously consider it? We will seriously consider it if there is an indication from our analysis that that is a proper approach.

MR. ZUDANS: But you do not have enough time to do it by hand.

MR. CRIMMINS: If we do not have enough time to do it manually, yes, sir.

MR. ZUDANS: Is the consensus today as far as Mark II is concerned you have enough time to do it by hand?

MR. CRIMMINS: That is correct. Part of the analysis that is ongoing is an analysis of boron mixing within the reactor which will substantiate that.

MR. ZUDANS: The other thing is, you said initially you scram discharge instrument volume and scram discharge volume were connected by a pipe which was enlarged.

MR. CRIMMINS: Let me clarify that. In the Susquehanna design -- and I would have covered this had I had an opportunity to discuss the Browns Ferry incident -- the connection, as you recall, there was a small diameter restriction between the scram discharge volume and the instrument volume at Browns Ferry.

That is not the case in the Susquehanna design. It is an eight-inch pipe which connects directly to a ten-inch --

MR. ZUDANS: Like that --

MR. CRIMMINS: The comment I made about piping was the float switches, which are the input to the alarms and rod block and scram associated with the instrument volume, are on a separate pipe and were connected to the drain line as opposed to directly into the volume. We are modifying that to make a direct connection with the volume to assure that there is no -- to minimize the possibility for restrictions which would invalidate that information.

MR. ZUDANS: What is the single most compelling reason why the scram discharge volume is not discharged to the suppression pool or discharged in the sump tank, and why is this instrument volume needed, if you have a strong opinion for that?

MR. CRIMMINS: I could not tell you why, the basis for draining it to one place or another. I do not see how that, though, relates to the need for the instrument volume. The purpose of the instrument volume --

MR. ZUDANS: You have an open drain. Whenever you discharge, you discharge it. You may still need a vent line when it goes open straight to the suppression pool. You still have a valve there after you have performed the function.

MR. CRIMMINS: Yes, that is correct. I think historically the concern has been a valid one, that even in light of however many drains one might have on that system, that you would like to have an indication that sufficient volume is available for the scram to take place and that in the event of a buildup to the point of where a scram could not take place, that it would be reaching the point where a scram could not take place, that you would automatically actuate the scram.

So regardless of the reliability of the drain system, you would still want to have -- the design basis is you would still want to have that instrument volume which indicates --

MR. ZUDANS: The desire is understandable and it is a correct one. But if you take the 18-inch valve and make it nice and big to accept the 18 pieces of pipe and then put another T in there, put another two-inch pipe, then you proceed to go to the sump, it seems like that latter portion does not -- is not looked upon with the same care. But that is part of the same thing.

So I say why don't you just put the same valve in now which you close when you need to close it, and that is the primary containment system?

MR. KERR: Zenons, if we do design work for this Applicant, we have to charge him.

(Laughter.)

MR. ZUDANS: I have repeated this comment so many times, and I think Mark III is -- we were told --

MR. KERR: But they have a Mark II. You can't make a Mark II look like a Mark III.

MR. ZUDANS: It's a newer model, then, right?

MR. KERR: Do you understand the comment?

MR. CRIMMINS: I do, yes, sir.

MR. MOELLER: To clarify, when you say you are going to do something at fuel load, you mean before startup?

MR. CRIMMINS: That is correct, yes, sir.

MR. KERR: Other questions?

(No response.)

Thank you, sir.

MR. CRIMMINS: Thank you.

MR. KERR: It is now 4:00 --

(Laughter.)

MR. KERR: -- and in looking at the rest of the agenda, I am going to make a unilateral decision that we have heard enough NRC staff discussion of ACRS questions on the environmental impact statement supplement. So if there is someone here from the staff who is waiting to discuss that, I am sorry you have had to wait this long, but if you won't feel hurt I will eliminate that item from the agenda.

I think the environmental -- the final environmental statement deals with at least part of Dr. Mark's concerns. But we will cover the Mark II containment program and the Susquehanna security system as scheduled.

MR. ROTH: My name is Dale Roth, senior project engineer, Pennsylvania Power & Light Company. My presentation is going to be on the Mark II containment.

This issue has been discussed numerous times over the past few years with the ACRS. I am sure you are all very familiar with the issue.

(Slide.)

It was most recently discussed with the Fluid Dynamics Subcommittee in April of this year when we held a two-day meeting in California.

Our position is that our plant has been designed to accommodate these very conservative safety relief valve and LOCA load specifications. Our program extends beyond the generic Mark II owners program. I will get into that in a little more detail later.

These specifications, load specifications for SRV and LOCA, are based on extensive data bases and these data bases are full-scale data bases. I think it is important to point out it is part of the program. I believe more full-scale test data exist on this issue than on almost any issue before the nuclear industry today.

This program has undergone extensive review with the staff and with the industry over the past few years to affirm the conservativisms which exist within these load specifications, and our final assessment for these loads is under way now and we plan this to be completed prior to fuel loading.

(Slide.)

I think we can skip the issue. I think we are familiar with the Mark II containment issue.

(Slide.)

Again, just to familiarize ourselves with the Mark II containment, we are speaking about the loads which occur within the suppression pool during safety relief valve discharge during LOCA.

(Slide.)

As I mentioned earlier, the plant design has been updated to accommodate these load specifications. Our program utilized portions of the generic program and the plant unique featur‹s which we have included for Susquehanna. The load definitions are documented in our desi‹gn assessment report, along with the assessment itself. Its review is contained within the SER and supplement 1 to the SER.

As I said earlier, the final assessment of the plant is being carried on right now.

(Slide.)

As Norm Curtis mentioned earlier this morning, we have taken what we consider a leadership role in this program from the outset. We found ourselves in what we consider a unique position. The program was split up early on into what was called a lead plant program and a long-term program. We were not designated as a, quote, unquote, "lead plant." We did not feel that we were indeed a long-term plant, either.

We found ourselves a leader of the long-term plants, I guess you could call it. Because of this position, we felt we had to aggressively attack the problem on our own because the generic program was structured to meet the needs of those lead plants early on. Because of this, we retained early in our program Stanford Research

Institute, SRI, to be an independent consultant for PP&L on the Mark II containment program.

In addition, we embarked on a development program with Kraftwerk Union to develop a plant specific T-quencher device. I will get into more detail on the next slide. And most recently, we have run a series of full-scale LOCA tests, again with Kraftwerk Union in Germany.

(Slide.)

The T-quencher program was initiated in '77. The program was initially aimed at giving Susquehanna a plant-specific quencher device. Once the design was finalized by Kraftwerk Union, a series of full-scale tests were performed in Germany on that device. The quencher design is now being used by six of the seven other Mark II plants. It has been adopted as a generic T-quencher.

MR. KERR: What is the matter with number seven?

MR. ROTH: They made the decision about the same time to install an X-quencher.

NRC review of this program has been completed and the load specifications were found to be acceptable.

(Slide.)

Just to familiarize the group with the T-quencher, here is a schematic of the device.

MR. ZUDANS: I had a question previously, not to you. That pipe that comes down to you and joins the

T-quencher, this joint between the vertical pipe and the T-quencher, is there a weld or is that a sliding joint?

MR. ROTH: Sliding, to allow thermal growth of the discharge pipe.

MR. ZUDANS: Okay.

MR. KERR: I am sorry. To allow what?

MR. ROTH: Thermal growth of the discharge pipe.

MR. KERR: I understand. Thank you.

MR. ZUDANS: You do not have other supports, though?

MR. ROTH: It is supported up above at the diaphragm slab, the pipe itself is.

In addition, we have run a series of full-scale tests with Kraftwerk Union. These tests were full-scale single cell tests performed in a prototypical test facility under prototypical test conditions. The tests have provided us with an extensive data base for the specification of a very conservative level of steam condensation load specification.

This specification was recently accepted by the staff in supplement 1 to the SER. And this load specification has been adopted as a design basis LOCA.

MR. ZUDANS: How many downcomers did you have in this?

MR. ROTH: One single cell.

MR. ZUDANS: But full scale?

MR. ROTH: Yes.

MR. CATTON: How do your results compare with the GE 4-T tests?

MR. ROTH: We find them very comparable.

(Slide.)

The next slide is just a configuration of the GKM2M facility. It contains a drywell tank, a wetwell tank, and a prototypical single vent pipe. In addition, as a result of this program we have made some modifications to the plant. They are indicated in the next slide.

Early on after the identification of the program, we did add some additional reinforcing bars to the containment structure itself. We have rerouted our SRV lines to give a more symmetric distribution of the lines within the pool. As I mentioned, we installed T-quenchers on these lines. We have redesigned and replaced our downcomer bracing system. We have recently upgraded the suppression pool monitoring systems per NRC's requirements in NUREG-0487. They are now Class 1E.

We have removed major equipment from the pool swell zone within the wetwell. And the biggest modifications that are going on now deal mainly with the last item. We are modifying and increasing the numbe of pipe supports in the containment and reactor building to accommodate the increased loading specifications.

(Slide.)

We conclude that this issue has been investigated thoroughly by not only PP&L but the Mark II owners over the last six years. Our design has been evaluated so that we can accommodate what we consider to be very conservative load specifications. These specifications are based on a wide range of experimental data and analytical methodologies.

Because of these conservatisms and the resulting plant modifications we have made, we feel that the plant will function safely under any of the postulated SRV actuations or LOCA conditions.

MR. CATTON: I would just like to comment. I followed PP&L's Mark II program practically since the beginning, and I think they have really done an excellent job.

MR. ROTH: Thank you.

MR. KERR: Are there other questions?

(No response.)

Thank you very much, sir.

MR. ELGAWILA: The question from the ACRS why we accepted the bending moment at Susquehanna -- (Inaudible).

MR. KERR: So they are not identical, there is a difference.

MR. ELGAWILA: There is a difference. The quencher is identical. The design load is different. The DFFR methodology that was approved by the staff a long time ago has been (Inaudible), but Susquehanna considered that load to be extremely conservative and they developed their own load based on (Inaudible) and we reviewed that load and came up with our acceptance criteria that would be issued in September in a NUREG.

MR. CATTON: Susquehanna actually went and measured it?

MR. ELGAWILA: That is correct.

MR. CATTON: So that makes it a little bit better than the early, what is it, GFR?

MR. ELGAWILA: DFR.

MR. CATTON: You were trying to get a number that you were assured was conservative. Susquehanna went out and blocked it out and measured it.

MR. ELGAWILA: That is correct.

MR. KERR: Thank you, sir.

Other questions or comments on this issue?

MR. MOELLER: I had a couple of questions on the purging of the containment. When would they be asked?

MR. KERR: Right now.

MR. MOELLER: All right, let me do that, then. I wanted to ask the staff, I notice that you have said that they do not need to install debris screens in the purging -- you know, to protect the purging valves in the containment until the first refueling. And I wondered why that?

MR. KERR: Do you understand the question, staff?

MR. ELGAWILA: We understand from the Applicants that procurement of the debris screen to meet the seismic qualification is very hard and it would take some time to order that. So it was NRC's decision that we can (Inaudible).

MR. MOELLER: What do the other plants do?

MR. ELGAWILA: LaSalle has same thing. We give them until first refueling outage.

MR. MOELLER: I see, this is a generic approach that you have decided upon.

MR. ELGAWILA: If you want to call it that way.

MR. MOELLER: Now, when they do purge, which I gather is limited to 90 hours a year, you will use the standby gas treatment system. Let me ask the Applicant, can you purge both units at once? If the standby gas treatment system is common, does that permit you to purge both units at once?

(Pause.)

MR. KERR: Is the man at which you were pointing hiding back there somewhere?

(Laughter.)

MR. KERR: Do you understand the question? Somebody can look up the answer.

MR. CRIMMINS: I will look up the answer.

MR. MOELLER: I have one last one. For the main condenser offgas treatment system, does that routinely go through a charcoal system? Do you have what we used to call an augmented charcoal system for this?

MR. KEISER: It ultimately goes through 170 tons of charcoal.

MR. MOELLER: That is on line all the time?

MR. KEISER: Yes, sir.

MR. MOELLER: Okay.

MR. KEISER: The offgas goes through the recombiners and then it goes through the charcoal system.

MR. MOELLER: It is funny, the SER -- I did not look, you know, in your safety evaluation or analysis report, but the SER never tells you about that charcoal system, or at least I could not find it.

Two other quick ones. You say you have a hydrogen analyzer at the outlet of each recombiner for the steam jet air rejecter, you know, to be sure you do not build up a combustible mixture. What happens if that hydrogen analyzer fails? I mean, it did not say. Are these in duplicate?

MR. KEISER: Yes, I believe there is an isolation signal on the hydrogen. Dependent on the failure mode, exactly what happens to the offgas; is that correct?

MR. MOELLER: I have two questions: What happens if the hydrogen concentration is too high? And number two, what happens if the hydrogen analyzer fails?

MR. ADAMS: It isolates on high hydrogen concentration.

MR. MOELLER: What if the hydrogen analyzer fails?

MR. ADAMS: There is duplicate.

MR. MOELLER: I notice again in reviewing LER's you do not have to search too far to find failures of these hydrogen analyzers. On your mechanical vacuum pump exhaust on the turbine prior to startup, you say you have a radiation monitor on that. And I guess if it reads too high, you do not evacuate the turbines. Then what happens?

MR. KEISER: I believe that system has an isolate on it also.

MR. MOELLER: I mean, what do you do? Is there a way to -- I mean, you never could start up, I presume. Is there some treatment system, airborne treatment system to send this -- the mechanical vacuum pumps' exhaust to --

MR. KEISER: It exhausts to the standby --

MR. ADAMS: Not with the vacuum pump. The normal offgas --

MR. MOELLER: It goes to the normal offgas system.

MR. ADAMS: For the air injector, not for the vacuum pump, no, sir.

MR. MOELLER: What do you do, then, if you get too high a reading? Do you stop pumping? Then what do you do?

MR. ADAMS: We have auxiliary steam that you can run the air rejectors with and draw vacuum using the steam.

MR. MOELLER: Then send it through the charcoal system, but it would take you a little extra time.

MR. ADAMS: Right.

MR. MOELLER: Okay, thank you.

MR. KERR: Does that complete your questions?

MR. MOELLER: Yes.

MR. KERR: Mr. Keiser, are you prepared to talk about the security system?

MR. KEISER: No, sir. I was briefly going to discuss the post-accident hydrogen control system. I can do it real quick or we could delay it.

MR. KERR: I think we should talk about that. I guess I got ahead of you on the agenda, and I do not want to do that. Please go ahead.

MR. KEISER: The post-accident hydrogen control system at Susquehanna Steam Electric Station consists of five subsystems. The first is the containment atmosphere subsystem. The function of this system is to provide a well-mixed atmosphere in the drywell and the wetwell, to assure that localized concentrations of hydrogen do not occur.

Post-LOCA mixing of the drywell is accomplished by safety-related portions of the containment ventilation system. With these drywell coolers, placed throughout the containment using portions of a duct. you get a sweeping action to prevent a localized buildup of hydrogen.

(Slide.)

The wetwell mixing is accomplished by blowdown to the wetwell and operation of the RHR system wetwell spray.

The second system is the hydrogen monitoring system.

(Slide.)

There are two redundant systems that provide a continuous monitor of gas concentrations within the wetwell and drywell to indicate, record and alarm detection of excessive hydrogen and oxygen. Each analyzer system has two sample points in the drywell and one sample point in the wetwell.

During reactor startup, the oxygen concentration is monitored for manual adjustment of nitrogen injection into the containment to ensure that the atmospheric makeup is 96 percent nitrogen and four percent oxygen. During unit outages, containment atmosphere is monitored to ensure there is sufficient for life support. Oxygen content less than 19 percent is alarmed.

During reactor operation containment atmosphere is monitored for excessive hydrogen and oxygen concentration. If hydrogen and oxygen concentration is greater than limits, it will be alarmed.

The containment atmosphere after a LOCA is monitored for excessive hydrogen or oxygen concentration, and hydrogen-oxygen limits greater than specified will be alarmed.

The third system is off-hydrogen recombiner system. There are two 100 percent redundant recombiner systems. They are provided to limit the hydrogen concentration to below four percent. Each system consists of two units, one unit located in the drywell and one unit located in the wetwell, for a total of four units.

(Slide.)

Each hydrogen recombiner is a natural convection flameless thermal reactor type hydrogen-oxygen recombiner. The recombiner heats a continuous 100 cubic feet per minute sream of containment atmosphere to a temperature sufficient for recombination of hydrogen and oxygen to form water.

(Slide.)

Our fourth system is the containment hydrogen purge system. The containment hydrogen purge is provided as a backup to the hydrogen recombiner system and would be used post-LOCA only if it is required as a result of failure of both recombiner systems.

The purge system controls the hydrogen concentration by dilution of the post-LOCA containment atmosphere with nitrogen and/or air. Nitrogen and/or air is added to the containment at a rate of 100 cubic feet per minute, and the containment atmosphere is purged through a two-inch vent bypass and processed to a standby gas treatment system. Up on the first 18-inch valve are the two-inch valves to the standby gas treatment system.

(Slide.)

The fifth system is the containment nitrogen inerting system. The nitrogen gas will be used for primary containment atmosphere control. The oxygen concentration of the inerted atmosphere during reactor operation will not exceed four percent by volume. There is a two-inch purge line which may be used for containment atmosphere control during normal operation.

All purge gases are processed through the standby gas treatment systems.

Any questions?

MR. KERR: Help my ignorance a little bit and tell me why, when you only have four percent oxygen, you worry about hydrogen collecting in pockets? You mentioned earlier that you had methods for making sure that hydrogen was dispersed. What difference does it make?

MR. KEISER: While we have less than four percent hydrogen?

MR. KERR: No. When you have less than four percent oxygen, why do you care whether the hydrogen concentrates or not? This isn't -- I am just asking out of curiosity.

MR. KEISER: I do not have an answer for you.

MR. CATTON: What about when they clear the nitrogen out and put oxygen in so people can go in there?

MR. KERR: I assumed that this is while they are having an containment o something.

MR. CATTON: Oh.

MR. KERR: Do you have an answer, Mr. Crimmins?

MR. CRIMMINS: Yes, sir. My name is Thomas Crimmins.

The design basis for the inerting system is intended to take care of the initial hydrogen generation as a result of the metal-water reaction following the containment. The recombiner system is designed for the longer-term radiolysis generation in which both oxygen and hydrogen are released and the oxygen content in the question might increase, and therefore you need a way to remove the oxygen from the hydrogen.

MR. KERR: I understand the recombiner or I thought I did. But in the first part of your commentary I thought you mentioned you had found some method to mix the hydrogen so that you would not get a concentration of hydrogen in the -- at some point in the system.

MR. CRIMMINS: Yes, sir.

MR. KERR: I wondered why you care.

MR. CRIMMINS: As the scenario proceeds, you might wind up with a higher concentration of either of the constituents of the detonable gases, either hydrogen or oxygen concentrated somewhere. So there is a requirement to keep it mixed. This is especially the situation with the hydrogen.

MR. KERR: You are assuming that some unknown source of oxygen or something that increases that concentration above four percent --

MR. CRIMMINS: Eventually radiolysis will increase both the concentration of hydrogen and oxygen in the containment.

MR. KEISER: There are studies that have been done that show -- demonstrate that the fans are not necessary in order to get proper circulation. We have not taken credit for any of those studies.

MR. KERR: It is not a point I wanted to pursue in great detail. I just was puzzled, if you have the thing inerted that it makes any difference whether hydrogen is concentrated or not.

MR. KEISER: There are studies that suggest it is not necessary,

MR. KERR: Mr. Moeller?

MR. MOELLER: I believe they were going to answer my question, the earlier one, whether the standby gas treatment system would handle --

MR. KERR: Yes, sir, they were.

MR. CRIMMINS: Yes, sir, we have a common redundant standby gas treatment system which is for both units, and we can accommodate venting from both the units through that system simultaneously.

MR. MOELLER: I have one rather unrelated question, if this is the right time.

MR. KERR: Is it related to Susquehanna?

(Laughter.)

MR. MOELLER: Yes.

MR. KERR: Okay.

MR. MOELLER: This has very little to do with anything that has been discussed. But on your turbines you have turbine seals which are sealed with clean steam. How do you make that steam? Can someone tell me? And at what pressure is it?

MR. ADAMS: Lee Adams, supervisor of operations.

We have two auxiliary boilers that provide steam at 125 pounds.

MR. MOELLER: 125 pounds?

MR. ADAMS: Yes. It is also the steam -- the same steam that supplies the steam generators.

MR. MOELLER: Okay. Then that steam could seal the turbine at the low pressure end, I presume. Can it seal -- what do you do about sealing at the high pressure end?

MR. KEISER: It is the same steam. The sealing is reduced to about three pounds.

MR. MOELLER: Okay, thank you.

MR. KERR: Are there other questions?

(No response.)

Does that complete your presentation?

MR. KEISER: Yes, sir.

MR. KERR: We need to go into closed session to talk about security, and my guess is there may be people who have cars parked somewhere. Is that the case? Does anybody need to take a recess to get -- I would suggest that we take about -- how long would it take, 10 or 15 minutes to do the car bit? Is 10 minutes enough to get your car out of the garage? Is there anybody who needs to?

(No rsponse.)

There is no one who needs to. Okay, then we will not recess except long enough to clear out those people who should not be here.

But before we do, I want to ask about an item that appears on page 7-4 of the SER. There is a description of the use of non-safety-grade equipment and listed among systems falling into this category is the recirc pump trip on turbine trip. Now, I am not -- I heard earlier from the applicant that the recirc pump trip was class 1. So this must be something different than that.

Is it or --

MR. STARK: I would like to respond to that. You are absolutely correct. The Applicant pointed that out to us, too. We discussed it with the reviewer. That particular item does not belong in that table. As a matter of fact, it belongs in the next paragraph. I am trying to look and see.

MR. KERR: It is just a typo or something?

MR. STARK: It does not belong there and you are correct in taking it out.

MR. KERR: Okay. I just wanted to demonstrate that I read at least one page of the SER.

(Laughter.)

MR. KERR: Well then, let's take about five minutes and prepare for a closed session. Wait a minute. I should ask. Do you want it to be in closed session?

MR. CURTIS: Dr. Kerr, before we move to the security item and perhaps close the record, I believe we still have a couple of open questions that we can disposition at this point.

MR. KERR: Then we had better close those questions if we can. Tell me what they are.

MR. CURTIS: The first one is on the seismic design of our transmission system. Tom Crimmins.

MR. CRIMMINS: Sir, we do not have any specific design requirements for the transmission system that relate to seismic design. However, there are a number of design features that do give you some confidence that at least some of the structures would be able to withstand, you know, considerable seismic events.

However, that is not the design basis. There are a number of components which we would not expect to exist through a large earthquake event, and that is the design basis for the onsite electrical supply system.

MR. KERR: It seems to me from listening to Professor Siess that there is something like a uniform building code which does apply or does have some seismic requirements. Are your structures built to even that level of seismic resistance?

MR. CRIMMINS: Well, some of the structures do, the towers and other structures. There are items such as the insulators and transformers which are not affected by that code and are probably a weak point in the system.

MR. KERR: Thank you, sir.

Was there another question?

MR. CURTIS: The second question is in the application of security testing -- I am sorry, psychological testing, and Chuck Sprunk, I believe, can respond to that. I see no reason why that cannot be done in open session.

MR. SPRUNK: Charles Sprunk, Director, Corporate Security, PP&L.

I understand the specific question related to whether or not the psychological testing administered for people who are granted unescorted access to the site, are they tested for suicidal tendencies? It does in fact include that.

MR. KERR: Okay.

Let me ask a question that does not have anything to do with suicidal tendencies. Do you think that this psychological test enables you to select with some sort of reasonable certainty people who might commit sabotage?

MR. SPRUNK: I would like to address that in more detail in closed session.

MR. KERR: That may be appropriate. I will certainly approve that.

MR. ZUDANS: Can I demonstrate that I read another page of the supplement?

MR. KERR: Sure.

MR. ZUDANS: I think there is a typo in 22-5 of the supplement, which says this is done by flooding the reactor pressure vessel through several relief valves. Did it intend to be "bleeding" the pressure vessel through several relief valves?

MR. KERR: Probably. We will accept that interpretation.

MR. ZUDANS: Line number 6 from the bottom of the page. And I was curious on 3-15 on the main body of the report, a quick one, the reasoning for allowing just 10 cycles for seismic subsystem analysis instead of requiring 50. That is not clear to me. That is on the bottom of page 3-15.

MR. KERR: That is just a statement; it is not a question.

MR. ZUDANS: I just wanted to know why.

MR. KERR: Your question is why was 10 cycles used instead of 50.

MR. ZUDANS: Some reason is given but they are not convincing.

MR. KERR: Does the staff understand the reference? It is on page 3-15, I guess the fourth paragraph under 3.7.3.

MR. STARK: I understand the question. I do not have an answer right now.

MR. KERR: Okay.

Does it make sense to say you will get an answer in time for the full committee meeting?

MR. STARK: Yes, I will look into that for you.

MR. KERR: Okay. Is that okay?

MR. ZUDANS: Yes, it is all right by me.

MR. KERR: Other questions?

(No response.)

Who else read the SER?

(Laughter.)

MR. KERR: Well, that is enough of that.

Let's take five minutes.

MR. CURTIS: Excuse me again. I am sorry, a little housecleaning or housekeeping. Our notes would indicate that we feel we have responded to all the questions raised here. If anybody is aware of any that we have not, I would like to identify them now.

MR. KERR: Is there anybody that thinks that the Applicant has not responded to all the questions raised here?

(No response.)

Speak now or forever -- you think they have not?

MR. CATTON: I do not know.

(Laughter.)

MR. KERR: We have a number of yesses and one undecided.

(Laughter.)

MR. CATTON: If they want more questions, we can probably find some.

MR. KERR: Anything else?

MR. CURTIS: The Applicant would recommend that we go into closed session for the security.

MR. KERR: After we go into closed session, which is not recorded, there will be a brief additional open session at which time we will discuss the ACRS meeting. We do not need that recorded, so I think this will be the end of the recorded part. But I do expect to have a very brief open session after the closed session.

Let's take five minutes and then be prepared for a closed session.)

(Whereupon, at 6:37 p.m. the meeting was recessed, to reconvene in closed sesssion.)

NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

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in the matter of: ACRS/Subcommittee on Susquehanna Nuclear Power Station

Date of Proceeding: July 23, 1981

Docket Number:

Place of Proceeding: Washington, D. C.

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

David S. Parker

Official Reporter (Typed)

(SIGNATURE OF REPORTER)

SITE INTRODUCTION

LEADERSHIP AREAS

- Organization
- Mk II Program
- Appendix R
- Security
- Advanced Control Room
- Simulator

I. SITE DESCRIPTION

A. LOCATION

THE SUSQUEHANNA SES IS A 1075 ACRE SITE LOCATED ON THE WEST BANK OF THE SUSQUEHANNA RIVER IN SALEM TOWNSHIP, LUZERNE COUNTY, PENNSYLVANIA. IT IS LOCATED 15 MILES NORTHWEST OF HAZLETON AND 20 MILES SOUTHWEST OF WILKES-BARRE, THE NEAREST CITIES WITH POPULATIONS IN EXCESS OF 25,000. IT IS FOUR MILES SOUTH OF SHICKSHINNY AND FIVE MILES NORTHEAST OF THE BOROUGH OF BER..CK.

THE TOPOGRAPHY IN THE SITE AREA RANGES FROM RELATIVELY FLAT FLOODPLAINS TO GENTLY ROLLING HILLS. ELEVATIONS RANGE FROM 500 FEET ON THE FLOODPLAIN TO 1,600 FEET ABOVE MEAN SEA LEVEL ON THE NORTHERN BOUNDARY.

THE MAIN STATION BUILDINGS ARE LOCATED ON A TERRACE ABOVE THE FLOODPLAIN, APPROXIMATELY 4,000 FEET WEST OF THE SUSQUEHANNA RIVER.

B. EXCLUSION AREA

THE EXCLUSION AREA DISTANCE IS 1800 FEET FROM THE PLANT COMMON RELEASE POINT. THE SITE PROPERTY OWNED BY PP&L (1075 ACRES) IS SIGNIFICANTLY LARGER THAN THE EXCLUSION AREA (235 ACRES). THE EXCLUSION AREA BOUNDARY AND THE SITE BOUNDARY ARE COINCIDENT FOR ABOUT 1350 FEET ALONG THE SOUTHERN PORTION OF THE SITE. PP&L OW[illegible] EXCLUSION AREA

INCLUDING MINERAL RIGHTS EXCEPT FOR TOWNSHIP ROUTE T-419 AND THEREFORE HAS AUTHORITY TO DETERMINE ALL ACTIVITIES WITHIN IT. TOWNSHIP ROUTE T-419, A LOCAL ROAD, TRAVERSES THE EXCLUSION AREA AT ITS NORTHERN EXTREMITY. THIS IS THE ONLY AREA WITHIN THE EXCLUSION AREA WHERE ACTIVITIES UNRELATED TO THE PLANT WILL OCCUR. PP&L HAS ARRANGED WITH THE SALEM TOWNSHIP SUPERVISORS AND WITH THE PA STATE POLICE TO CONTROL TRAFFIC ON ROUTE T-419 IN THE EVENT OF AN EMERGENCY.

C. POPULATION DENSITY

THE LOW POPULATION ZONE (LPZ) HAS BEEN DEFINED AS A CIRCULAR AREA OF 3 MILE RADIUS, THE CENTER WHICH COINCIDES WITH THAT OF THE EXCLUSION AREA. THE ESTIMATED POPULATION IN THE LPZ IN 1980 WAS ABOUT 2700 PERSONS AND IS PROJECTED TO REACH ABOUT 3000 BY 2020 (THE PROJECTED END OF PLANT LIFE).

THERE ARE NO SCHOOLS, HOSPITALS, STATE OR MUNICIPAL PARKS WITHIN THE LPZ. THE STATION RECREATION AREA, WITH PEAK DAILY ATTENDANCE ESTIMATED TO BE 800 PERSONS IS WITHIN THE LPZ. LUZERNE OUTWEAR COMPANY, AN INDUSTRIAL FACILITY IS LOCATED ABOUT 1.25 MILES NORTH-NORTHWEST OF THE SITE (~486 PERSONS EMPLOYED). CAR-MAR INC., IS A FIRM LOCATED IN A PLANNED INDUSTRIAL PARK ABOUT 1.7 MILES SOUTHWEST OF THE PLANT. CAR-MAR EMPLOYES APPROXIMATELY 70 PEOPLE. NO OTHER FIRMS HAVE MOVED IN YET. THE BERWICK AREA INDUSTRIAL ASSOCIATION, BEACH HAVEN SITE, IS THE ONLY OTHER INDUSTRIAL FACILITY KNOWN TO BE WITHIN THE LPZ. OTHER TRANSIENT POPULATION WITHIN THE LPZ IS LOW.

THE LARGEST COMMUNITY WITHIN 10 MILES OF THE SITE IS BERWICK LOCATED ABOUT 5 MILES SOUTHWEST OF THE SITE, WHICH HAD A 1980 POPULATION OF 12,189 PERSONS. THE NEAREST DENSILY POPULATED CENTER WITH A POPULATION OF ABOUT 25,000 PERSONS, IS THE CITY OF HAZLETON, ABOUT 15 MILES SOUTHEAST, WHICH HAD 1980 POPULATION OF 27,318 PERSONS. PP&L HAS EXAMINED POPULATION TRENDS WITHIN 10 MILES OF THE SITE AND HAS CONCLUDED THAT IT IS UNLIKELY THAT A POPULATION CENTER, (WITHIN THE MEANING OF THE TERM IN 10 CFR PART 100) CLOSER TO THE SITE THAN HAZLETON WILL DEVELOP DURING THE PLANT LIFETIME. THE CITIES OF WILKES-BARRE AND SCRANTON, WITH 1980 POPULATIONS OF 51,551 AND 88,117 PERSONS, RESPECTIVELY, ARE LOCATED ABOUT 18 MILES and 35 MILES, RESPECTIVELY, NORTHEAST OF THE SITE. PP&L HAS ESTIMATED THAT THE 1980 POPULATION WITHIN 30 MILES OF THE SITE IS APPROXIMATELY 652,000 PERSONS. PP&L PROJECTS THAT THE POPULATION WITHIN 30 MILES WILL DECLINE IN A VALUE OF ABOUT 600,000 PERSONS BY THE YEAR 2020.

D. TRANSPORTATION ROUTES

THE SUSQUEHANNA RIVER FLOWS NORTH TO SOUTH ABOUT 4000 FEET EAST OF THE PLANT. NAVIGATION, EXCEPT FOR RECREATION BOATING, IS NEGLIGIBLE ALONG THIS STRETCH OF THE RIVER.

THERE ARE TWO RAILROAD LINES WITHIN 5 MILES OF THE PLANT. THE ERIE-LACKAWANNA LINE TRAVERSES THE FLOODPLAIN NEAR THE WEST BANK OF THE SUSQUEHANNA RIVER APPROXIMATELY 2900 FEET EAST OF THE CENTER OF THE EXCLUSION AREA. THIS LINE IS USED ONLY FOR PLANT ACCESS VIA A SPUR

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THE DELAWARE AND HUDSON LINE IS LOCATED ON THE EAST BANK OF THE SUSQUEHANNA RIVER ABOUT 1.25 MILES EAST OF THE PLANT. A PROFILE OF HAZARDOUS CHEMICALS SHIPPED ON THE RAILROAD WAS OBTAINED IN 1975 AND IT WAS DETERMINED THAT AMMONIA AND SULFUR DIOXIDE WERE BEING SHIPPED SUFFICIENTLY FREQUENTLY TO REQUIRE A DETAILED ANALYSIS. A PROBABILISTIC MODEL WHICH CONSIDERS RAILROADS ACCIDENT RATES, RAILCAR SHIPPING WEIGHT AND FREQUENCY OF SHIPMENTS, AS WELL AS DISTANCES OF VARIOUS TRACK SEG-MENTS FROM THE PLANT, AND METEOROLOGICAL DISPERSION CONDITIONS WAS

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THERE ARE FOUR ROADS THAT PASS IN THE SITE VICINITY. THESE ARE:

1) SALEM TOWNSHIP ROAD T-419 WHICH PASSES TO THE NORTH ABOUT 1600 FEET FROM THE CENTER OF THE EXCLUSION AREA AND 500 FEET FROM VITAL PLANT STRUCTURES.

2) SALEM TOWNSHIP ROAD T-438 WHICH PASSES TO THE WEST ABOUT 2000 FEET FROM THE CENTER OF THE EXCLUSION AREA AND 1400 FEET FROM VITAL PLANT STRUCTURES.

3) SALEM TOWNSHIP ROAD T-456 WHICH PASSES TO THE SOUTH ABOUT 1800 FEET FROM THE CENTER OF THE EXCLUSION AREA AND 1600 FEET FROM VITAL PLANT STRUCTURES.

4) U.S. ROUTE 11 WHICH PASSES TO THE EAST ABOUT 2600 FEET FROM THE CENTER OF THE EXCLUSION AREA AND 2500 FEET FROM VITAL STRUCTURES.

PP&L HAS ANALYZED A PROPANE TRUCK ACCIDENT ON U.S. ROUTE 11 AND HAVE SHOWN THIS POSES NO HAZARD. TOXIC MATERIAL TRANSPORT AND HAZARDS ALONG THESE ROADS IS NOT EXPECTED ON THE BASIS THAT THROUGH TRUCK TRAFFIC IS EXPECTED TO USE INTERSTATE 80 AND 81 AND THAT LOCAL INDUSTRY IN THE BERWICK AREA DOES NOT INCLUDE INDUSTRY CLASSIFICATIONS WHICH ARE EXPECTED TO PRODUCE OR CONSUME QUANTITIES OF HAZARDOUS MATERIALS.

E. METEOROLOGY

EASTERN PA IS SUBJECTED TO THUNDERSTORM ACTIVITY AND THE EFFECT OF TROPICAL STORMS. FREEZING RAIN AND SNOW ARE COMMON WINTERTIME PHENOMENON. TORNADOES HAVE BEEN REPORTED IN THE SITE VICINITY. PP&L HAS DESIGNED PLANT STRUCTURES TO WITHSTAND SEVERE OR EXTREME CONDITIONS AT THE SITE IN ACCORDANCE WITH 10 CFR PART 50, APPENDIX A, GENERAL DESIGN CRITERIA 2. ONSITE METEOROLOGICAL MEASUREMENTS HAVE PROVIDED DATA FOR RELEASES OF RADIOACTIVE GAS IN ACCORDANCE WITH 10 CFR PART 100.10 AND 10 CFR PART 50 APPENDIX I.

F. HYDROLOGY

1. FLOOD POTENTIAL

THE ONLY NATURAL WATER BODY POSING A SIGNIFICANT POTENTIAL FLOOD HAZARD TO THE PLANT IS THE SUSQUEHANNA RIVER. EXCEPT FOR THE RIVER INTAKE AND DISCHARGE STRUCTURES, ALL MAJOR PLANT STRUCTURES ARE 4000 FEET FROM THE SUSQUEHANNA RIVER AT ELEVATION 670 FEET MSL OR HIGHER. THIS ELEVATION IS APPROXIMATELY 175 FEET ABOVE THE SUSQUEHANNA RIVER FLOODPLAIN, MORE THAN 150 FEET ABOVE THE HIGHEST RECORDED RIVER LEVEL AND OVER 120 FEET ABOVE THE CALCULATED PROBABLE MAXIMUM FLOOD ELEVATION.

THE LARGEST FLOOD OF RECORD ON THE SUSQUEHANNA RIVER NEAR THE SITE (1972 - TROPICAL STORM AGNES) YIELDED A WATER ELEVATION MORE THAN 150 FEET BELOW PLANT GRADE AND MORE THAN 8 FEET BELOW THE DESIGN FLOOD LEVEL OF THE RIVER INTAKE STRUCTURE.

2. ULTIMATE HEAT SINK (UHS)

THE UHS IS THE ONSITE SEISMIC CATEGORY 1, SPRAY POND. THE RIVER INTAKE PROVIDES WATER FOR NORMAL OPERATION DURING EXTREME HYDRAULIC EVENTS. THE SPRAY POND PROVIDES COOLING WATER FOR EMERGENCY SHUTDOWN AND FOR THE RESIDUAL HEAT REMOVAL SERVICE WATER SYSTEM DURING NORMAL SHUTDOWN.

THE SPRAY POND IS A KIDNEY SHAPED, CONCRETE LINED BASIN, THAT CONTAINS 25 MILLION GALLONS OF WATER WITH A SURFACE AREA OF 8 ACRES. THERE ARE 4 SPRAY NETWORKS CONTAINING A TOTAL OF 1056 SPRAY NOZZLES ON 264 "TREES". THE SPRAY POND WILL BE SUFFICIENT TO PROVIDE 30 DAYS OF COOLING WATER WITHOUT MAKEUP.

3. GROUNDWATER

NO PLANT USE OF GROUNDWATER DURING OPERATION OF THE PLANT IS ANTICIPATED. A POSTULATED FAILURE OF THE EVAPORATOR CONCENTRATE TANK, THE TANK OUTSIDE OF CONTAINMENT WHOSE FAILURE HAS THE GREATEST POTENTIAL TO RESULT IN HIGH OFFSITE RADIONUCLIDE CONCENTRATIONS; WAS ANALYZED TO ESTIMATE THE CONCENTRATION OF RADIOACTIVE CONTAMINANTS AT OFFSITE LOCATIONS. THE CONTENTS OF THE TANK WERE CONSERVATIVELY ASSUMED TO ENTER THE GROUNDWATER INSTANTANEOUSLY, AS A SLUG RELEASE. THE NUCLIDES WERE ASSUMED TO TRAVEL WITH A VELOCITY CONTROLLED BY THE GROUNDWATER VELOCITY AS MODIFIED BY CONSERVATIVELY ESTIMATED ION EXCHANGE CHARACTERISTICS.

THE GROUNDWATER GRADIENT IS TOWARD A BEDROCK VALLEY NORTH OF THE RADWASTE BUILDING AND THEN TOWARDS THE SUSQUEHANNA RIVER. IT IS CONSERVATIVELY ESTIMATED THE MINIMUM GROUNDWATER TRAVEL TIME TO BE 9.2 YEARS. FOR THOSE NUCLIDES THAT ARE AFFECTED BY ION EXCHANGE PROCESSES THE TRAVEL TIMES WOULD BE LONGER. THE CALCULATED CONCENTRATIONS OF ALL NUCLIDES WERE WELL BELOW THE

MAXIMUM PERMISSIBLE CONCENTRATIONS LISTED IN 10 CFR PART 20, APPENDIX B, TABLE II BEFORE MIXING WITH SUSQUEHANNA RIVER WATER.

G. GEOLOGY AND SEISMOLOGY

THE SEISMIC CATEGORY 1 STRUCTURES IN THE POWERBLOCK AREA ARE SUPPORTED ON FIRM, UNWEATHERED ROCK HAVING AN INTACT UNCONFINED COMPRESSIVE STRENGTH IN EXCESS OF 3,600 PSI AND A YOUNGS MODULUS IN EXCESS OF 3 X 10^6 PSI. THE STRUCTURAL LOADS WILL PRODUCE NO SIGNIFICANT TOTAL OR DIFFERENTIAL SETTLEMENT OF FOUNDATIONS SUPPORTED ON BEDROCK.

THE EMERGENCY SERVICE WATER PUMPHOUSE IS SUPPORTED ON GLACIAL SOILS AT A DEPTH OF ABOUT 50 FEET BELOW ORIGINAL GRADE. THE GROSS FOUNDATION LOADS ARE CALCULATED TO BE 2.8 KSF OR DEAD LOADS AND 0.3 KSF FOR LIVE LOAD. THE SPRAY POND AND SEISMIC CATEGORY I PIPELINE AND CONDUITS WILL NOT EXERT SIGNIFICANT STATIC LOAD ON SUBSURFACE SOILS; THUS NO SIGNIFICANT SETTLEMENT DUE TO STATIC LOADS IS EXPECTED.

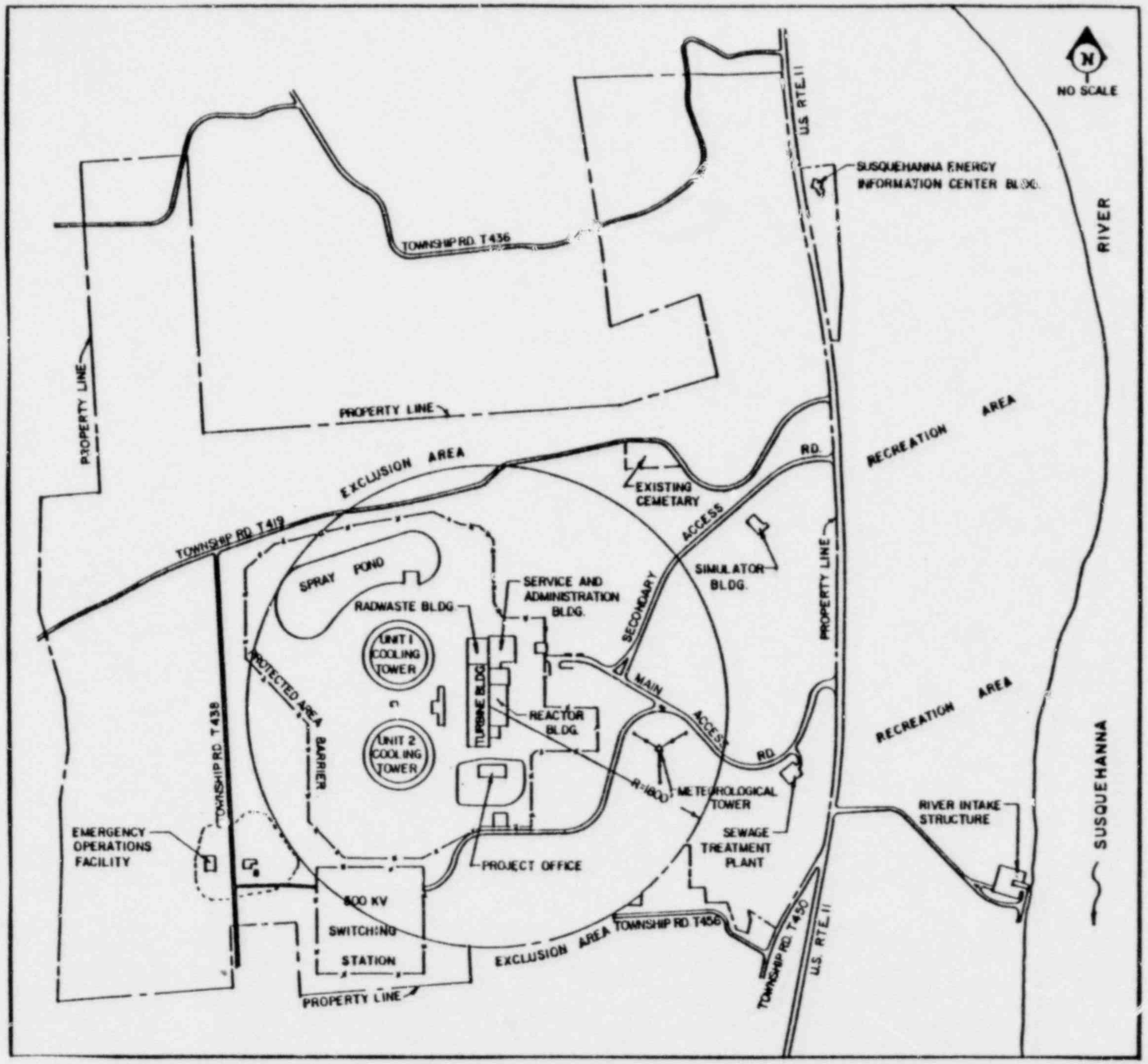
THE SAFE SHUTDOWN EARTHQUAKE DESIGN ACCELERATION FOR STRUCTURES SUPPORTED ON ROCK IS 0.10 G. TO ACCOMMODATE SOIL AMPLIFICATION OF SEISMIC MOTION, THIS SAFE SHUTDOWN EARTHQUAKE VALUE HAS BEEN INCREASED TO 0.15 G FOR SOIL-SUPPORTED STRUCTURES. THE CORRESPONDING VALUES FOR THE OPERATING BASES EARTHQUAKE ARE 0.05 G AND 0.08 G.

THE MAXIMUM SETTLEMENT UNDER THE SPRAY POND DURING A SAFE SHUTDOWN EARTHQUAKE WAS CALCULATED TO BE 1.2 INCHES. THE MAXIMUM SETTLEMENT UNDER THE EMERGENCY SERVICE WATER PUMPHOUSE WAS CALCULATED TO BE 1.0

INCH. THE MAXIMUM DIFFERENTIAL SETTLEMENT ACROSS THE SPRAY POND WILL BE EQUAL TO THE MAXIMUM TOTAL SETTLEMENT BECAUSE PART OF THE SPRAY POND IS CUT INTO ROCK. THE MAXIMUM SETTLEMENT OF THE SEISMIC CATEGORY I PIPELINES AND CONDUITS IS EXPECTED TO BE LESS THAN 1.0 INCH BECAUSE THEY ARE SUPPORTED ON A LESSER DEPTH OF GLACIAL SOIL THAN THE SPRAY POND. CONSERVATIVE ASSUMPTIONS WERE USED IN THESE CALCULATIONS AND ACTUAL SETTLEMENTS AS A RESULT OF DYNAMIC LOADING ARE EXPECTED TO BE LESS. ALL PIPING AND STRUCTURES WERE DESIGNED FOR THIS SETTLEMENT.

II. COMPARISON OF PRINCIPAL DESIGN FEATURES

MANY FEATURES OF THE DESIGN OF SUSQUEHANNA ARE SIMILAR TO OTHER PLANTS UNDER CONSTRUCTION (E.G. LASALLE, ZIMMER) OR IN OPERATION (E.G. HATCH 2). A LISTING OF COMPARABLE PRINCIPAL PARAMETERS AND FEATURES OF SUSQUEHANNA, LASALLE, ZIMMER AND HATCH 2 IS ATTACHED.


NO SCALE
N
SUSQUEHANNA ENERGY INFORMATION CENTER BLDG.
RIVER
SUSQUEHANNA
U.S. RTE. 11
TOWNSHIP RD. T436
PROPERTY LINE
PROPERTY LINE
EXCLUSION AREA
RECREATION AREA
RECREATION AREA
RD.
EXISTING CEMETARY
ACCESS
SECONDARY
SIMULATOR BLDG.
PROPERTY LINE
TOWNSHIP RD. T419
SPRAY POND
SERVICE AND ADMINISTRATION BLDG.
RADWASTE BLDG.
UNIT 1 COOLING TOWER
UNIT 2 COOLING TOWER
TURBINE BLDG.
PROTECTED AREA
BARRIER
MAIN
ACCESS
REACTOR BLDG.
RD.
R=1800'
METEOROLOGICAL TOWER
SEWAGE TREATMENT PLANT
RIVER INTAKE STRUCTURE
TOWNSHIP RD. T438
EMERGENCY OPERATIONS FACILITY
PROJECT OFFICE
500 KV
SWITCHING
STATION
EXCLUSION AREA
TOWNSHIP RD. T456
TOWNSHIP RD. T450
U.S. RTE. 11
PROPERTY LINE

SER

OPEN ITEMS

SER OUTSTANDING ISSUES

- Turbine Missiles
- Environmental Qualification of Electricl Equipment
- Steam Bypass of the Supression Pool
- Additional Justification Required for T-Quencher Loads
- Review of Submerged Dragloads
- IE Bulletin 79-27 and 80-06
- Fire Review of Alternate Safe Shutdown System
- Modification of Automatic Depressurization System Logic
- Provide Common Reference Level for Vessel Level Instrumentation
- Emergency Preparedness
    - Upgrade Emergency Preparedness
    - Upgrade Emergency Support Facilities
    - Long-Term Emergency Preparedness
- Heavy Loads Generic Letter
- Scram Discharge Volume Generic Letter

MANAGEMENT
AND
ORGANIZATION

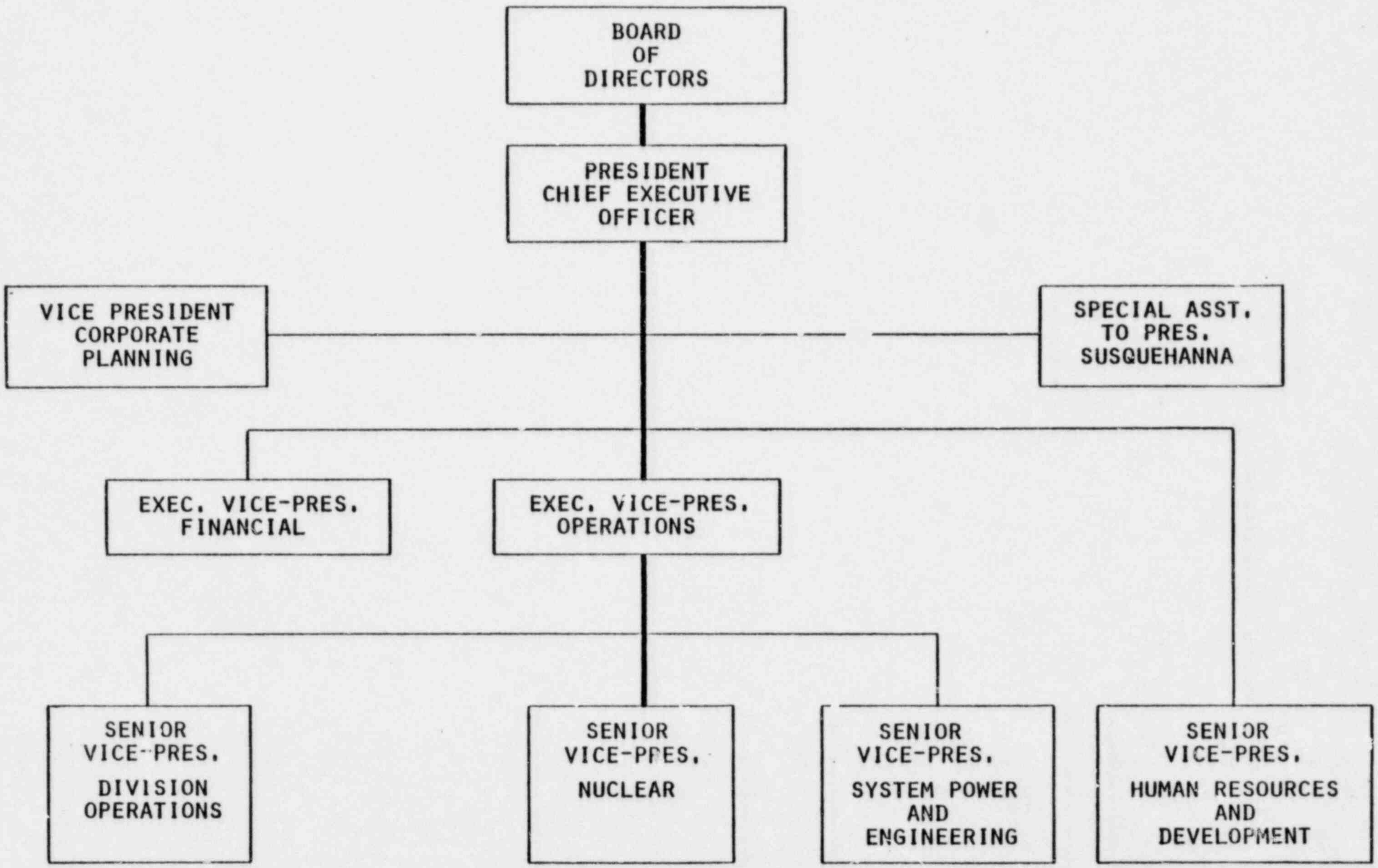
PENNSYLVANIA POWER & LIGHT

<u>NUCLEAR ORGANIZATION AND STAFFING</u>

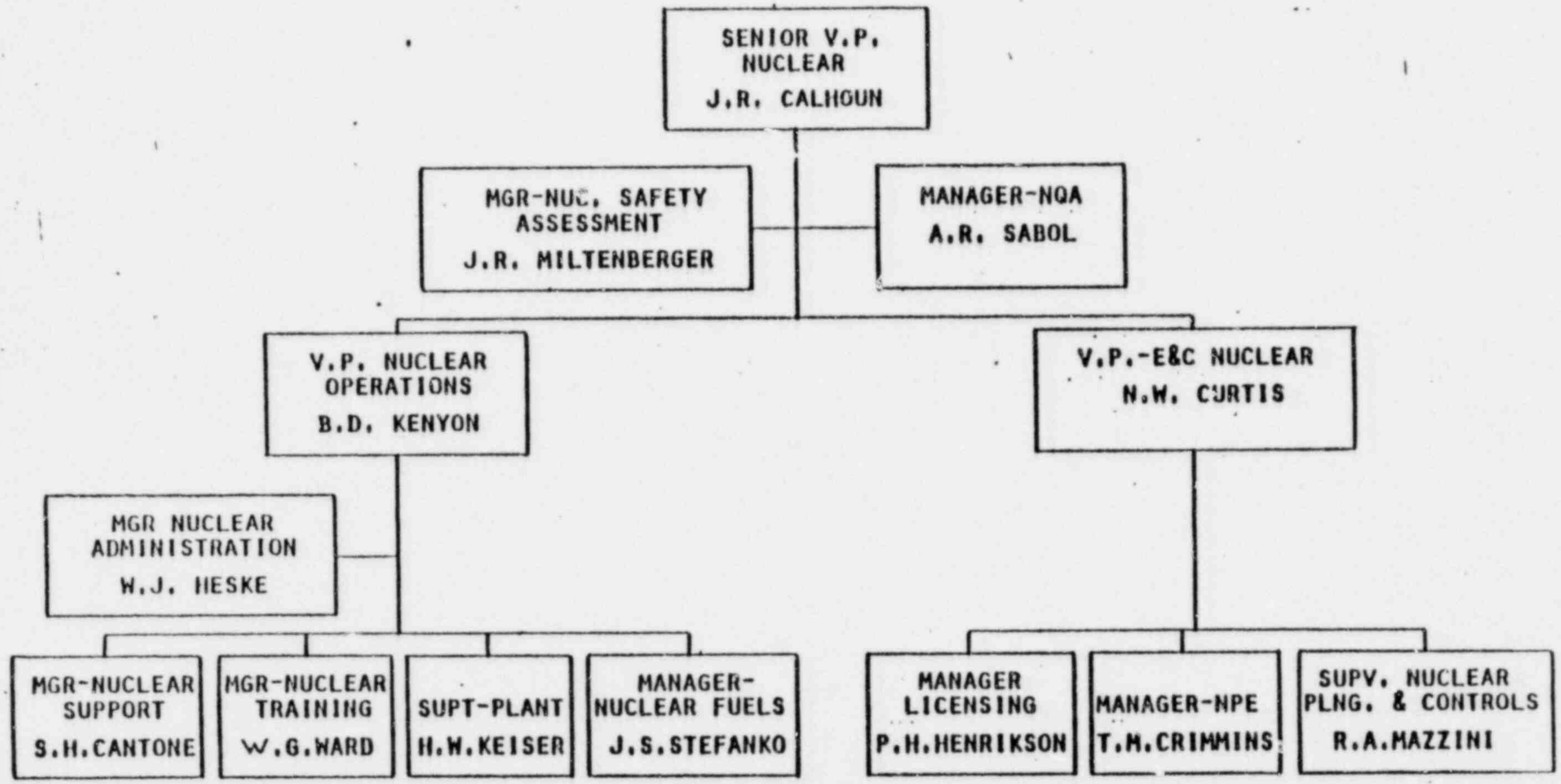
- o COMPLIANCE WITH NUREG 0731
- o ENHANCEMENTS
- o MANAGEMENT PHILOSOPHY

- Background
- Post TMI Assessments
  - Design
  - Organization and Staffing
  - Radiation Monitoring
  - Emergency Plans
  - Communications
- Result

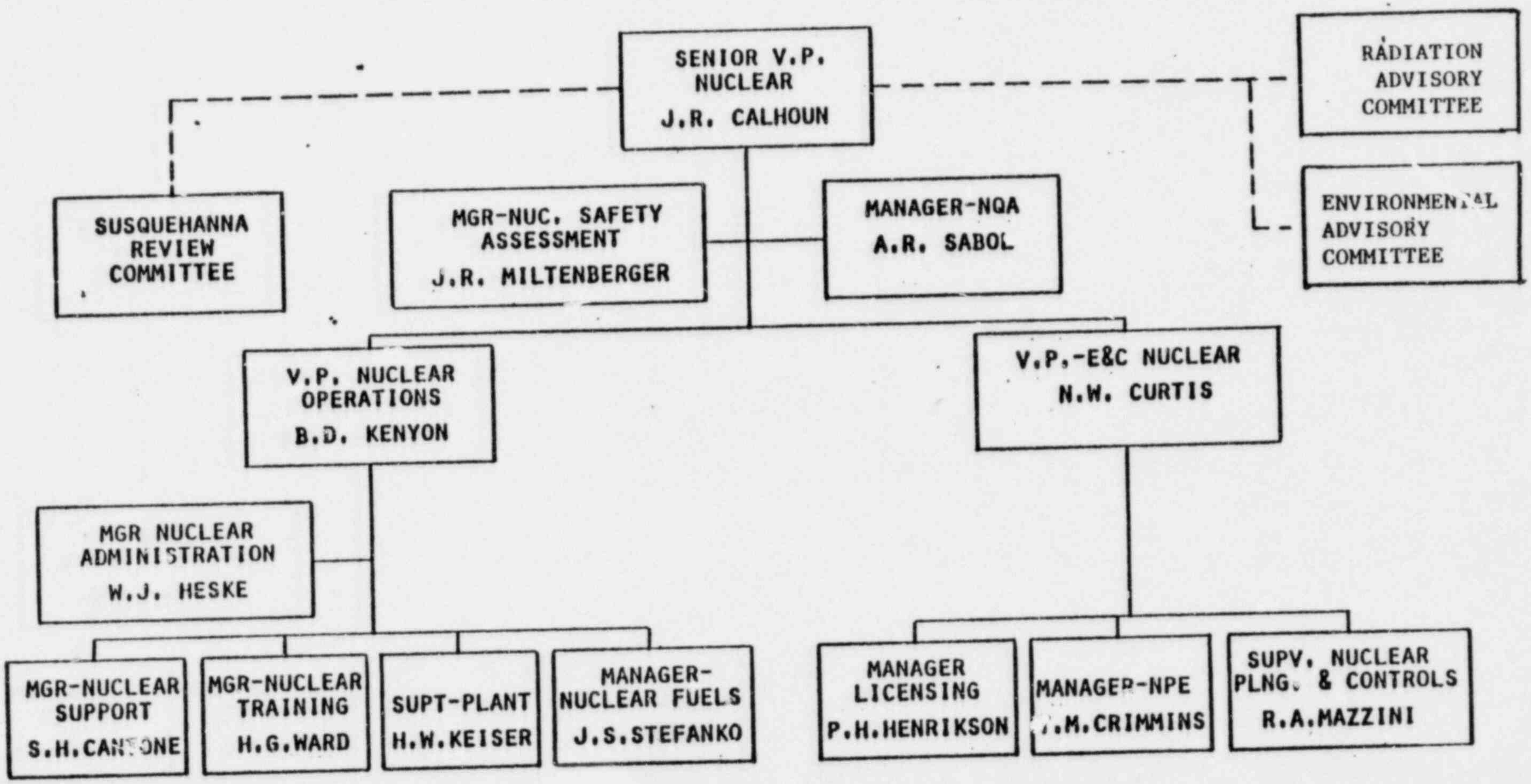
CORPORATE MANAGEMENT ORGANIZATION



NUCLEAR DEPARTMENT ORGANIZATION

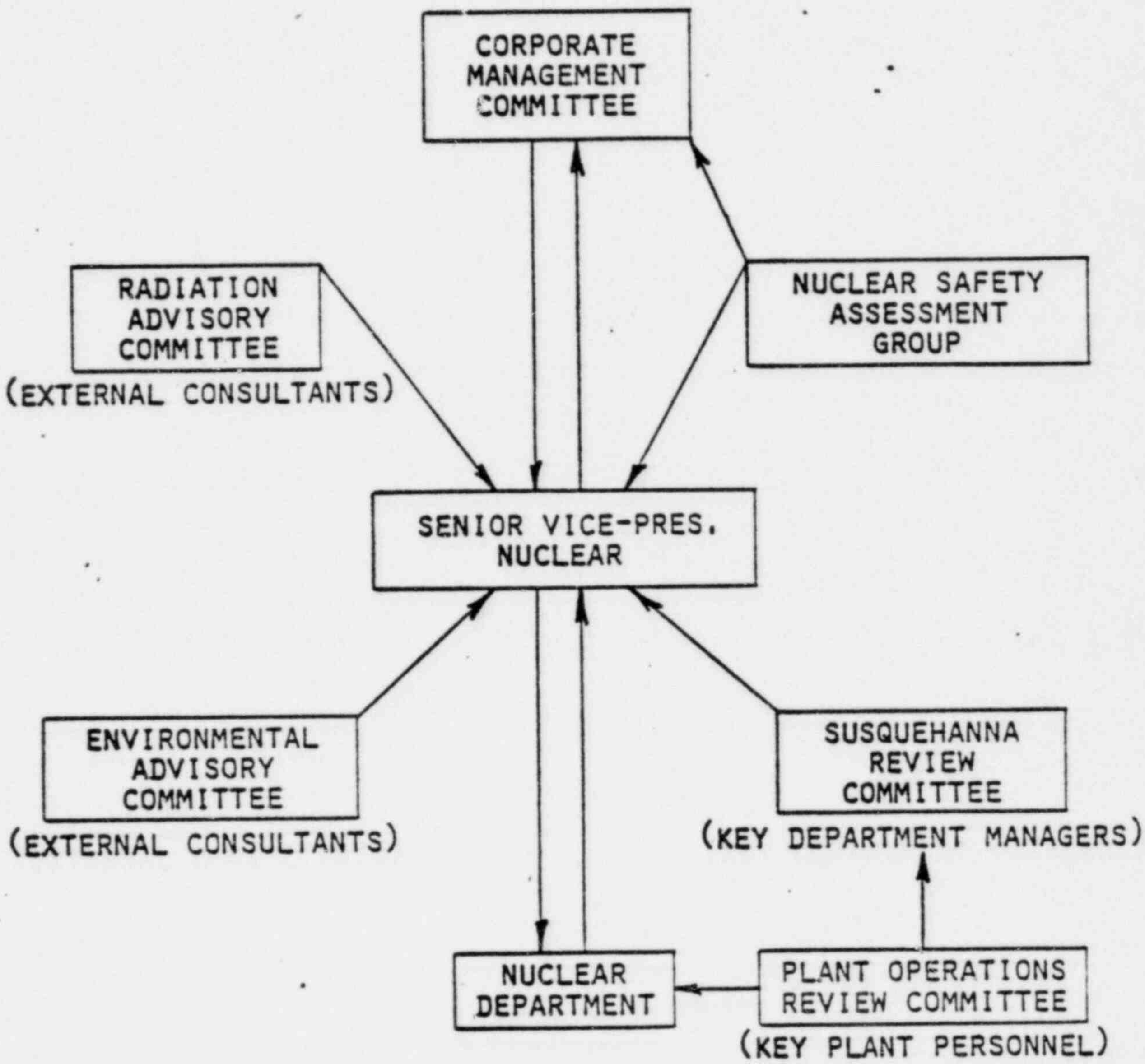


NUCLEAR DEPARTMENT ORGANIZATION



TRAINING

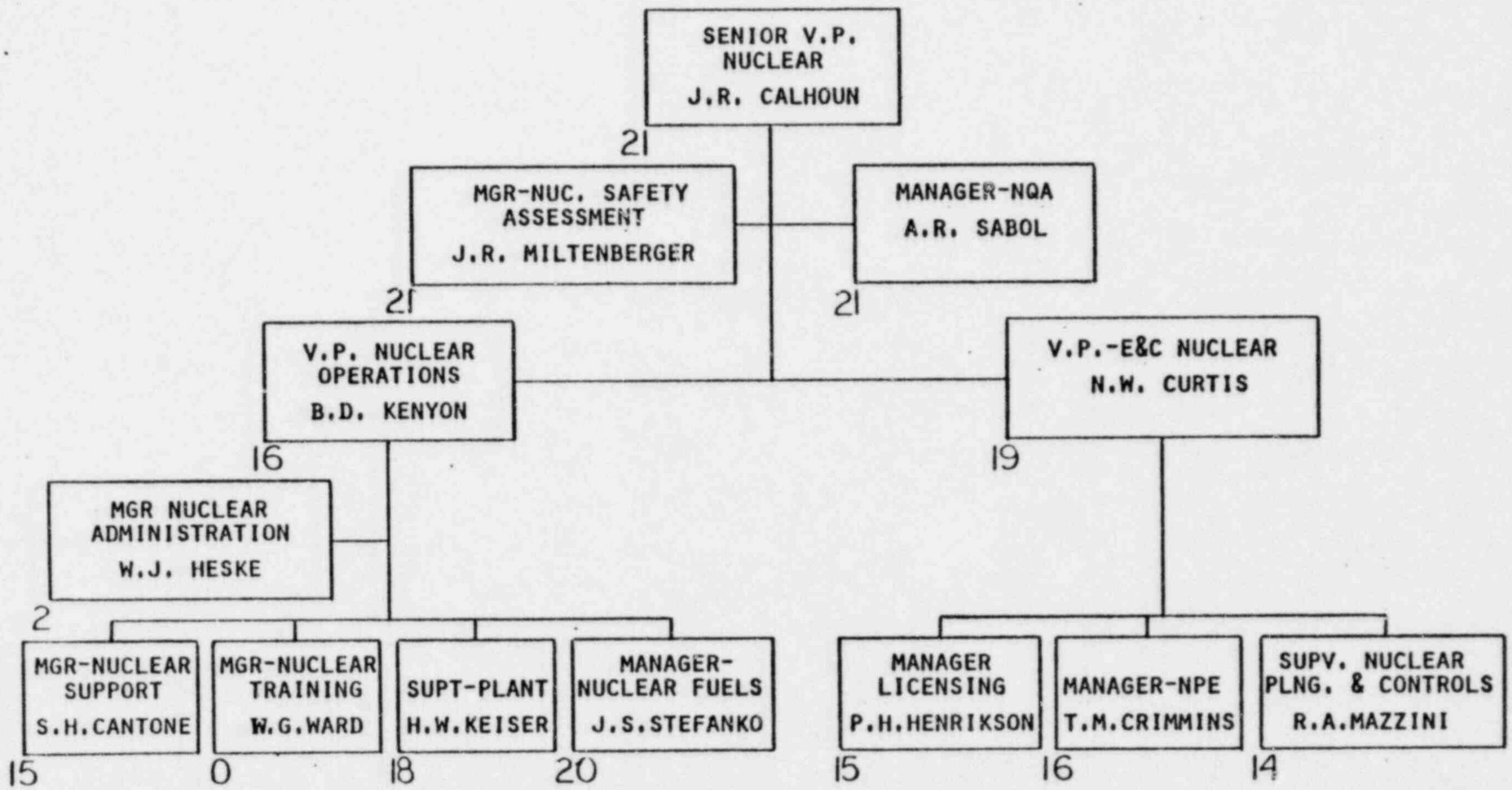
- o CONSOLIDATION
- o REPORTING RELATIONSHIP
- o MANAGER OF NUCLEAR TRAINING
- o COMPREHENSIVE
- o SIMULATOR


CORPORATE MANAGEMENT COMMITTEE
RADIATION ADVISORY COMMITTEE
(EXTERNAL CONSULTANTS)
NUCLEAR SAFETY ASSESSMENT GROUP
SENIOR VICE-PRES. NUCLEAR
ENVIRONMENTAL ADVISORY COMMITTEE
(EXTERNAL CONSULTANTS)
SUSQUEHANNA REVIEW COMMITTEE
(KEY DEPARTMENT MANAGERS)
NUCLEAR DEPARTMENT
PLANT OPERATIONS REVIEW COMMITTEE
(KEY PLANT PERSONNEL)

NUCLEAR ORGANIZATION

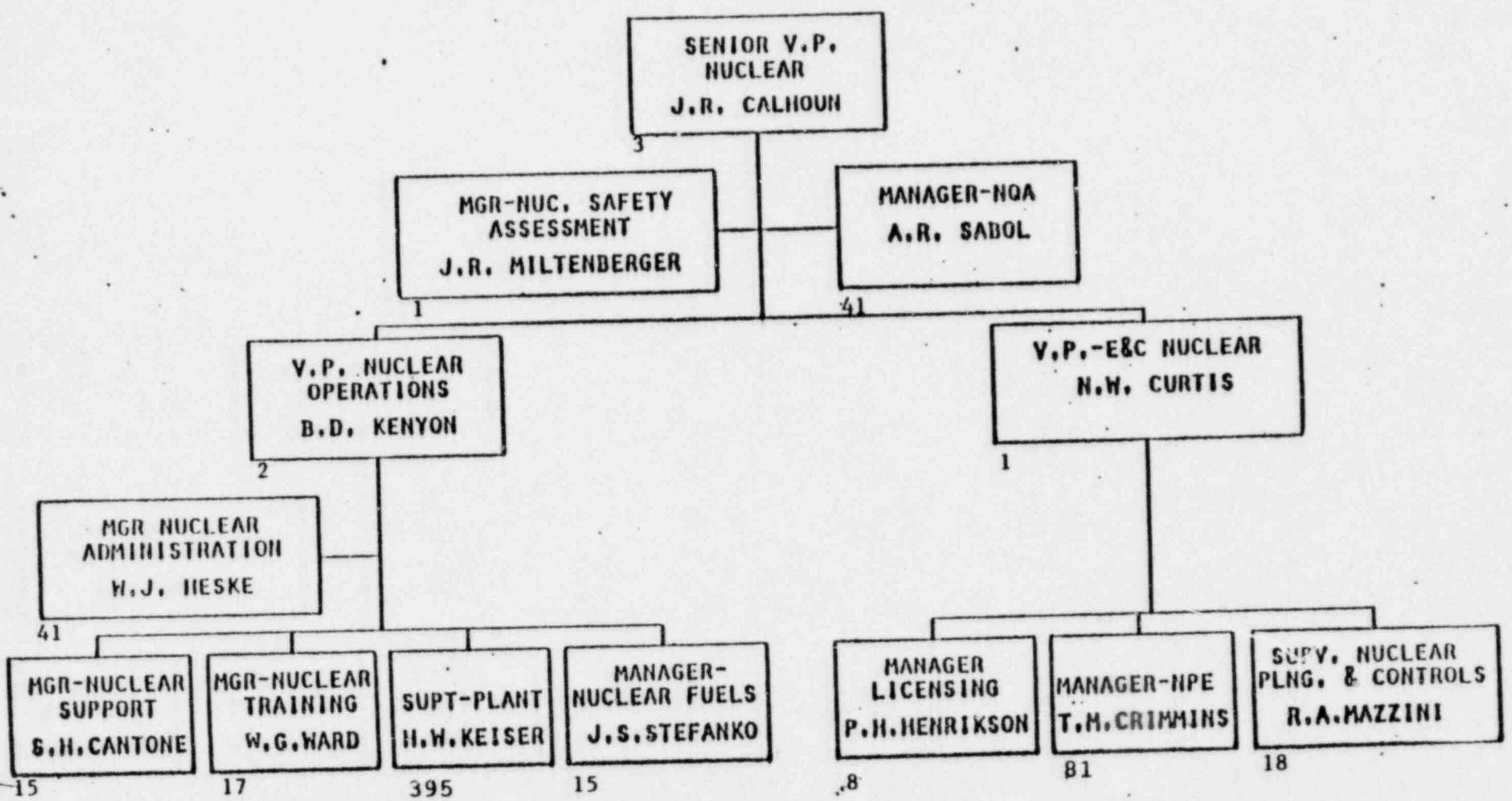
- Singular Purpose
- Clear Responsibilities and Authority
- Effective Procedure Program
- Good Communications
  - VERTICAL
  - HORIZONTAL
  - EXTERNAL

NUCLEAR RELATED EXPERIENCE---YEARS



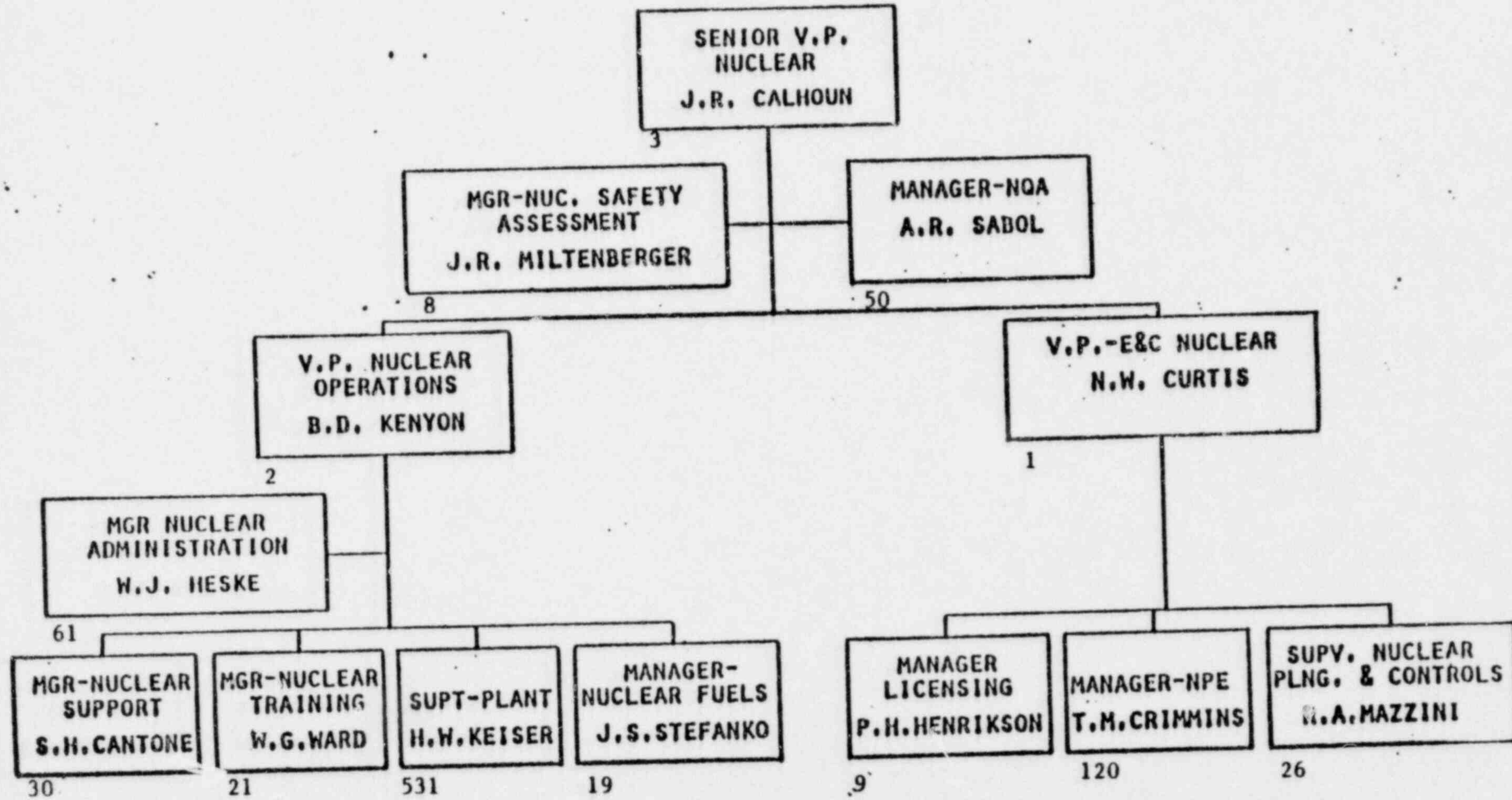
TOTAL -- 198 MAN YEARS

NUCLEAR DEPARTMENT MANPOWER AS OF 5/81



TOTAL PERSONNEL AS OF MAY 24, 1981 ... 732

NUCLEAR DEPARTMENT MANPOWER, BUDGETED 12/82



TOTAL PERSONNEL BUDGETED, END OF 1982 ... 881

NUCLEAR DEPARTMENT EXPERIENCE

ON-SITE

TOTAL .... 1,388 MAN-YEARS

NUCLEAR .... 1,038 MAN-YEARS

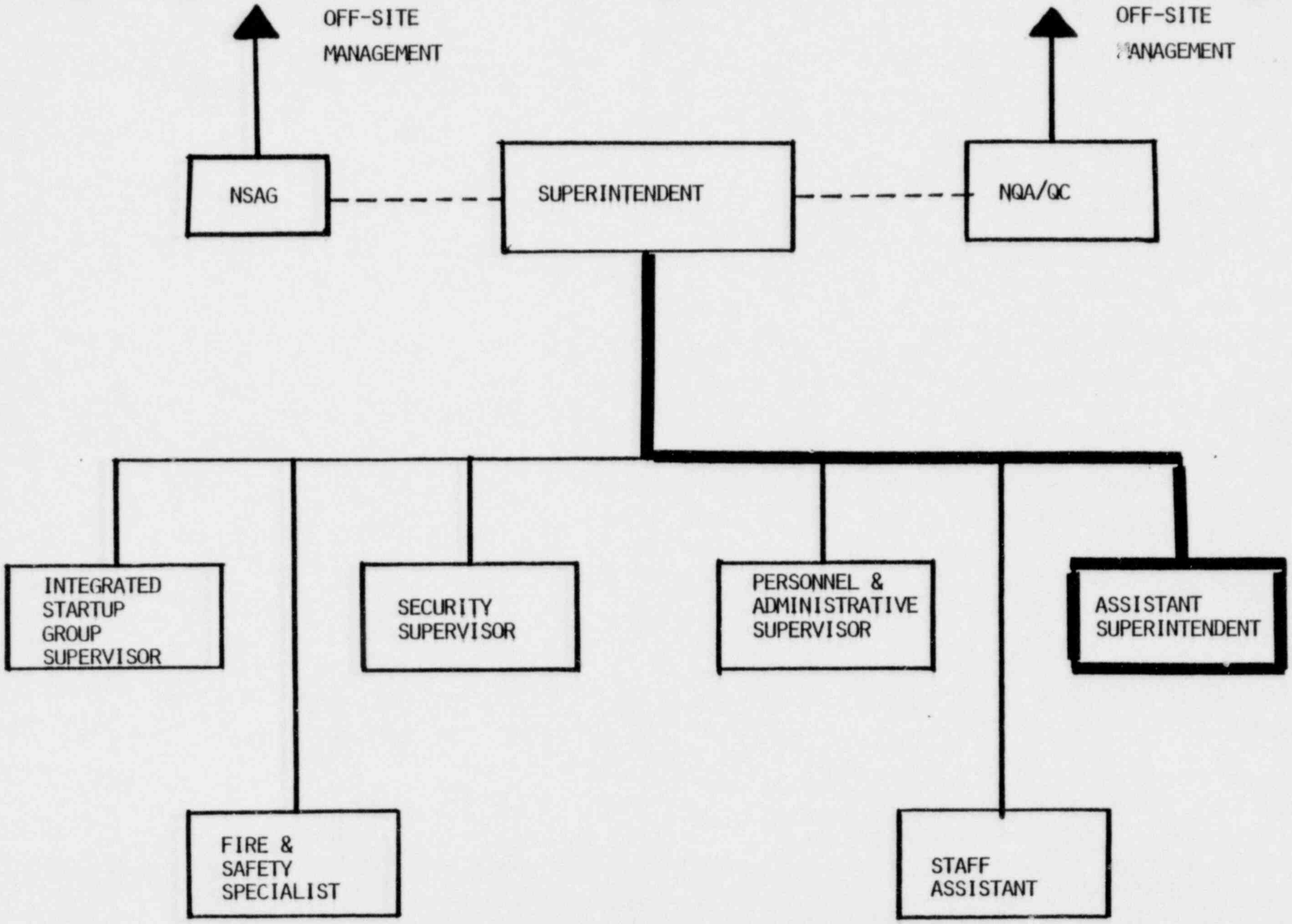
OFF-SITE

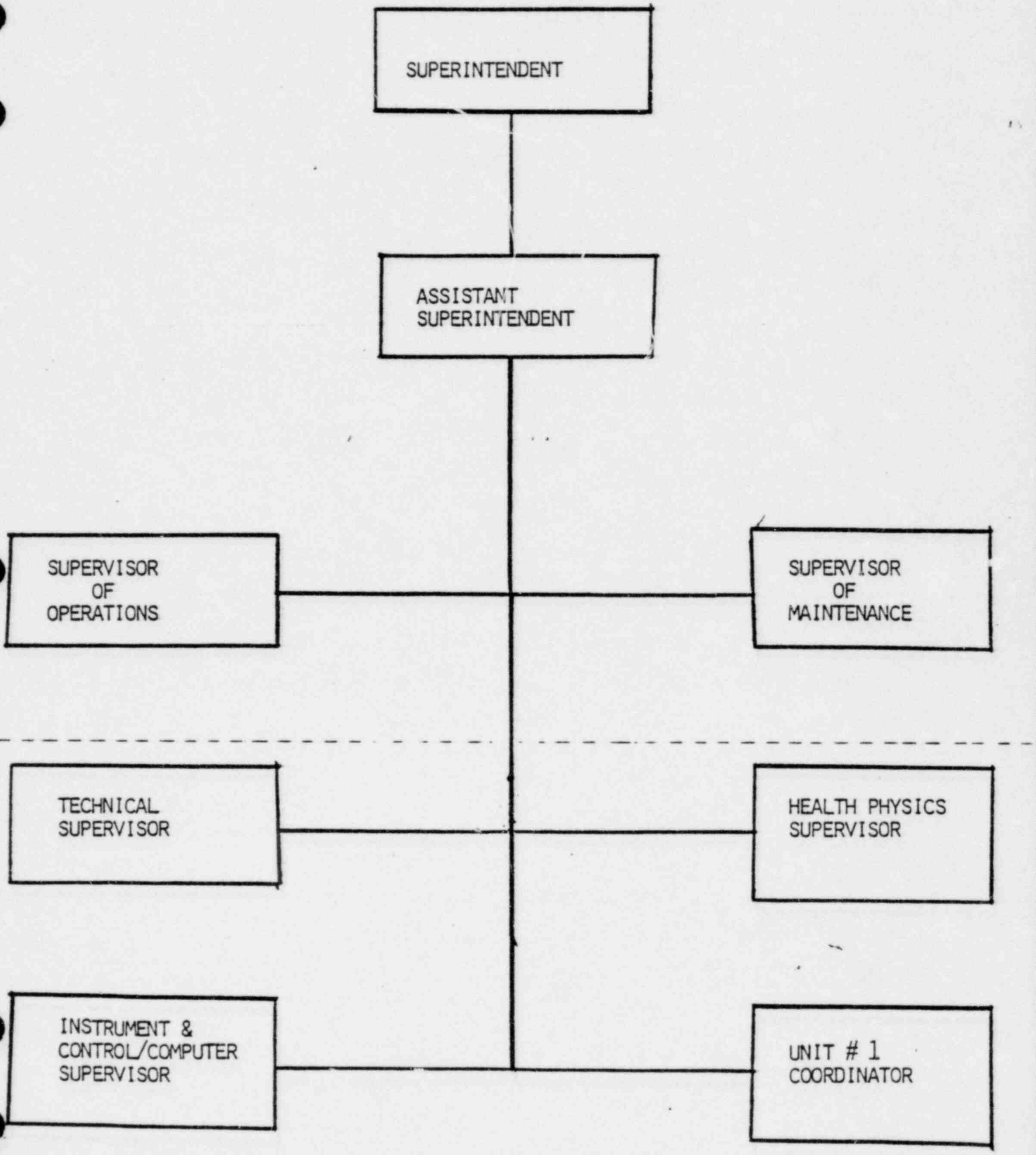
TOTAL .... 1,616 MAN-YEARS

NUCLEAR .... 1,081 MAN-YEARS

SUMMARY

- Organization
- Top Management Involvement
- Review & Assess
- Staffing and Experience Levels
- Innovation
- Goal


OFF-SITE
MANAGEMENT
OFF-SITE
MANAGEMENT
NSAG
SUPERINTENDENT
NQA/QC
INTEGRATED STARTUP GROUP SUPERVISOR
SECURITY SUPERVISOR
PERSONNEL & ADMINISTRATIVE SUPERVISOR
ASSISTANT SUPERINTENDENT
FIRE & SAFETY SPECIALIST
STAFF ASSISTANT


SUPERINTENDENT
ASSISTANT SUPERINTENDENT
SUPERVISOR OF OPERATIONS
SUPERVISOR OF MAINTENANCE
TECHNICAL SUPERVISOR
HEALTH PHYSICS SUPERVISOR
INSTRUMENT & CONTROL/COMPUTER SUPERVISOR
UNIT # 1 COORDINATOR

SUSQUEHANNA PLANT STAFF
ORGANIZATION/ RESPONSIBILITIES/ STAFFING

	YEAR END 1981	6-30-81
SUPERINTENDENT		
ADMINISTRATION	39	37
PERSONNEL ADMINISTRATION		
PROCUREMENT		
WAREHOUSING		
DOCUMENT CONTROL		
CLERICAL SUPPORT		
SECURITY	107	82
SECURITY PROGRAM IMPLEMENTATION		
TEMPORARY SECURITY PERSONNEL		
INTEGRATED STARTUP GROUP	34	27
EQUIPMENT AND SYSTEM TESTING		
ASSISTANT SUPERINTENDENT		
OPERATIONS	89	73
PLANT/ SYSTEM/ EQUIPMENT OPERATION		
MAINTENANCE	106	91
PREVENTIVE MAINTENANCE		
CORRECTIVE MAINTENANCE		
TECHNICAL	45	36
RESULTS ENGINEERING		
CORE MONITORING		
CHEMISTRY		
SHIFT TECHNICAL ADVISORS		

ASST. SUPERINTENDENT CON'T		YEAR END 1981	6-30-81
INSTRUMENTATION & CONTROLS		39	34
PREVENTIVE MAINTENANCE			
CORRECTIVE MAINTENANCE			
COMPUTERS			
HEALTH PHYSICS		20	15
RADIATION PROTECTION			
	TOTAL	479	395

TRAINING

PURPOSE OF PRESENTATION

PHILOSOPHY OF TRAINING

FUNCTIONS AND STRUCTURE

GENERAL OVERVIEW OF PROGRAMS

PHILOSOPHY OF TRAINING

ORGANIZATION

- REPORTS TO VICE-PRESIDENT
- EXIST FOR ONE BWR PLANT
- DEMONSTRATED COMPANY COMMITMENT

PHILOSOPHY OF TRAINING

EDUCATIONAL

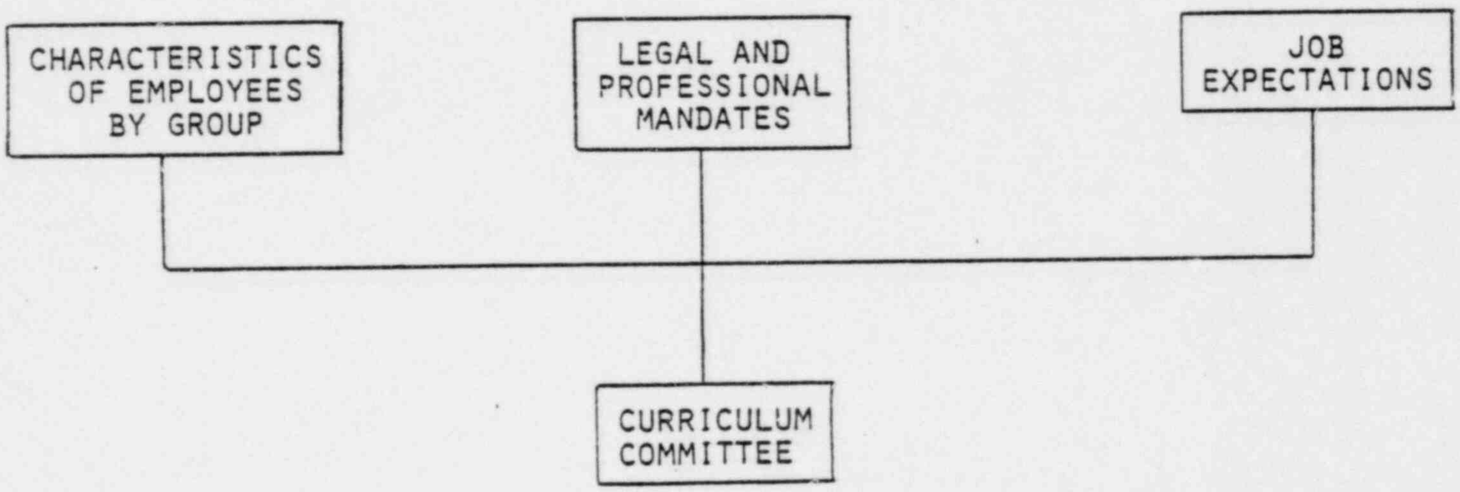
- LEARNING BY DOING
- REALISTIC ENVIRONMENT
- CURRICULUM DEVELOPMENT SYSTEM
- INSTRUCTIONAL MATERIAL SYSTEM
- FORMATIVE AND SUMMATIVE EVALUATION

T.P. 2

CURRICULUM COMMITTEE
CONCEPT

ASSUMPTIONS

1. NO ONE KNOWS EVERYTHING ABOUT JOB COMPETENCIES FOR A POSITION
2. THE MOST IMPORTANT JOB COMPETENCIES MUST BE KNOWN



TRAINING SUPERVISOR

RESPONSIBLE INSTRUCTOR

STENOGRAPHER

OCCUPATIONAL LINE SUPER.

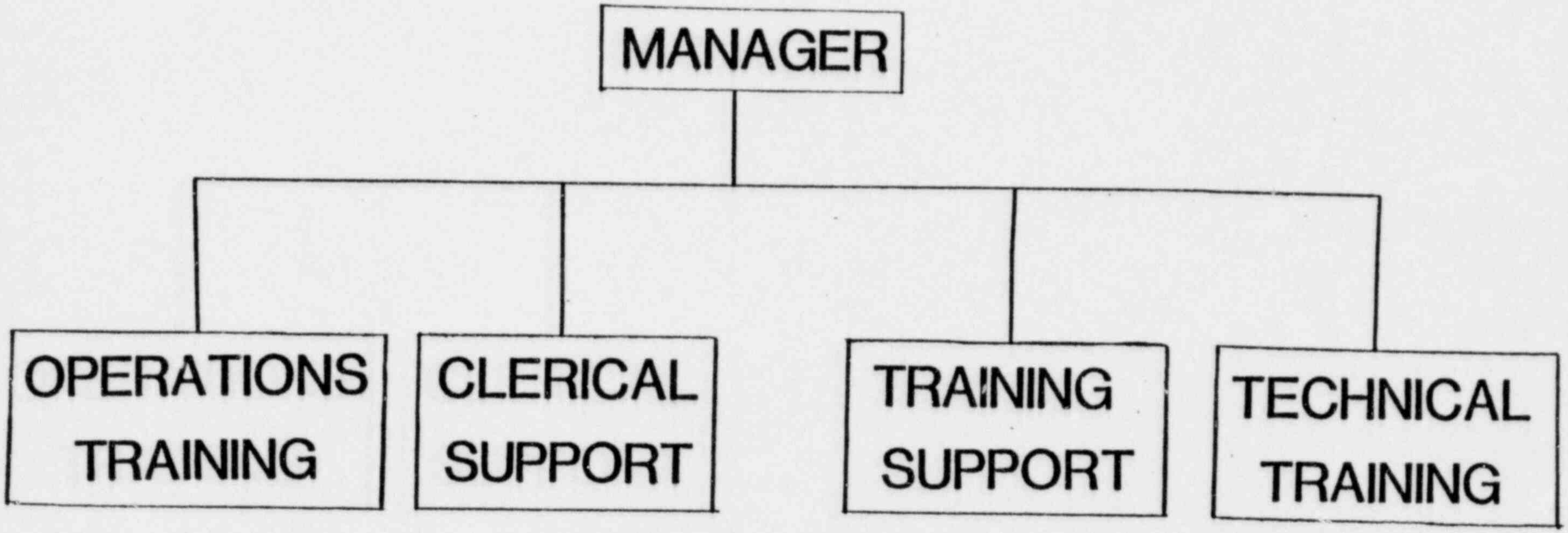
OCCUPATIONAL EXPERT WORKER

ADVISOR

FUNCTIONS

- TEACHING
- TESTING
- RECORDS

STRUCTURE


MANAGER
OPERATIONS TRAINING
CLERICAL SUPPORT
TRAINING SUPPORT
TECHNICAL TRAINING

TECHNICAL TRAINING - SUSQUEHANNA SES

WORK GROUP	SELECTION	TYPE OF TRAINING (IN DAYS OF TRAINING)			
POSITION	EXAMINATION	GENERAL	THEORY	SKILLS	PLANT DESIGN & OPERATION
MAINTENANCE					
FOREMAN & ASSISTANTS		5		20	15
MECHANICS	YES	5	10	36	15
REPAIRMEN	YES	5	10	36	15
HELPERS	YES	5			4
INSTRUMENTS & CONTROLS					
FOREMAN & ASSISTANTS		5		60	15
INSTRUMENTMEN	YES	5	60	60	15
INSTRUMENTMEN - CONTROLS	YES	5	IN PROGRESS		
HEALTH PHYSICS					
FOREMAN		3		40	15
SPECIALISTS		3		40	15
MONITORS	YES	3	85	90	15
CHEMISTRY					
SUPERVISION		5		25	15
CHEMISTRY LEADER	YES	5	CORRESPONDENCE	5	25
CHEMISTRY ANALYST	YES	5	CORRESPONDENCE	2	15
NON LICENSED OPERATORS					
NUCLEAR PLANT OPERATOR	YES	5	52	10	25
AUXILIARY OPERATOR	YES	5	IN PROGRESS		
ENGINEERING					
ENGINEERS		5		3	25
SPECIALISTS		5		3	15

CURRICULUM COMMITTEE

GENERAL

TRAINING SUPERVISOR

INSTRUCTOR

MANAGER/SUPERVISOR

TECHNICAL EXPERT

ADVISOR

CURRICULUM PLANNING COMMITTEE
OPERATIONS

ASSISTANT SUPERINTENDENT OF PLANT

MANAGER - NUCLEAR TRAINING

SUPERVISOR OF OPERATIONS

SHIFT SUPERVISOR

SIMULATOR INSTRUCTOR

SUPERVISOR - OPERATIONS TRAINING

SUSQUEHANNA STEAM ELECTRIC STATION

SIMULATOR FACTS

CONTRACT AWARDED . . . . OCTOBER, 1976

COMMENCEMENT OF TRAINING . . . . OCTOBER, 1979

CAPABILITIES:

INITIAL STARTING CONDITIONS . . . 21

SPEEDS OF SIMULATION 3

BACKTRACK . . . . 10 MINS

MALFUNCTIONS 225

CRYWOLF 1583

SIMULATOR USAGE

PROCEDURE CHECKOUT

UNCOVER PLANT DESIGN PROBLEMS

HUMAN FACTOR ENGINEERING

TRAINING

NRC

OPERATIONS TRAINING PROGRAMS

1. SENIOR REACTOR OPERATOR CANDIDATES

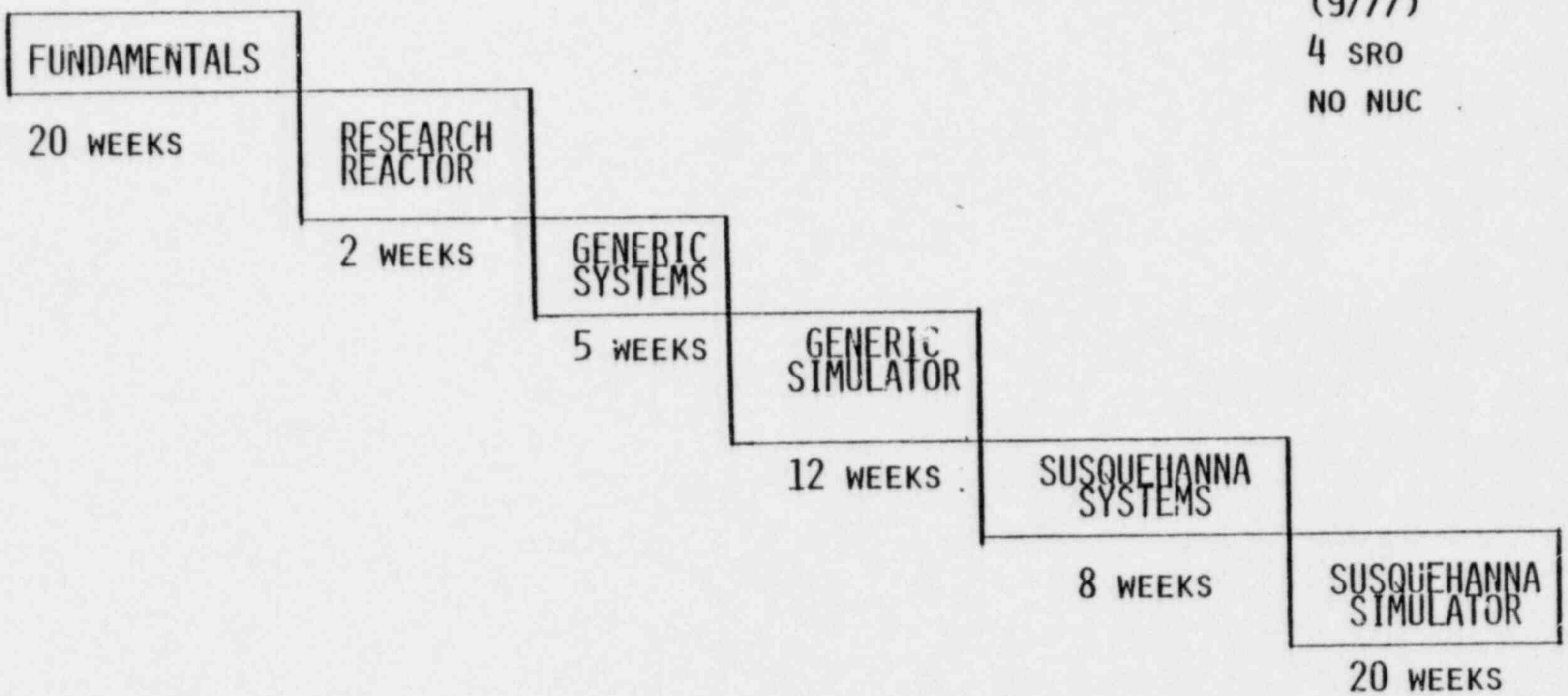
2. REACTOR OPERATOR CANDIDATES

3. NUCLEAR PLANT OPERATORS

4. AUXILIARY SYSTEM OPERATORS

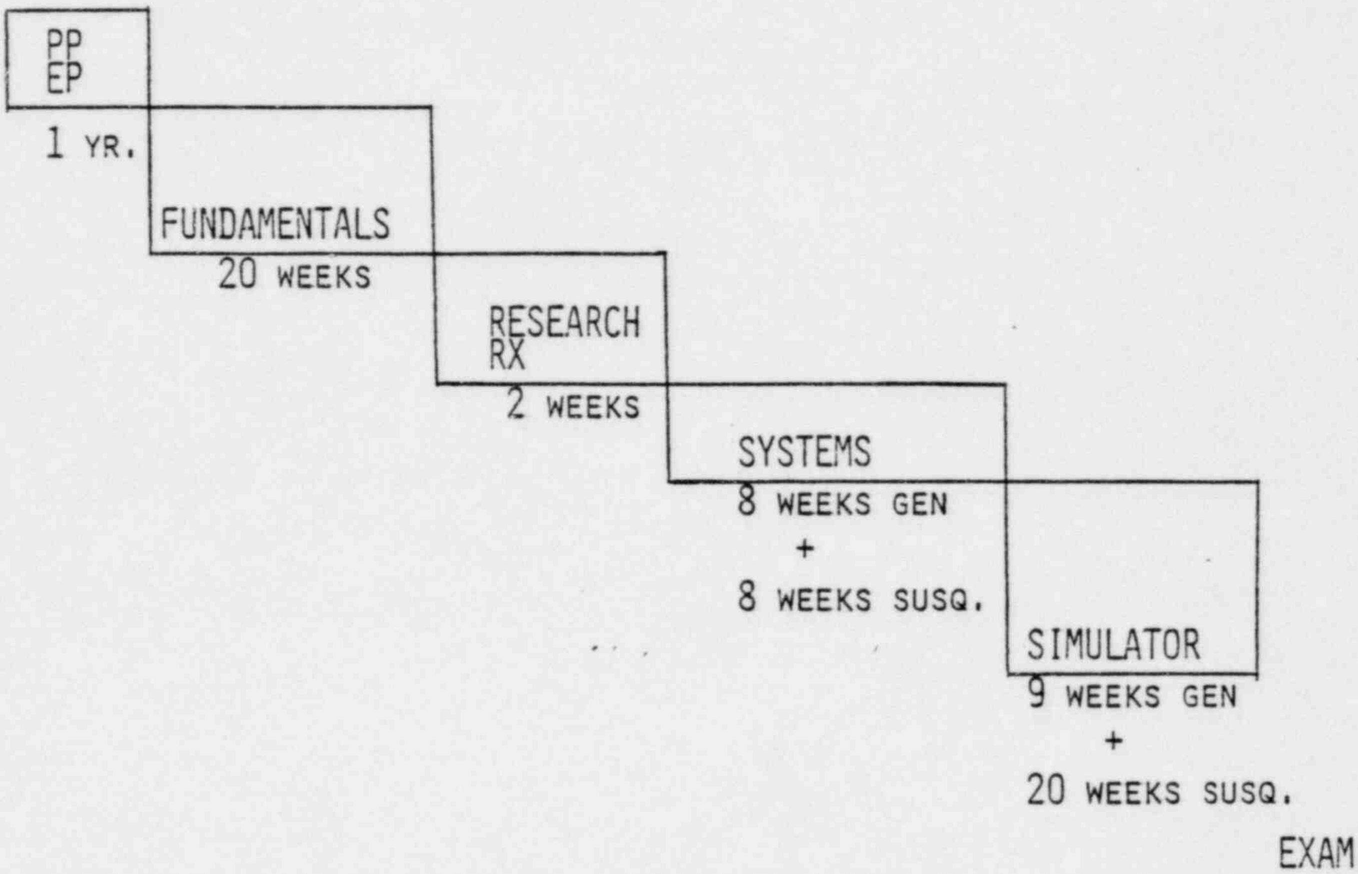
INITIAL TRAINING PROGRAM
SRO CANDIDATES
· OPERATIONS

(9/77)
4 SRO
NO NUC



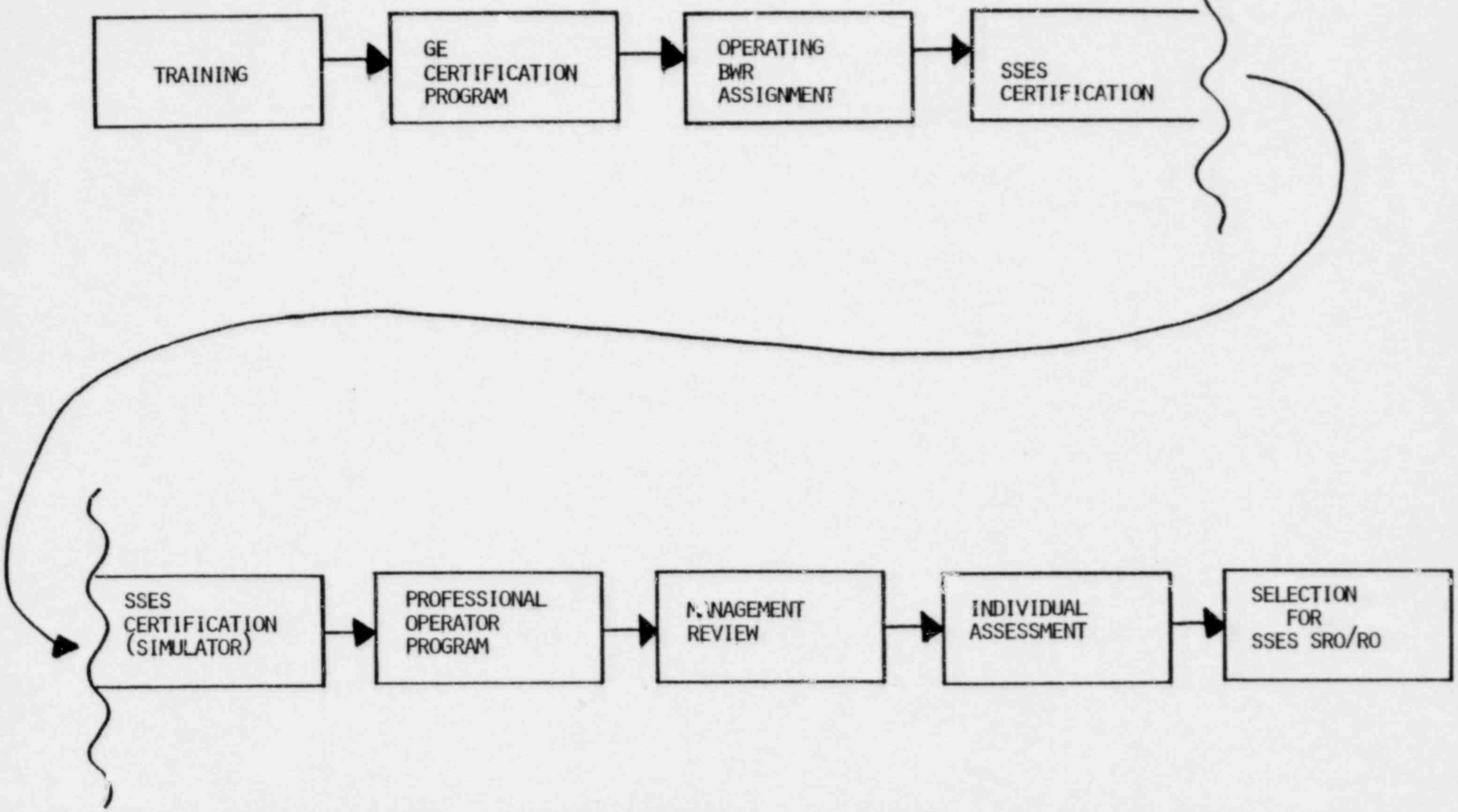
TRAINING FOR REACTOR OPERATORS

NO - NUCLEAR EXPERIENCE



<u>EXAM</u>

RO 8 HOUR WRITTEN, PLANT WALK-THROUGH, SIMULATOR DEMONSTRATION


TRAINING
GE CERTIFICATION PROGRAM
OPERATING BWR ASSIGNMENT
SSES CERTIFICATION
SSES CERTIFICATION (SIMULATOR)
PROFESSIONAL OPERATOR PROGRAM
MANAGEMENT REVIEW
INDIVIDUAL ASSESSMENT
SELECTION FOR SSES SRO/RO

CURRENT ASO / NPO TRAINING PROGRAM

AUXILIARY SYSTEM OPERATOR TRAINING

- ORIENTATION 1 WEEK
- FUNDAMENTALS 8 WEEKS
- PLANT SYSTEMS 1 WEEK
- AUXILIARY SYSTEMS 3 WEEKS

NUCLEAR PLANT OPERATOR TRAINING

- ORIENTATION 1 WEEK
- FUNDAMENTALS 5 WEEKS
- NUCLEAR PLANT SYSTEMS 5 WEEKS

SHIFT TECHNICAL ADVISOR TRAINING

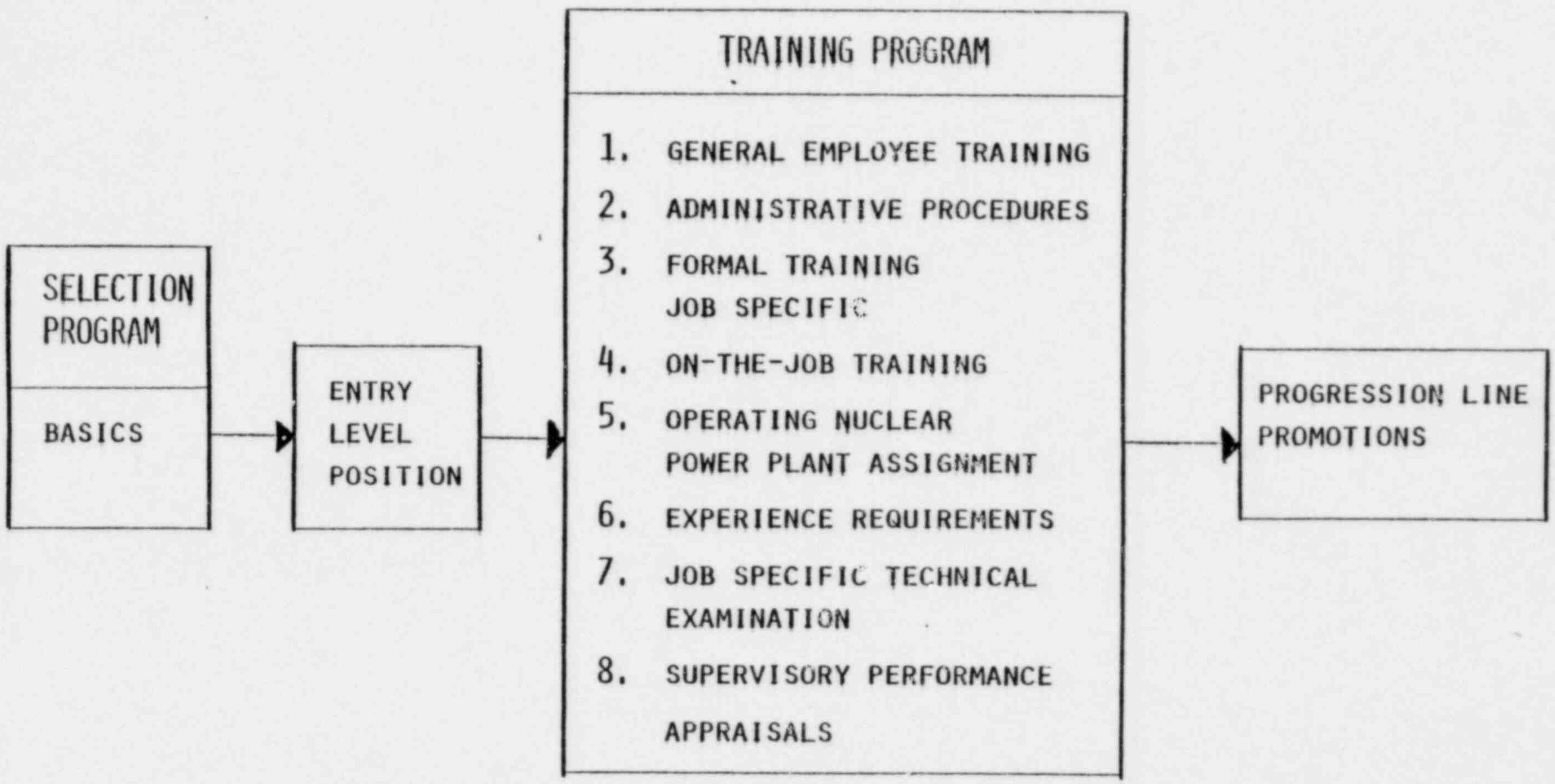
SUBJECT MATERIAL

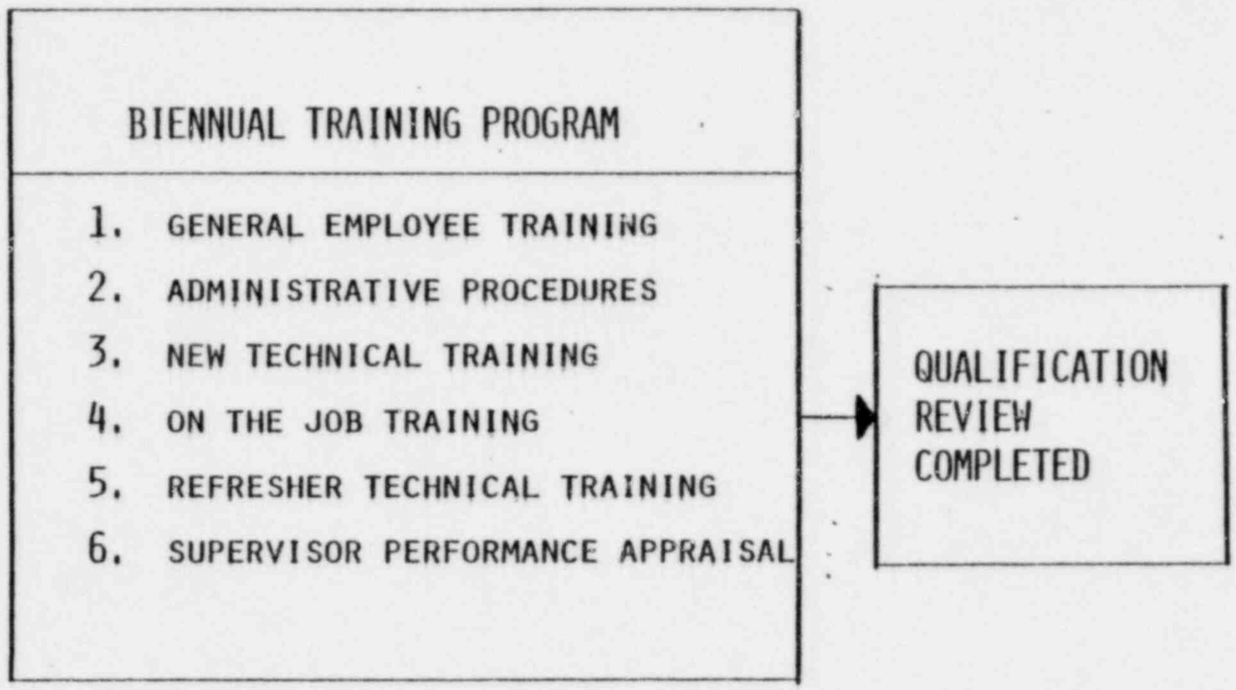
- PLANT SYSTEMS
- ADVANCED NUCLEAR THEORY
- THERMOHYDRAULICS
- TRANSIENT ANALYSIS
- CHEMISTRY
- HEALTH PHYSICS
- STARTUP TESTING
- INSTRUMENTATION & CONTROLS
- ELECTRICAL THEORY

SHIFT TECHNICAL ADVISOR TRAINING

MAJOR ELEMENTS

- FORMAL CLASSROOM . . . 762 HOURS
- SIMULATOR . . . . 182 HOURS
- 8-HOUR WRITTEN EXAMINATION
- SIMULATOR DEMONSTRATION
- ORAL EXAMINATION


SELECTION PROGRAM
BASICS
ENTRY LEVEL POSITION
TRAINING PROGRAM
1. GENERAL EMPLOYEE TRAINING
2. ADMINISTRATIVE PROCEDURES
3. FORMAL TRAINING JOB SPECIFIC
4. ON-THE-JOB TRAINING
5. OPERATING NUCLEAR POWER PLANT ASSIGNMENT
6. EXPERIENCE REQUIREMENTS
7. JOB SPECIFIC TECHNICAL EXAMINATION
8. SUPERVISORY PERFORMANCE APPRAISALS
PROGRESSION LINE PROMOTIONS


BIENNUAL TRAINING PROGRAM
1. GENERAL EMPLOYEE TRAINING
2. ADMINISTRATIVE PROCEDURES
3. NEW TECHNICAL TRAINING
4. ON THE JOB TRAINING
5. REFRESHER TECHNICAL TRAINING
6. SUPERVISOR PERFORMANCE APPRAISAL
QUALIFICATION
REVIEW
COMPLETED

CONTROL ROOM
HUMAN FACTORS
ENGINEERING

ADVANCED CONTROL ROOM

1971 - CONTROL ROOM OPTIMIZATION STUDY

CONTROL ROOM OPTIMIZATION STUDY

OBJECTIVE:

IMPROVE CONTROL ROOM OPERATOR RESPONSE CAPABILITIES THROUGH REDUCTION OF OPERATING BENCHBOARD LENGTH AND SIMPLIFICATION OF THE DISPLAY AND CONTROL DEVICES MOUNTED ON THESE BOARDS.

RESULTS:

ADVANCED CONTROL ROOM CONCEPT

- ADVANCED GRAPHIC AND ALPHANUMERIC DISPLAY
- REDUCED SIZE CONTROL HARDWARE
- INCORPORATION OF HUMAN ENGINEERING AND CONTROL ROOM ENVIRONMENTAL CONSIDERATIONS

ADVANCED CONTROL ROOM

1971	-	CONTROL ROOM OPTIMIZATION STUDY
1974	-	OPERABILITY ANALYSIS

ADVANCED CONTROL ROOM

1971	-	CONTROL ROOM OPTIMIZATION STUDY
1974	-	OPERABILITY ANALYSIS
1980	-	PP&L HUMAN FACTORS ENGINEERING ASSESSMENT

ADVANCED CONTROL ROOM

1971 - CONTROL ROOM OPTIMIZATION STUDY

1974 - OPERABILITY ANALYSIS

1980 - PP&L HUMAN FACTORS ENGINEERING ASSESSMENT

1981 - NRC HUMAN FACTORS ENGINEERING ASSESSMENT

PP&L HUMAN FACTORS ENGINEERING ASSESSMENT

SCOPE OF EVALUATION

- OPERATOR QUESTIONNAIRE
- PANEL ELEMENTS AND INTEGRATION
- COMPUTER SYSTEM
- ANNUNCIATOR AND ALARM SYSTEM
- WORKSPACE AND ENVIRONMENT
- PROCEDURES

PP&L HUMAN FACTORS ENGINEERING ASSESSMENT

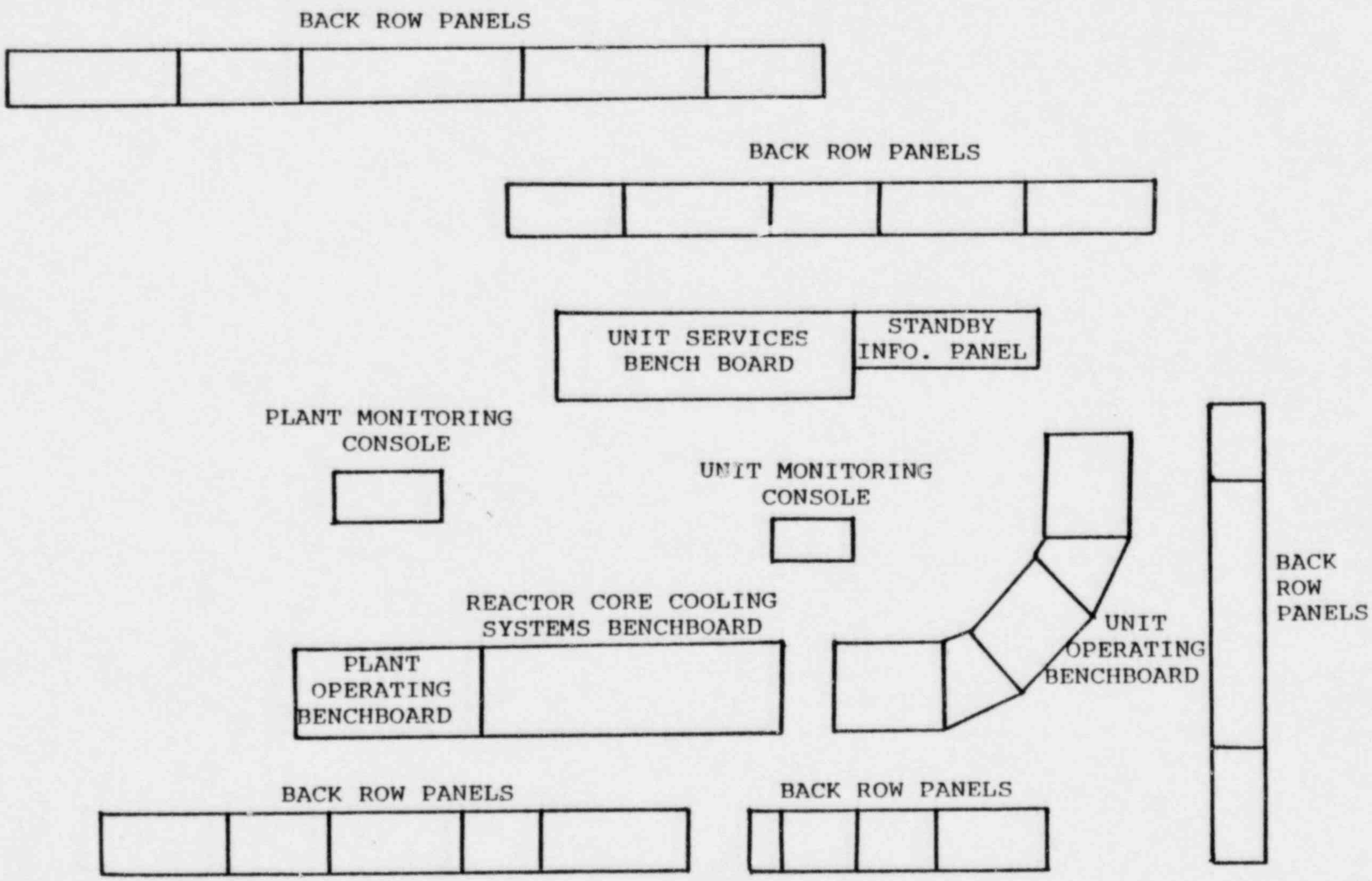
FINDINGS

- ACR BASICALLY COMPLIES WITH HUMAN FACTOR CRITERIA
- USE OF COMPUTER DISPLAYS ENHANCES OPERATION
- GOOD FUNCTIONAL GROUPING OF ALARMS, DISPLAYS AND CONTROLS
- GOOD WORKING ENVIRONMENT
- OPERATING PROCEDURES ADEQUATE AND CONSISTENT
- SEVERAL AREAS IDENTIFIED BY OPERATORS WHERE ENHANCEMENTS WOULD BE BENEFICIAL
- SPECIFIC IMPROVEMENTS IDENTIFIED

CONTROL ROOM

INAD. CORE COOLING

REMOTE SHUTDOWN PANEL



UNIT 1 CONTROL ROOM
LAYOUT

SUSQUEHANNA EMERGENCY

INSTRUMENTATION

- MAJORITY OF INSTRUMENTATION ON FRONT ROW PANELS
- INFORMATION FROM SAFETY SYSTEMS IS HARDWIRED
- INFORMATION FROM NON-SAFETY SYSTEM ON CRT DISPLAYS
- INSTRUMENTATION GROUPED BY SYSTEM AND FUNCTION
- SUPPORTING INFORMATION ON BACKROW PANELS
- ALARMS ANNUNCIATED ON FRONT ROW PANELS

SUSQUEHANNA S.E.S. COMPLIANCE TO RG - 1.97

- 93% OF THE REQUIRED VARIABLES ARE MEASURED.
- 38% OF THE REQUIRED VARIABLES CONFORM TO ALL THE CRITERIA OF THE GUIDE.
- 55% OF THE REQUIRED VARIABLES REQUIRE UPGRADING TO COME INTO COMPLETE COMPLIANCE.

PP&L ACTION

- ASSESS SUSQUEHANNA DESIGN AGAINST RG - 1.97 DESIGN CRITERIA.
- FORMULATE PLANT SPECIFIC IMPLEMENTATION PLAN FOR SUSQUEHANNA.
- SUBMIT PLAN TO NRC STAFF FOR CONCURRENCE. (1st QUARTER '82)
- IMPLEMENT CHANGES WHEN TIME AND EQUIPMENT BECOME AVAILABLE.

ADEQUATE CORE COOLING

IN A BWR

- ACTIVE FUEL IS COVERED BY A LIQUID OR TWO PHASE MIXTURE
- ECCS FLOW EXISTS IN SUFFICIENT QUANTITY TO REMOVE HEAT FROM CORE
- STEAM FLOW EXISTS IN SUFFICIENT QUANTITY TO REMOVE HEAT FROM CORE

INSTRUMENTATION TO INSURE ADEQUATE CORE COOLING

- REACTOR WATER LEVEL INSTRUMENTS
- INDICATIONS OF LOW PRESSURE ECCS OPERATION
  - LOW PRESSURE ECCS FLOW INSTRUMENTS
  - CORE SPRAY PUMP DISCHARGE PRESSURE INSTRUMENTS

SUSQUEHANNA REACTOR

WATER LEVEL INSTRUMENTATION DESIGN

- 25 D/P INSTRUMENTS
- 6 INDICATORS
- 5 RECORDERS
- COLD REFERENCE LEGS
- VARIABLE AND REFERENCE LEGS HAVE EQUAL DROPS IN CONTAINMENT
- SPECIAL REACTOR WATER LEVEL CRT DISPLAY

REMOTE SHUTDOWN

INITIAL DESIGN REQUIREMENT - GENERAL DESIGN CRITERIA 19

- CAPABILITY FOR HOT SHUTDOWN FROM OUTSIDE MAIN CONTROL ROOM

- POTENTIAL FOR SUBSEQUENT COLD SHUTDOWN

CLARIFICATIONS

STANDARD REVIEW PLAN - SECTION 7.4 REV.1

- REDUNDANT SAFETY GRADE CAPABILITY

- LOCAL CONTROL PANELS

APPENDIX K - ECCS REQUIREMENTS

APPENDIX R - FIRE PROTECTION REQUIREMENTS

STATUS OF NRC STAFF/PP&L REVIEW

NRC STAFF HAS REVIEWED SYSTEM AND DISCUSSED RESULTS WITH PP&L - ONLY ONE MINOR DIFFERENCE REMAINS OPEN.

GDC 19 (PER SRP)	-	PP&L IN AGREEMENT WITH NRC STAFF AND WILL BE IN COMPLIANCE PRIOR TO FUEL LOAD.
APPENDIX R	-	IN COMPLIANCE.
APPENDIX K	-	AUTO INITIATION OF ONE ECCS TRAIN DEFEATED BY TRANSFER (ALTERNATE TRAIN AUTO INITIATION UNAFFECTED). DESIGN AND PROCEDURE CHANGE DESIGNED TO KEEP AUTO INITIATION BEING REVIEWED.

STATUS OF NRC STAFF/PP&L REVIEW

NRC STAFF HAS REVIEWED SYSTEM AND DISCUSSED WITH PP&L - ALL ITEMS RESOLVED

GDC 19 (PER SRP)	-	PP&L IN AGREEMENT WITH NRC STAFF AND WILL BE IN COMPLIANCE PRIOR TO FUEL LOAD.
APPENDIX R	-	IN COMPLIANCE.
APPENDIX K	-	PP&L IN AGREEMENT WITH NRC STAFF AND WILL BE IN COMPLIANCE PRIOR TO FUEL LOAD.

BWR CORE THERMOCOUPLES

NRC PURPOSES

- DIVERSE INDICATION OF WATER LEVEL
- INDICATE POTENTIAL BREACH OR ACTUAL BREACH OF FUEL CLADDING

OPERATOR ACTIONS

- WILL USE SYMPTOM BASED EMERGENCY PROCEDURE
- PROVIDES QUICK RESPONSE
- OPERATOR WILL TAKE ACTION TO RESTORE LEVEL BEFORE IT REACHES THE FUEL ZONE
- OPERATOR PROCEDURES PROVIDE SAFE ACTIONS WITH NO WATER LEVEL INDICATIONS
- THERMOCOUPLE INDICATIONS WOULD NOT PROVIDE OPERATOR ACTION INFORMATION

EMERGENCY
PLANNING

PP&L

TWO NORTH NINTH STREET, ALLENTOWN, PA. 18101 PHONE: (215) 821-5151

R. K. CAMPBELL
President
821-5947

February 25, 1980

CORPORATE POLICY STATEMENT:

SUSQUEHANNA STEAM ELECTRIC STATION EMERGENCY DIRECTOR

Immediate response, assessment, and the implementation of protective and corrective measures pertaining to an emergency condition at the Susquehanna Steam Electric Station shall be the responsibility of the SSES Emergency Director. The individual who shall act in the capacity of SSES Emergency Director is determined as follows:

> Immediately upon the occurrence of an emergency, the Shift Supervisor on duty at the station shall assume the role of SSES Emergency Director. The Shift Supervisor shall continue to perform the functions of the SSES Emergency Director, as described in the SSES Emergency Plan, until relieved of that responsibility by the Superintendent of Plant, or his designated alternate. The alternates to the Superintendent of Plant for that purpose are:
>
> First Alternate -- Assistant Superintendent of Plant
> Second Alternate -- Supervisor of Operations

The SSES Emergency Director shall implement applicable portions of the SSES Emergency Plan to prevent or mitigate the consequences of emergencies at the Susquehanna Steam Electric Station. He shall have the authority to act on the behalf of PP&L in all matters concerning an emergency, at least until such time as the scope, severity and potential radiological consequences have been assessed, and the appropriate protective and corrective actions have been implemented. Following that critical period, but still with complete regard for health and safety, major decisions and Corporate commitments are the responsibility of PP&L management.

Throughout the course of an emergency condition, all expertise and support available within the PP&L organization shall be provided at the request of the SSES Emergency Director.

Robert K. Campbell

ACCIDENT RESPONSE & MITIGATION PHASES

IMMEDIATE RESPONSE TO EMERGENCY CONDITION

- Identification of Condition
- Prompt Corrective Action
- Prompt Notification

ACTIVATION OF EMERGENCY (ON-SITE) ORGANIZATION

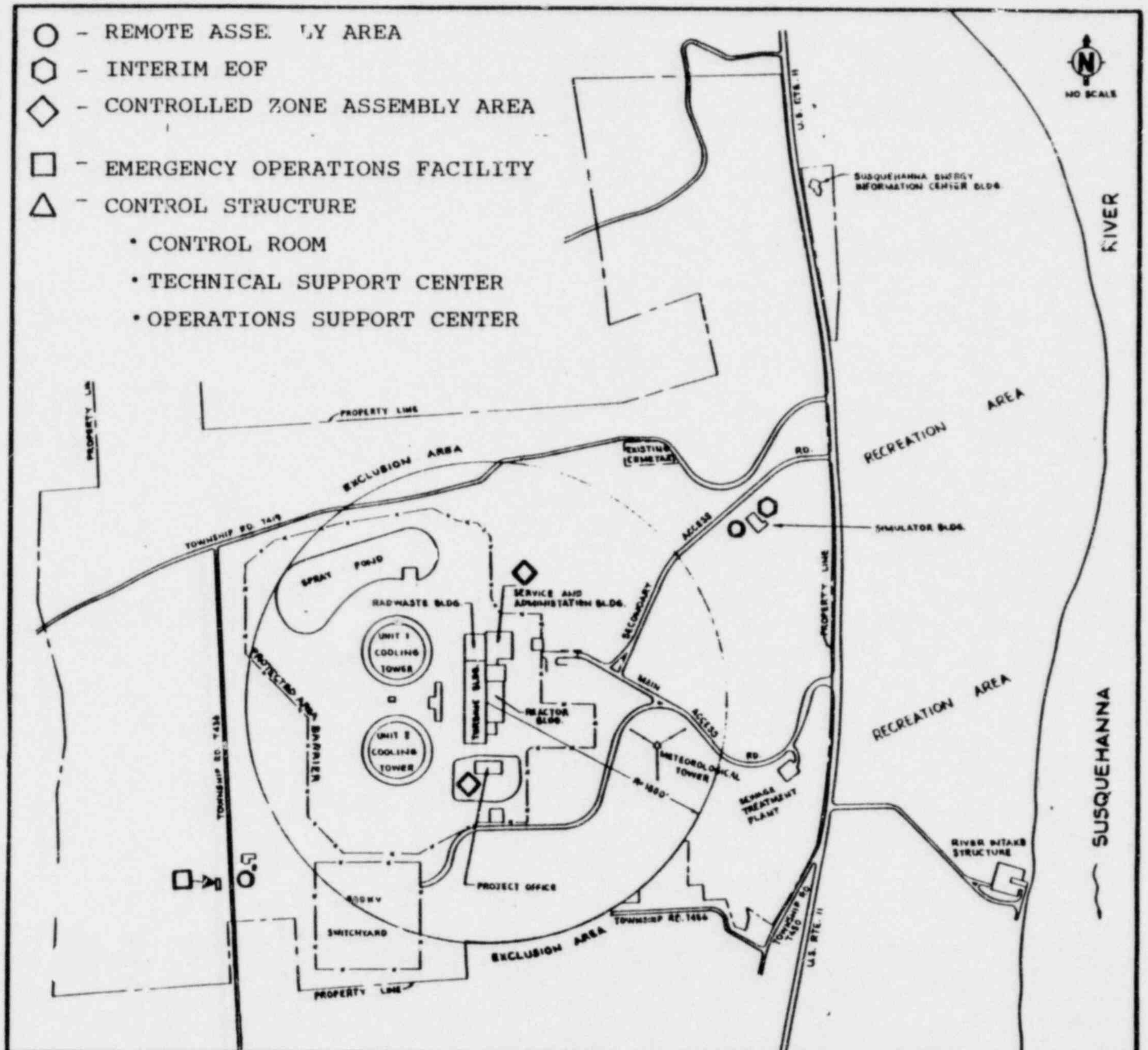
- Emergency Director
- Support Managers
- Support Personnel
- Continued Agency Communication

ACTIVATION OF RECOVERY ORGANIZATION

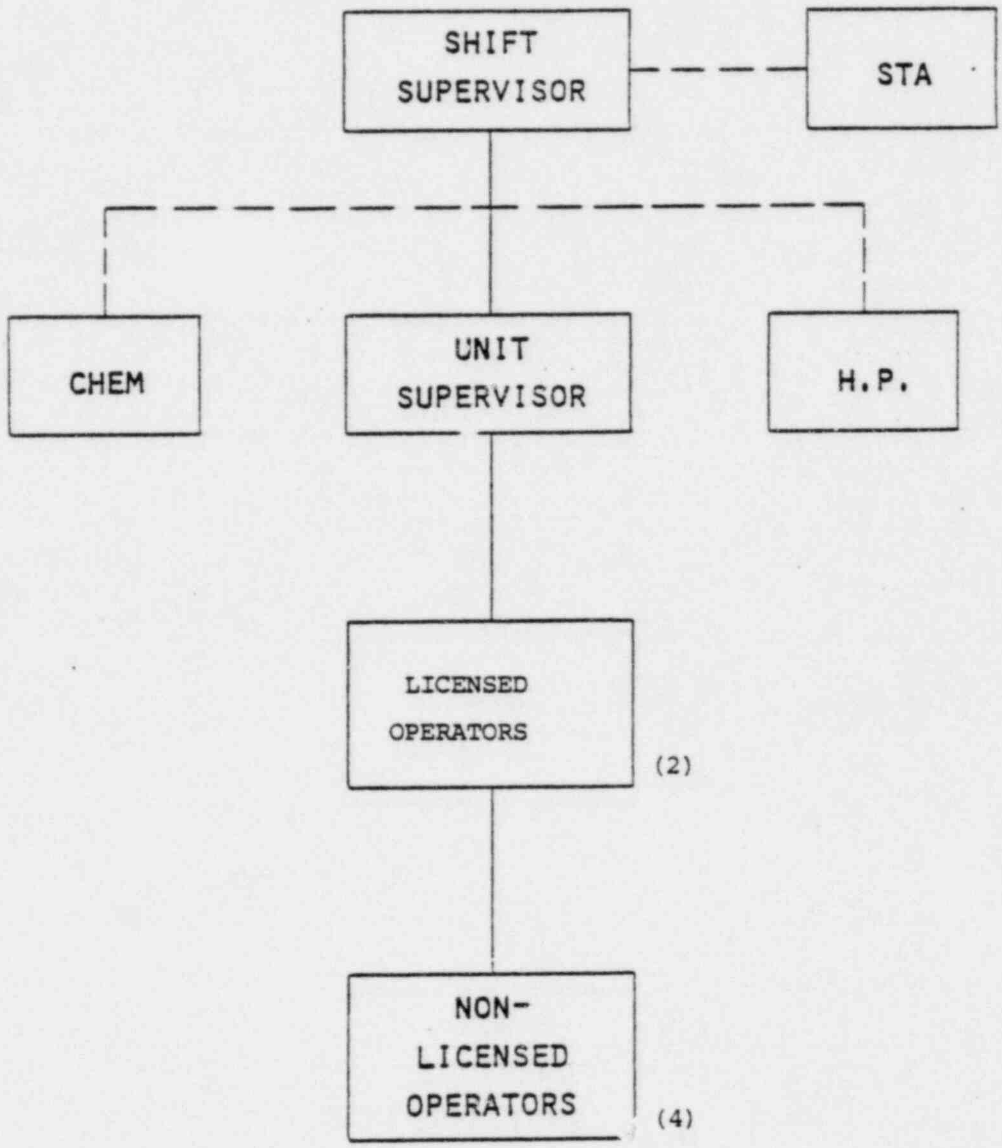
- Recovery Manager
- In-Depth Technical Support
- In-Depth Radiological Assessment
- Public & Agency Communication

RESTORATION

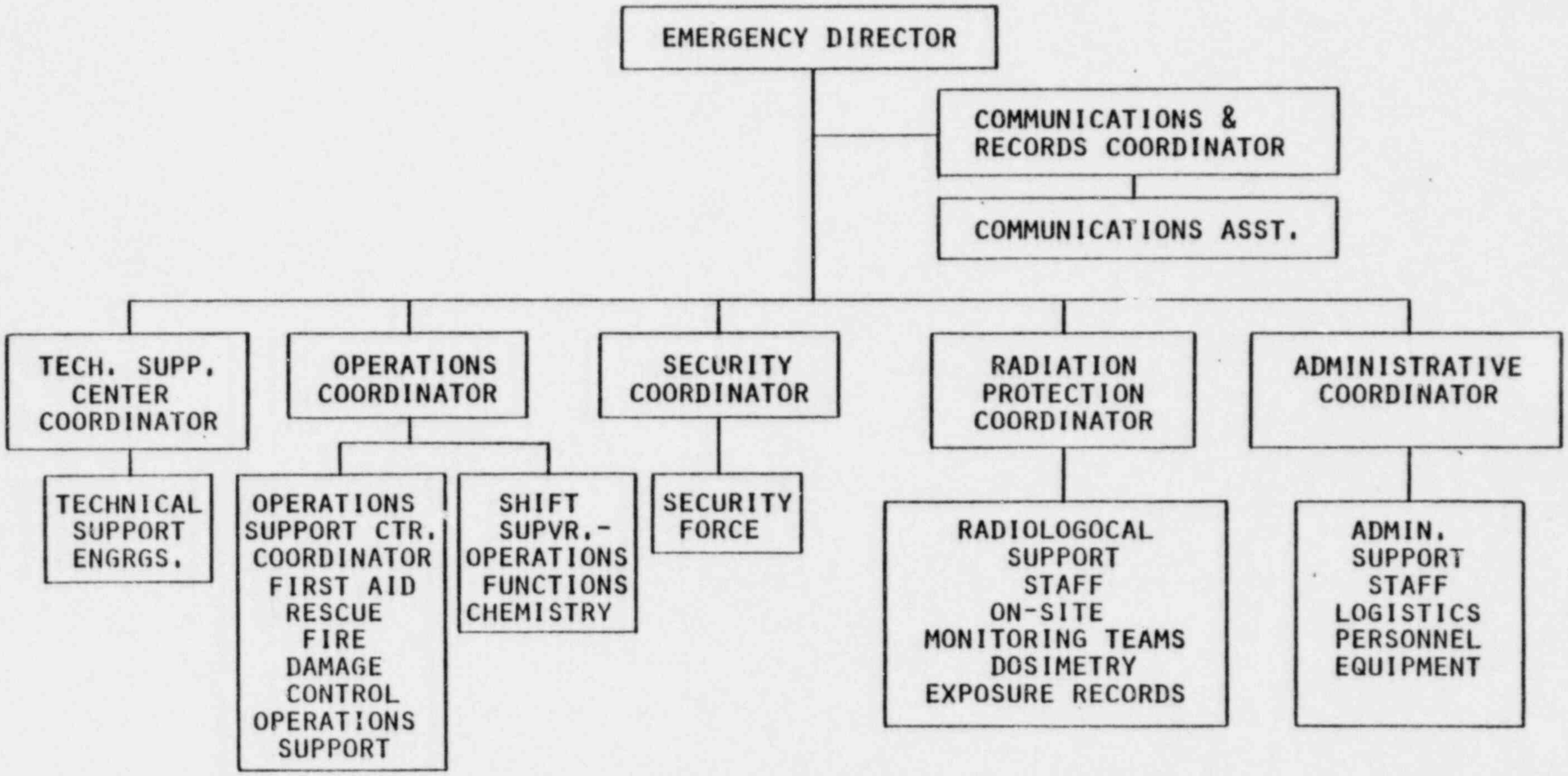
- Long Term Repair/Modification
- Return To Service

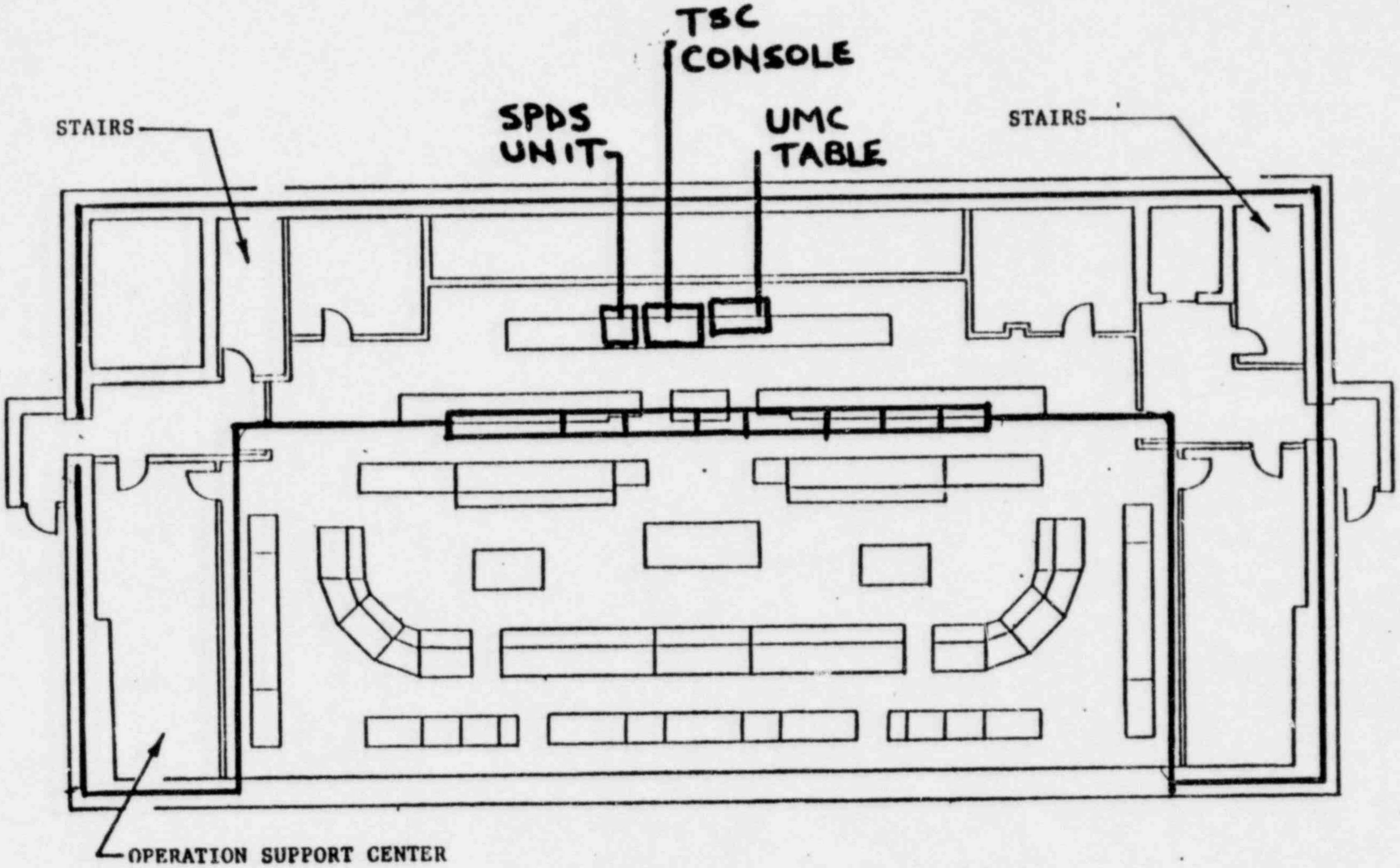

- REMOTE ASSE LY AREA
- INTERIM EOF
- CONTROLLED ZONE ASSEMBLY AREA
- EMERGENCY OPERATIONS FACILITY
- CONTROL STRUCTURE
• CONTROL ROOM
• TECHNICAL SUPPORT CENTER
• OPERATIONS SUPPORT CENTER
N
NO SCALE
SUSQUEHANNA RIVER
RECREATION AREA
RECREATION AREA
EXCLUSION AREA
EXCLUSION AREA
PROPERTY LINE
PROPERTY LINE
PROPERTY LINE
TOWNSHIP RD. T419
TOWNSHIP RD. T438
TOWNSHIP RD. T464
U.S. RTE. 11
SPRAY POND
RADWASTE BLDG.
SERVICE AND ADMINISTRATION BLDG.
UNIT 1 COOLING TOWER
UNIT 2 COOLING TOWER
TURBINE BLDG.
REACTOR BLDG.
PROTECTED AREA BARRIER
METEOROLOGICAL TOWER
SEWAGE TREATMENT PLANT
SECONDARY ACCESS
MAIN ACCESS RD.
SIMULATOR BLDG.
SUSQUEHANNA ENERGY INFORMATION CENTER BLDG.
EXISTING CEMETARY
RIVER INTAKE STRUCTURE
PROJECT OFFICE
SWITCHYARD

IMMEDIATE RESPONSE
--
(ON-SHIFT) ORGANIZATION

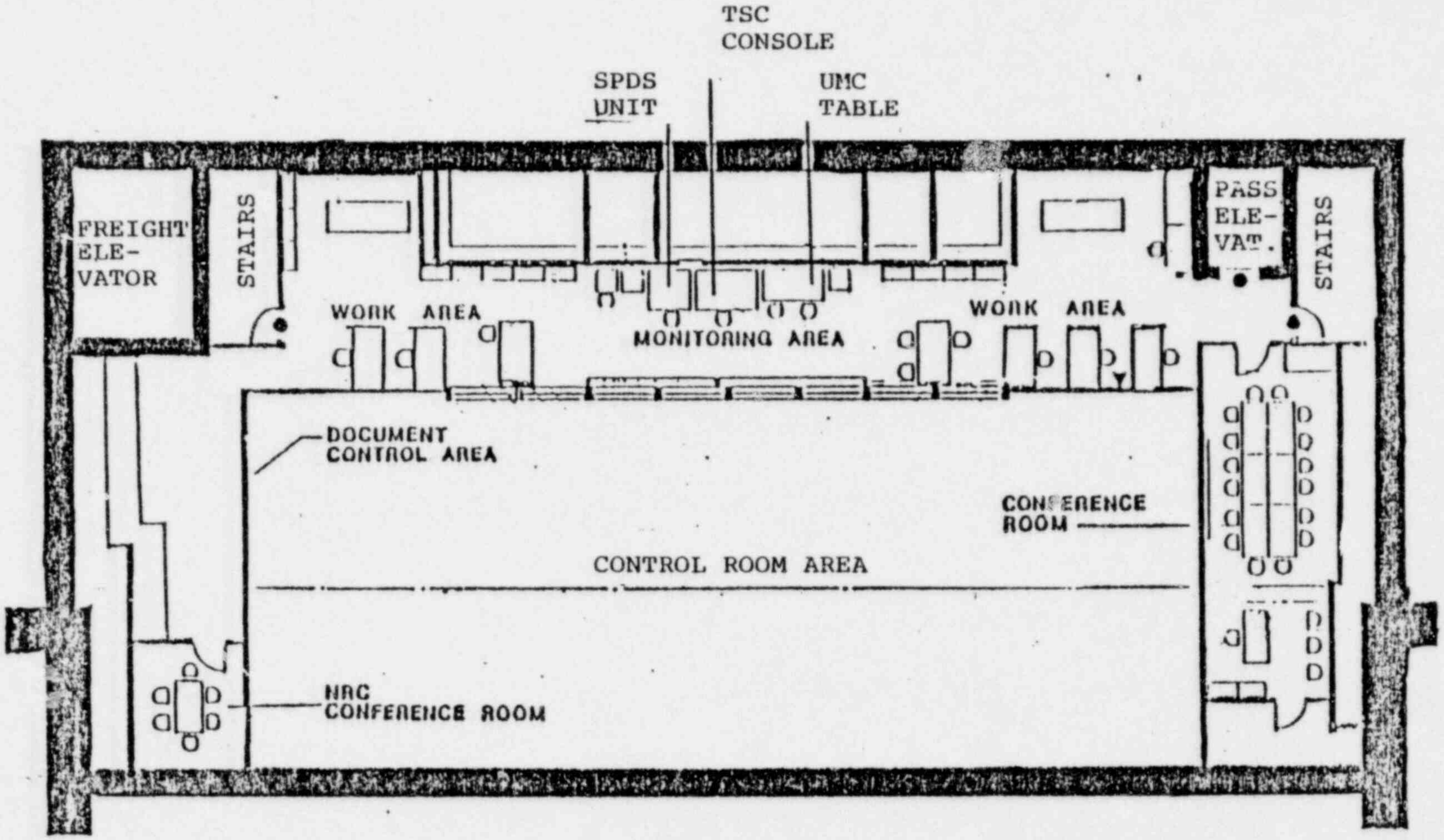


ON-SITE EMERGENCY ORGANIZATION



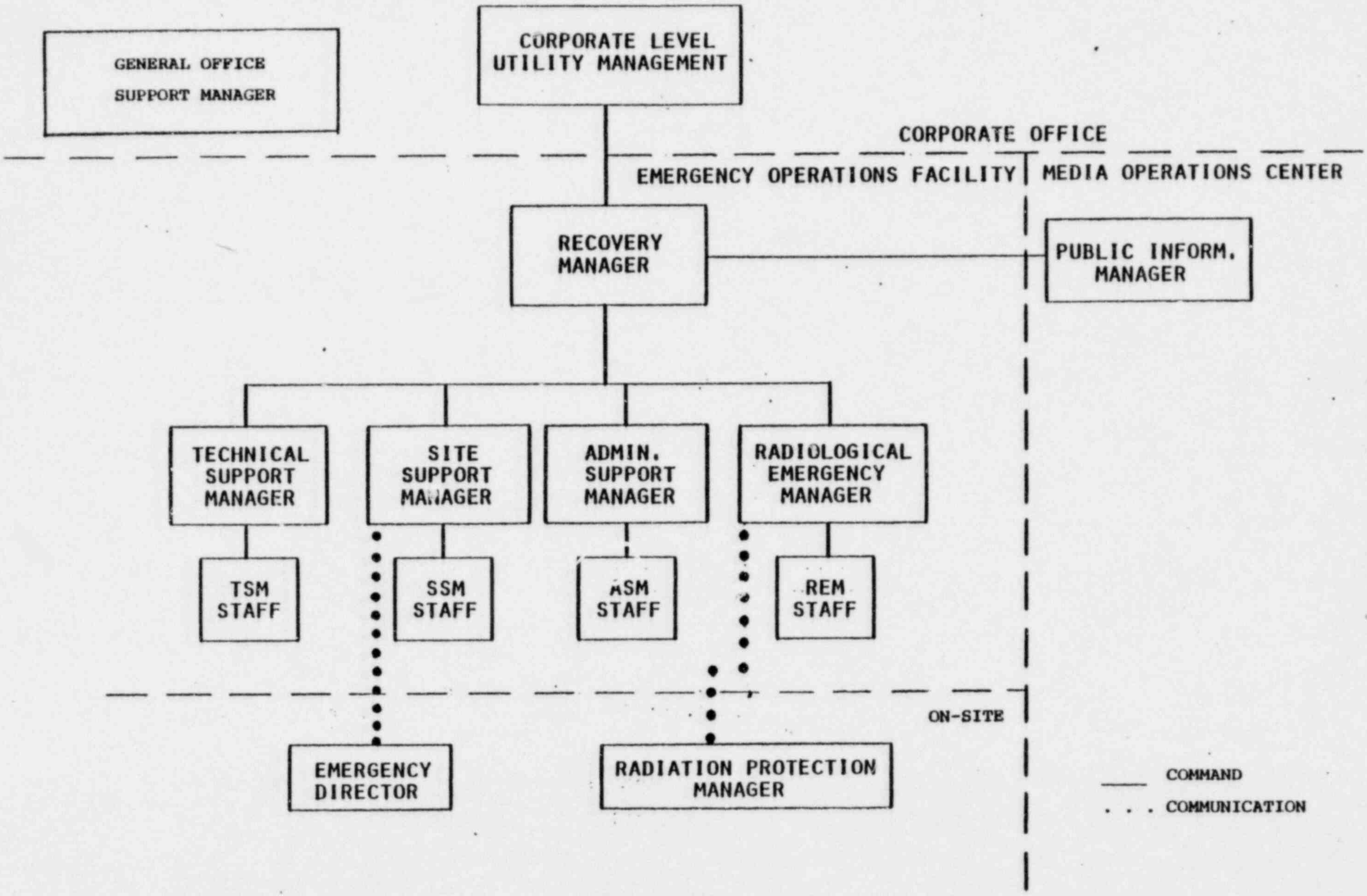


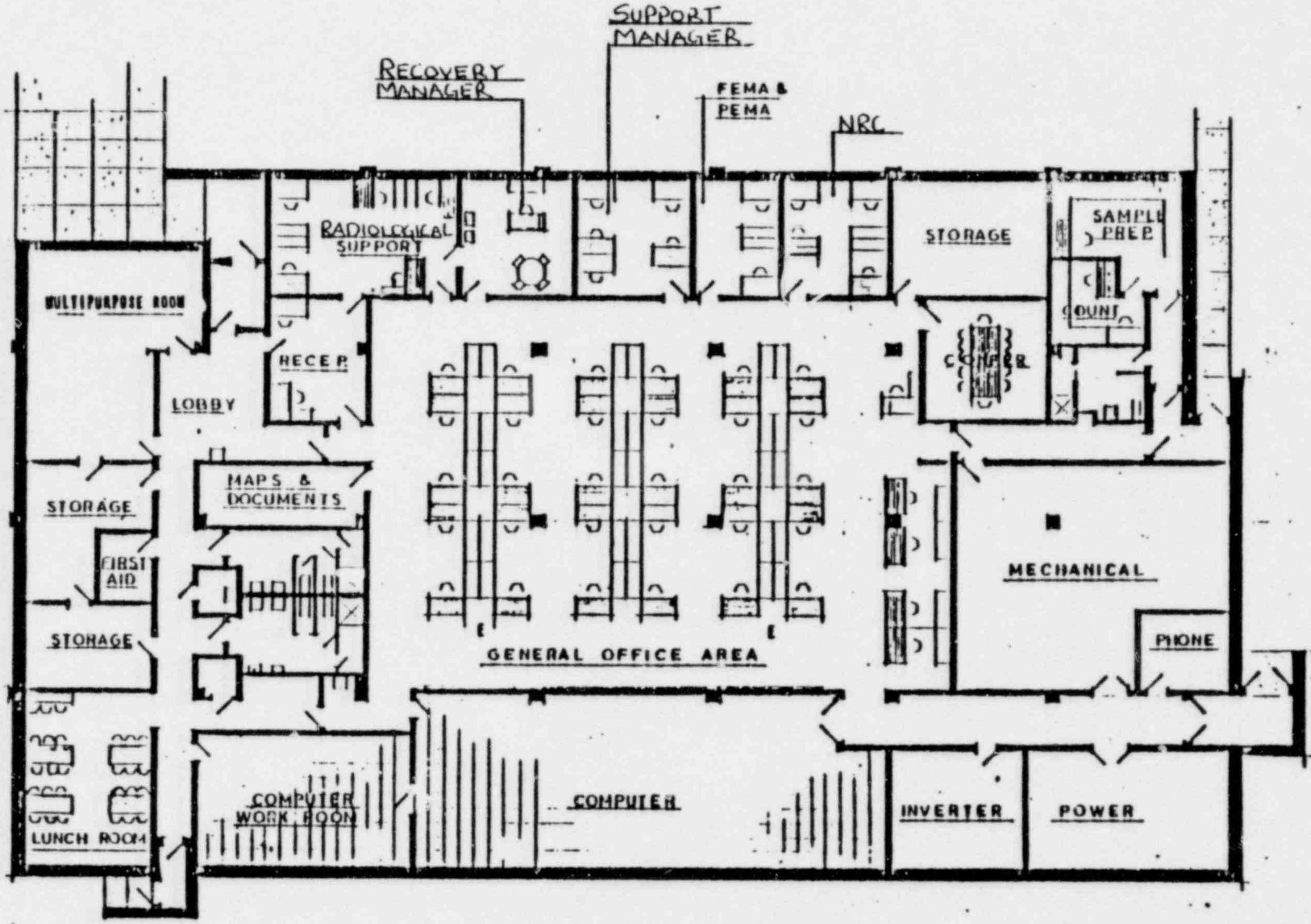
CONTROL ROOM
TSC



TECHNICAL SUPPORT CENTER

RECOVERY ORGANIZATION





RECOVERY MANAGER
SUPPORT MANAGER
FEMA & PEMA
NRC
RADIOLOGICAL SUPPORT
STORAGE
SAMPLE PREP
COUNT
CONFER
MULTIPURPOSE ROOM
RECEP
LOBBY
MAPS & DOCUMENTS
STORAGE
FIRST AID
STORAGE
GENERAL OFFICE AREA
MECHANICAL
PHONE
LUNCH ROOM
COMPUTER WORK ROOM
COMPUTER
INVERTER
POWER

COMMUNICATIONS

TELEPHONE SYSTEM

- TWO SEPARATE PBX SYSTEMS
- "HOT LINES" TO VARIOUS LOCAL AND FEDERAL AGENCIES AND PP&L FACILITIES

PUBLIC ADDRESS SYSTEM

- FIVE CHANNELS PER UNIT WITH MERGE CAPABILITY

PLANT MAINTENANCE/TEST JACK SYSTEM

- INDEPENDENT VOICE COMMUNICATION

UHF RADIO

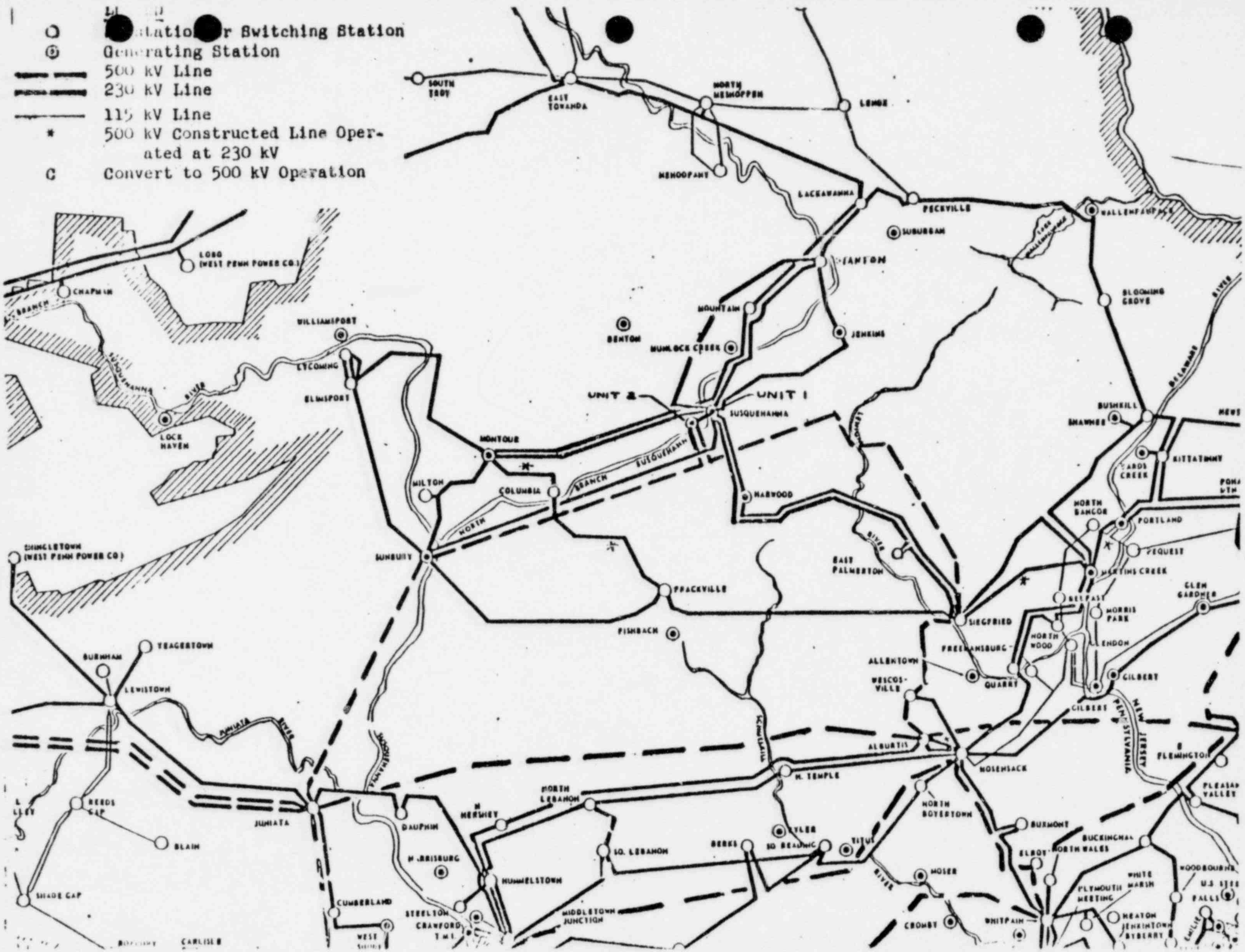
- ON-SITE AND NEAR-SITE COMMUNICATIONS FOR SECURITY, OPERATIONS, MAINTENANCE AND EMERGENCY PLANNING

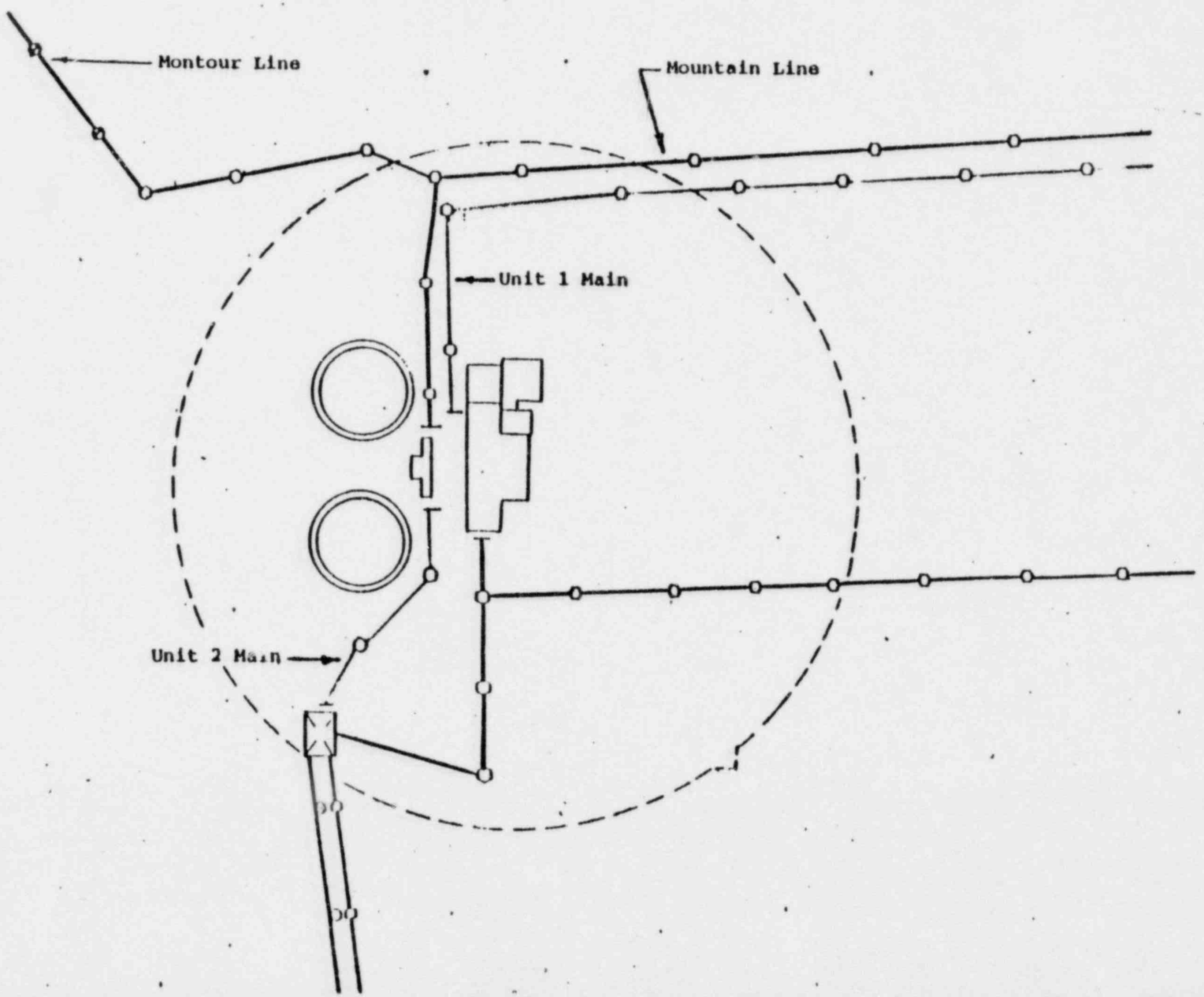
VHF RADIO

- OFF-SITE COMMUNICATION FOR EMERGENCY PLANNING COORDINATION ENVIRONMENTAL DATA GATHERING, OFFSITE PAGING, AND GENERAL BACKUP

ELECTRIC

REVIEW STABILITY STUDIES INCLUDING WORST CONDITION WITH
LOSS OF LARGEST UNIT ON PL SYSTEM.


Switching Station
Generating Station
500 kV Line
230 kV Line
115 kV Line
500 kV Constructed Line Operated at 230 kV
Convert to 500 kV Operation
SOUTH TROY
EAST TOWANDA
NORTH MESHOPPEN
LENOX
MEHOOPANY
LACKAWANNA
PECKVILLE
SUBURBAN
WALLENPAUPACK
BLOOMING GROVE
LOGO (WEST PENN POWER CO.)
CHAPMAN
WILLIAMSPORT
LYCOMING
ELMSPORT
LOCK HAVEN
SUSQUEHANNA
RIVER
BENTON
MOUNTAIN
JENKINS
HUMLOCK CREEK
UNIT 2
UNIT 1
SUSQUEHANNA
MONTOUR
MILTON
COLUMBIA
NORTH
BRANCH
SUSQUEHANNA
HARWOOD
SUNBURY
FRACKVILLE
FISHBACK
EAST PALMERTON
SIEGFRIED
BUSHKILL
SHAWNEE
KITTATINNY
NORTH BANGOR
PORTLAND
PEQUEST
MARTINS CREEK
BELFAST
MORRIS PARK
GLEN GARDNER
NORTH WOOD
FREEMANSBURG
QUARRY
ALLENTOWN
WESCOS-VILLE
GILBERT
NEW JERSEY
PENNSYLVANIA
FLEMINGTON
ALBURTIS
HOSENSACK
SHINGLETOWN (WEST PENN POWER CO.)
YEAGERTOWN
BURNHAM
LEWISTOWN
JUNIATA
RIVER
REEDS GAP
BLAIN
SHADE GAP
JUNIATA
DAUPHIN
HERSHEY
NORTH LEBANON
N. TEMPLE
H. ARRISBURG
HUMMELSTOWN
SO. LEBANON
BERKS
SO. READING
TYLER
TITUS
NORTH BOYERTOWN
BUXMONT
BUCKINGHAM
NORTH WALES
ELROY
PLEASANT VALLEY
WHITE MARSH
PLYMOUTH MEETING
WOODBOURNE
MOSER
RIVER
CUMBERLAND
STEELTON
CRAWFORD
TMI
MIDDLETOWN JUNCTION
CROMBY
WHITPAIN
HEATON
JENKINTOWN
BYBERRY
CARLISLE


Montour Line
Mountain Line
Unit 1 Main
Unit 2 Main

STABILITY

- GENERATOR - TRANSMISSION SYSTEM INTERACTION
- TRANSIENT STABILITY TIMEFRAME
- STABILITY INFLUENCED
  - LOAD LEVEL
  - TRANSMISSION
  - TYPE OF DISTURBANCE
  - DURATION OF DISTURBANCE
  - LOCATION OF DISTURBANCE

TYPICAL SYSTEM DISTURBANCES

IN ORDER OF INCREASING SEVERITY:

- LOSS OF A LARGE BLOCK OF LOAD
- LOSS OF A MAJOR GENERATING UNIT
- PHASE-TO-GROUND FAULT WITH NORMAL CLEARING
- PHASE-TO-GROUND FAULT WITH DELAYED CLEARING
- THREE PHASE FAULT WITH NORMAL CLEARING
- THREE PHASE FAULT WITH DELAYED CLEARING

RELIABILITY CRITERIA

MUST REMAIN STABLE

- THREE PHASE FAULT WITH NORMAL CLEARING
- PHASE-TO-GROUND FAULT WITH A STUCK BREAKER

  OR

  OTHER CAUSE FOR DELAYED CLEARING

MUST REVIEW

- THREE PHASE FAULT WITH DELAYED CLEARING

SELECTED STABILITY CASE LIST

o LOSS OF SUSQUEHANNA #1 DUE TO A NON-TRANSMISSION SYSTEM CAUSE.	STABLE
o LOSS OF SUSQUEHANNA #2 DUE TO A NON-TRANSMISSION SYSTEM CAUSE.	STABLE
o LOSS OF SUSQUEHANNA #1 AND #2 DUE TO A NON-TRANSMISSION SYSTEM CAUSE.	STABLE
o THREE PHASE FAULT AT WORST 500KV LOCATION (SUSQUEHANNA-ALBURTIS 500KV LINE) WITH DELAYED CLEARING. LOSE LINE AND SUSQUEHANNA 500-230KV TRANSFORMER.	STABLE
o THREE PHASE FAULT AT WORST 230KV LOCATION (500-230KV TRANSFORMER LEADS) WITH DELAYED CLEARING. LOSE TRANSFORMER AND STANTON-SUSQUEHANNA #2 230KV LINE.	STABLE
o THREE PHASE FAULT AT WORST 500KV LOCATION (SUSQUEHANNA-ALBURTIS 500KV LINE) WITH DELAYED CLEARING. LOSE LINE AND SUSQUEHANNA 500-230KV TRANSFORMER AND TRIP SUSQUEHANNA #1.	STABLE
o THREE PHASE FAULT AT WORST 230KV LOCATION (500-230KV TRANSFORMER LEADS) WITH DELAYED CLEARING. LOSE TRANSFORMER AND STANTON-SUSQUEHANNA #2 230KV LINE AND TRIP SUSQUEHANNA #2.	STABLE

SYSTEM OPERATION

NORMAL OPERATION

- o MONITOR FACILITIES
- o MAINTAIN VOLTAGE, FREQUENCY, POWER FLOW
- o GENERATION RESERVE
- o ANALYZE OUTAGES

AIDS TO LOAD MANAGEMENT

- o COMPUTER - MONITOR AND CONTROL
- o ON-LINE LOAD FLOW ANALYSIS
- o PRE-ANALYSIS OF EQUIPMENT OUTAGES
- o PROFESSIONAL DISPATCHERS
- o SIMULATOR
- o UNDERFREQUENCY RELAYS - 20% OF LOAD
- o SUPERVISORY CONTROL - 45% OF LOAD
- o QUICKSTART GENERATION

  HYDRO - 350 MW
  COMBUSTION TURBINES - 420 MW

DURING EMERGENCIES

ALWAYS ADJUST FOR NEXT CONTINGENCY

1. PURCHASE POWER
2. ADJUST GENERATION
3. START OFF-LINE GENERATORS
4. CURTAIL NON-ESSENTIAL USES
5. DROP INTERRUPTIBLE LOAD
6. PUBLIC APPEAL
7. VOLTAGE REDUCTION
8. DROP LOAD

STATION BLACKOUT

THREE PHASE APPROACH:

1. DEVELOPMENT OF TRAININ, AND PROCEDURES

2. ENGINEERING EVALUATIONS; ACQUISITION OF TEST DATA.

3. COMPLETE TRAINING / APPROVE PROCEDURES.

STATION BLACKOUT EVENT EVALUATION

INITIATING CONDITIONS: SIMULATANEOUS LOSS OF POWER TO BOTH STARTUP TRANSFORMERS WITH SUBSEQUENT FAILURE TO START OF ONSITE DIESEL GENERATORS

AUTOMATIC ACTIONS

- LOAD REJECT, MAIN GENERATOR AND TURBINE TRIP
- REACTOR VESSEL AND CONTAINMENT ISOLATION
- SAFETY RELIEF VALUE ACTUATION IN RELIEF MODE
- HPCI AND RCIC AUTOMATIC INITIATION ON LEVEL II
- LOAD SHEDDING ON 4.16KV AND 13.8KV BUSSES
- AC OPERATED AND AIR OPERATED EQUIPMENT TO FAILED CONDITION

PLANNED RESPONSE OF OPERATING CREW

- CONTROL REACTOR LEVEL USING HPCI & RCIC, RCIC ALONE AFTER 15 MIN
- INITIATE CONTROLLED BLOWDOWN OF REACTOR PRESSURE. MAINTAIN REACTOR PRESSURE WITHIN PREDETERMINED BAND USING ADS (KEY SWITCH) FUNCTION OF SAFETY-RELIEF VALVES
- SECURE DC LOADS NOT ESSENTIAL TO THIS TRANSIENT
- SET UP FOR TEMPORARY MONITORING OF CRITICAL PARAMETERS NOT AVAILABLE IN CONTROL ROOM
- MAKE NECESSARY PREPARATIONS FOR CONTINGENCY ACTIONS
- WHEN MONITORED CRITICAL PARAMETERS REACH PREDEFINED LIMITS, INITIATE CONTINGENCY ACTIONS
- INITIATE CORRECTIVE ACTION TO RESTORE ONSITE A/C POWER. DETERMINE PROJECTED AVAILABILITY OF OFFSITE POWER.
- ONCE AC POWER BECOMES AVAILABLE, RESTORE INHOUSE LOADS ON A PRIORITY BASIS

STATION BLACKOUT TEST

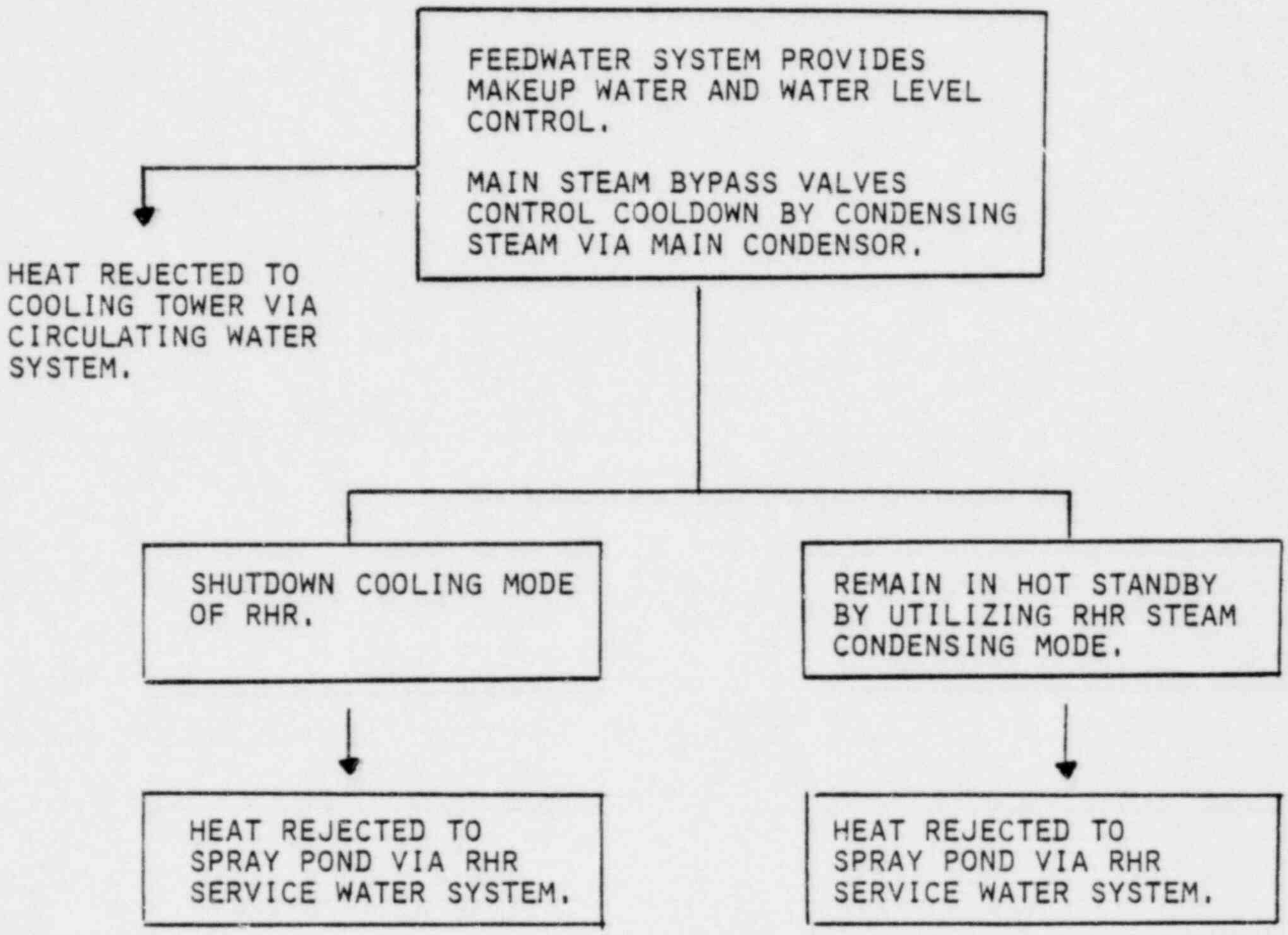
BRIEF DESCRIPTION -

- OPERATE AT AT LEAST 85% POWER FOR AT LEAST 7 DAYS
- ORDERLY SHUTDOWN TO THE POINT WHERE THE MAIN GENERATOR IS TO BE SEPARATED FROM GRID
- INITIATE ACTIONS THAT WILL CAUSE A SIMULATED BLACKOUT TO BE EXPERIENCED BY THE REACTOR, PRIMARY CONTAINMENT, HPCI, AND RCIC SYSTEMS
- MONITOR PLANT PARAMETERS. WHEN CUTOFF POINTS ARE REACHED, INITIATE PREDEFINED CONTINGENCY ACTIONS
- TEST TERMINATES WHEN EITHER OF THE FOLLOWING OCCURS FIRST
  1. A CUTOFF POINT IS REACHED WHICH REQUIRES TERMINATING THE TEST
  2. SUFFICIENT DATA HAS BEEN COLLECTED

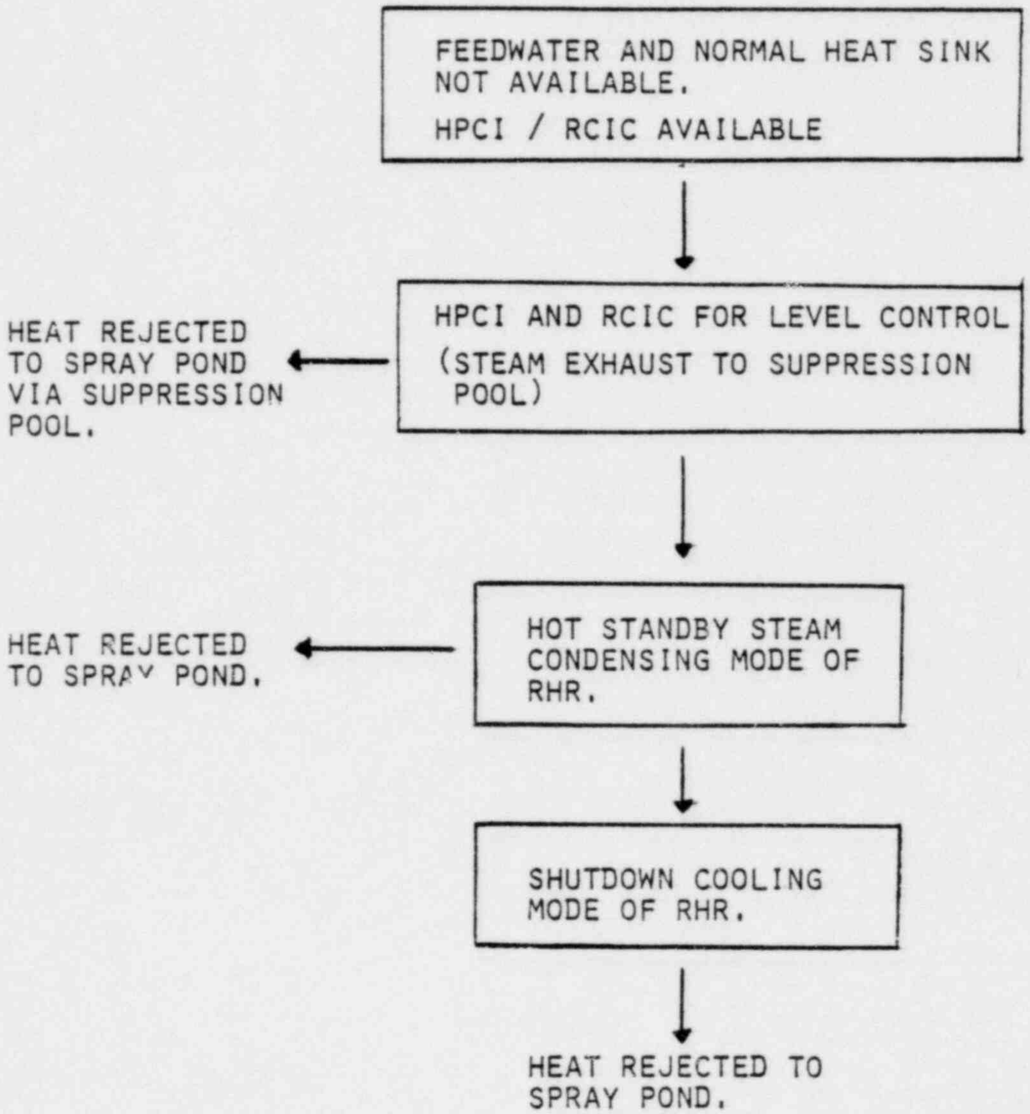
DECAY HEAT
REMOVAL

NORMAL DECAY HEAT REMOVAL

ALL SYSTEMS AVAILABLE



DEGRADED MODE OF DECAY HEAT REMOVAL



DEGRADED MODE OF DECAY HEAT REMOVAL

HPCI AND RCIC NOT AVAILABLE

REACTOR ISOLATED FROM NORMAL HEAT SINK.

↓

INITIATE CS / LPCI; DEPRESSURIZES (SRV OR ADS)

↓

WHEN CONDITIONS STABILIZE, SHUTDOWN COOLING MODE OF RHR TO REJECT HEAT TO SPRAY POND.

ENVIRONMENT QUALIFICATION
OF EQUIPMENT

ISSUE:

CLASS IE ELECTRICAL EQUIPMENT MUST MEET UPGRADED REQUIREMENTS FOR ENVIRONMENTAL QUALIFICATION BY JUNE 30, 1982. FOR SSES THESE ARE CATEGORY II REQUIREMENTS FROM NUREG-0588.

POSITION:

- o CLASS IE EQUIPMENT AT SSES WAS QUALIFIED TO MANY PRE-NUREG-0588 STANDARDS.

- o WE HAVE COMMITTED TO UPGRADE QUALIFICATION TO CATEGORY II OF NUREG-0588 AND PURCHASE ALL NEW CLASS IE ELECTRICAL EQUIPMENT TO CATEGORY I OF NUREG-0588.

- o OUR GOAL CONTINUES TO BE COMPLETION OF THIS REQUALIFICATION PROGRAM BY JUNE 30, 1982 BUT DIFFICULTIES IN MEETING THIS GOAL EXIST.

  - CONCISE IDENTIFICATION/UNDERSTANDING OF THE REQUIREMENTS

  - VENDOR RESPONSIVENESS

  - AVAILABILITY OF TEST FACILITIES, EXPERIENCED MANPOWER AND QUALIFIED REPLACEMENTS.

JUSTIFICATION:

- SSES "ENVIRONMENTAL QUALIFICATION REPORT FOR CLASS IE EQUIPMENT" SUBMITTED IN NOVEMBER, 1980
  - IDENTIFIED ALL CLASS IE COMPONENTS IN HARSH ENVIRONMENT
  - IDENTIFIED ENVIRONMENTAL CONDITIONS FOR EACH HARSH AREA WITHIN THE PLANT
- REVISION 1 OF REPORT SUBMITTED IN APRIL, 1981
  - IDENTIFIED QUALIFICATION STATUS OF EQUIPMENT AS OF APRIL
  - 25% OF THE COMPONENTS HAD COMPLETE DOCUMENTATION SHOWING QUALIFICATION OF CATEGORY II
  - WE HAVE TAKEN A CONSERVATIVE DEFINITION FOR DETERMINING THAT COMPLETE DOCUMENTATION EXISTS

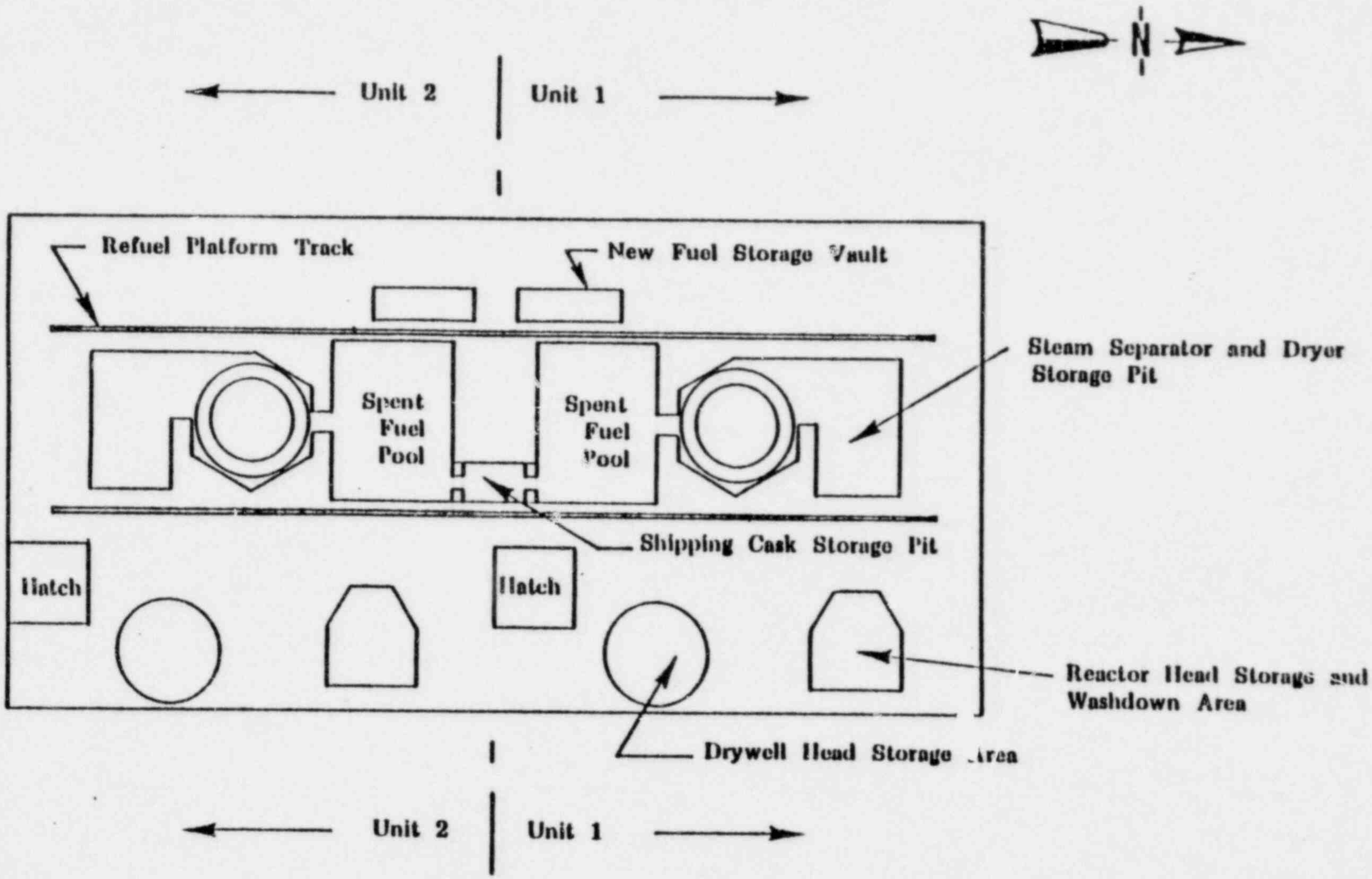
AGGRESSIVE PROGRAM TO DOCUMENT QUALIFICATION OF REMAINING COMPONENTS UNDERWAY

- DOCUMENT SEARCH
- ANALYSIS
- TESTING
- REPLACEMENT

- FOR MANY COMPONENTS PARALLEL PATHS TO CLOSURE ARE BEING PURSUED

- CONFIDENT OUR PROGRAM MEETS THE TECHNICAL REQUIREMENTS OF NUREG-0588

SPENT FUEL STORAGE



Reactor Building 818 Foot Level

SPENT FUEL POOL RACK CAPACITIES

2 POOLS - 1 FOR EACH UNIT, EACH CONTAINING:

2840 FUEL STORAGE LOCATIONS

10 SPECIAL STORAGE LOCATIONS CAPABLE OF ACCEPTING

- CANNED DEFECTIVE FUEL IN CONTAINERS
- CONTROL RODS
- CONTROL ROD GUIDE TUBES

130 STORAGE LOCATIONS FOR CONTROL RODS ON PEGS AROUND THE PERIMETER OF THE POOL.

THE FOLLOWING OPERATING STRATEGIES ARE ASSUMED ALWAYS RETAINING 764 OPEN STORAGE LOCATIONS TO ENABLE OFF LOADING THE ENTIRE CORE IF REQUIRED:

- 1/4 CORE DISCHARGED EVERY YEAR ENABLES 10 YEARS OF DISCHARGE FUEL TO BE STORED.
- 1/3 CORE DISCHARGED EVERY 18 MONTHS ENABLES 12 YEARS OF DISCHARGE FUEL TO BE STORED.

THE FOLLOWING OPERATING STRATEGIES ARE ASSUMED IF NO SPACE IS RETAINED TO OFF LOAD AN ENTIRE CORE:

- 1/4 CORE DISCHARGED EVERY YEAR ENABLES 14 YEARS OF DISCHARGE FUEL TO BE STORED.
- 1/3 CORE DISCHARGED EVERY 18 MONTHS ENABLES 16 YEARS OF DISCHARGE FUEL TO BE STORED.

SCRAM DISCHARGE
VOLUME

NUREG - 0785

AEOD REPORT

SAFETY CONCERNS ASSOCIATED WITH PIPE BREAKS IN BWR SCRAM SYSTEM

NRC RECOMMENDATIONS

- UPGRADE CRD-HYDRAULIC CONTROL UNIT EXHAUST LINES AND SCRAM DISCHARGE VOLUME PIPING TO "HIGHEST STANDARDS FOR DESIGN; FABRICATION, INSTALLATION, TESTING, ISI QA AVAILABLE (ASME III CLASS 1).

- PROVIDE REDUNDANT RELIABLE BREAK DETECTION INSTRUMENTS IN SDV AREA.

- DEVELOP EMERGENCY OPERATING PROCEDURES AND TRAINING PROGRAMS FOR SDV PIPING BREAK MITIGATION.

- CONSIDER IMPROVING SCRAM EXHAUST VALVE CLOSURE RELIABLIITY.

- IMPROVE MAINTENANCE PRACTICES ASSOCIATED WITH SDV PIPING AND CRD HCU MANUAL VALVES.

SUSQUEHANNA

- EVALUATION ON NUREG - 0785 ONGOING
- STATUS TO DATE
  - SSES IS A MARK II CONTAINMENT WITH INHERENT DESIGN IMPROVEMENTS OVER THE MARK I CONCEPT WHICH FORMED THE BASIS FOR NUREG - 0785
    - WATER TIGHT ECCS PUMP ROOMS
    - IMPROVED SEPARATION BETWEEN SDV's AND ECCS PUMP ROOMS
    - CRD MAKE-UP PUMPS IN TURBINE BUILDING
    - 2 -250 GPM REACTOR BUILDING SUMP PUMPS

SUSQUEHANNA COMPARISON TO AEOD RECOMMENDATIONS

- CRD PIPING (INCLUDING SDV & SDIV) DESIGNED AND BUILT TO ASME III CLASS 2 REQUIREMENTS.

- MULTIPLE BREAK DETECTION DEVICES OR METHODS AVAILABLE TO OPERATOR
  - AREA RADIATION MONITORS
  - REACTOR BUILDING SUMP LEVEL ALARMS
  - CRD HIGH TEMPERATURE ALARMS
  - REACTOR BUILDING VENTILATION HIGH RADIATION ALARM
  - REACTOR BUILDING VENTILATION ISOLATION
  - OPERATOR OBSERVATION

- EMERGENCY OPERATING PROCEDURES UNDER DEVELOPMENT. THEY WILL ADDRESS APPROPRIATE OPERATOR ACTIONS

- SCRAM EXHAUST VALVE HAS A FAIL OPEN DESIGN. THIS IS ESSENTIAL TO FAIL SAFE SCRAM. NO MODIFICATION ANTICIPATED

- MAINTENANCE PRACTICES WILL BE IN ACCORDANCE WITH NUREG-0785.

BROWNS FERRY - 3

PROBLEM

- INCOMPLETE SCRAM

PROBABLE CAUSE

- SMALL PIPE BLOCKAGE BETWEEN SDV AND SDIV
- DESIGN INADEQUACIES

BROWNS FERRY 3
INCOMPLETE SCRAM

SUSQUEHANNA HAS:

- IN EXCESS OF DESIGN BASIS VOLUME REQUIRED FOR COMPLETE SCRAM
- PROPERLY SLOPED DIV DRAINS
- PROPERLY SLOPED SDV VENTS
- DIRECTLY CONNECTED SDV TO SDIV (8" SDV HEADERS PIPED DIRECTLY TO A VERTICAL 10" SDIV)
- SDIV DIRECTLY INSTRUMENTED WITH FLOAT SWITCHES (LEVEL)
- DIFFERENTIAL PRESSURE LEVEL SWITCHES ADDED BY 12/82

MODIFICATION SCHEDULE

- ADD REDUNDANT, DIVERSE LEVEL SENSORS	12/82
- ADD REDUNDANT VENT AND DRAIN ISOLATION VALVES	12/82
- RELOCATE LEVEL SENSOR TAPS TO SDIV	F. L.
- ADD VACUUM BREAKER TO SDV VENT SYSTEM	12/82

CONCLUSION

- SUPERIOR DESIGN
- MODIFICATIONS ADD MORE SAFETY MARGIN

ATWS

THE ATWS EVALUATION CONCERNS ARE

- RADIOLOGICAL CONSEQUENCES (10 CFR 100)
- PRIMARY SYSTEM PRESSURE (<LEVEL C)
- PRIMARY CONTAINMENT (PRESS/TEMP)
- FUEL INTEGRITY (CORE COOLABLE GEOMETRY) (NEUTRON OSCILLATIONS)
- LONG TERM SHUTDOWN
- AVAILABILITY
- SCHEDULE

SUSQUEHANNA'S ANALYSIS WILL ACCOUNT FOR ALL OF THESE CONCERNS AND WE ARE COMMITTED TO HAVE ASSURANCE THAT ALL ELEMENTS OF THE ATWS ISSUE WE EMPLOY WILL ACHIEVE THESE GOALS.

ATWS RESOLUTION

PROPOSED NRC RULE-vs-PP&L COMMITMENT

	SECY 80-409	SSES
• PLANT SPECIFIC ANALYSIS	YES	YES
• RECIRC PUMP TRIP (RPT)	YES	YES
• OPERATOR TRAINING (OT)	YES	YES
• SCRAM DISCHARGE VOLUME (SDV)	YES	YES
• CONTAINMENT ISOLATION	YES	YES
• HPCI IMPROVEMENT	YES	YES
• ALTERNATE ROD INSERTION (ARI)	YES	*
• LOGIC (CHANGE)	YES	**
• AUTO STANDBY LIQUID CONTROL	YES	***

* NEED WILL BE DETERMINED BY ANALYSIS RESULTS

** THE ANALYSIS FOR SSES NEEDS TO BE COMPLETED TO DETERMINE THE OVERALL SAFETY OF THE PLANT BEFORE INITIATING MSIV CLOSURE OR FEEDWATER RUNBACK.

*** • DISTRIBUTION TESTS NEED TO BE COMPLETED TO DETERMINE PROPER POINT(S) OF SLC INJECTION.

• ANALYSIS NEEDS TO BE COMPLETED TO DETERMINE VALIDITY OF AUTO INITIATION AND NEED FOR INCREASED FLOW RATE.

TENTATIVE SCHEDULE FOR
ATWS IMPLEMENTATION

TOPIC	UNIT 1	UNIT 2
• PLANT SPECIFIC ANALYSIS	1/1/82	1/1/82
• RECIRCULATION PUMP TRIP	FUEL LOAD	FUEL LOAD
• OPERATOR TRAINING	FUEL LOAD AND ON-GOING	FUEL LOAD AND ON-GOING
• SCRAM DISCHARGE VOLUME MODIFICATIONS	FUEL LOAD (PARTIAL) 12/31/82 (COMPLETED)	FUEL LOAD

MARK II

MARK II CONTAINMENT SUMMARY

ISSUE:

ORIGINAL DESIGN OF MARK II PLANTS DID NOT DIRECTLY CONSIDER THE SUPPRESSION POOL HYDRODYNAMIC LOADS DUE TO SAFETY RELIEF VALVE DISCHARGE AND POSTULATED LOCA EVENTS.

POSITION:

THE SUSQUEHANNA PLANT DESIGN HAS BEEN UPGRADED TO ACCOMODATE VERY CONSERVATIVE SRV AND LOCA LOAD SPECIFICATIONS.

JUSTIFICATION:

PP&L'S MARK II CONTAINMENT PROGRAM EXTENDS BEYOND GENERIC MARK II OWNERS GROUP EFFORT. LOAD SPECIFICATIONS ARE BASED ON FULL SCALE TEST DATA. EXTENSIVE INDUSTRY AND NRC REVIEW OF ENTIRE PROGRAM HAS CONFIRMED CONSERVATISM OF METHODOLOGIES. FINAL PLANT ASSESSMENT UNDERWAY AND WILL BE COMPLETED BY FUEL LOAD.

ISSUE:

- Original design of Mark II plants did not directly consider the suppression pool hydrodynamic loads due to safety relief valve discharge and postulated LOCA events

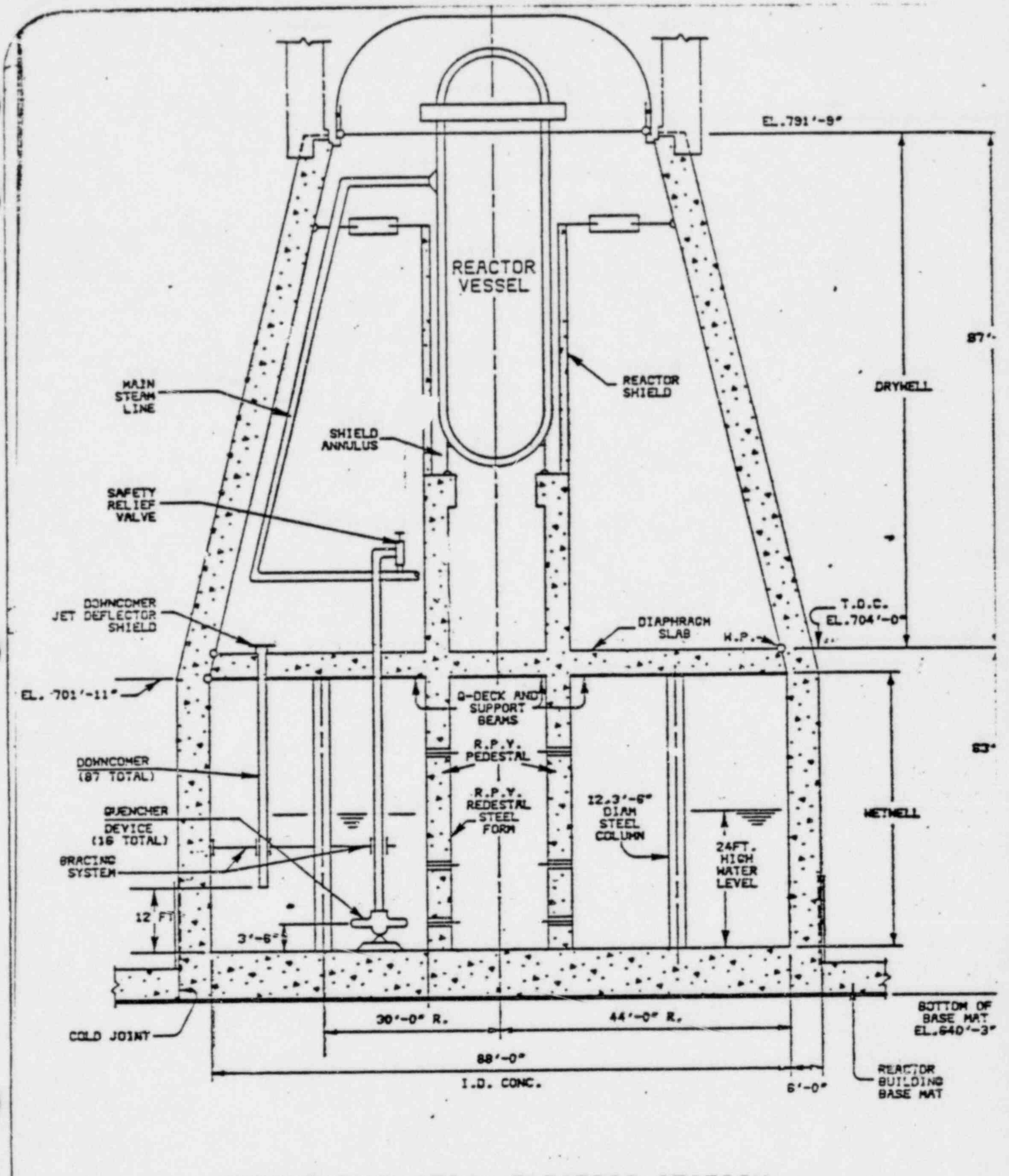
- Problem identified in 1974 -1975

  - Mark III testing
  - Foreign and domestic operating experience

- NRC bulletin and letters requesting additional information initiated Mark II program

- Mark II utility group formed in June 1975 to generically address the issue

- Identified as unresolved safety issue task A-8 & A-39



SUSQUEHANNA STEAM ELECTRIC STATION
CROSS SECTION OF CONTAINMENT

POSITION:

- SSES DESIGN HAS BEEN UPGRADED TO ACCOMODATE VERY CONSERVATIVE SRV AND LOCA LOADS
- SUSQUEHANNA DESIGN ASSESSMENT UTILIZES BOTH MARK II GENERIC LOADS AND PLANT UNIQUE LOADS
- PLANT UNIQUE LOADS AND PLANT ASSESSMENT ARE DOCUMENTED IN SUSQUEHANNA DESIGN ASSESSMENT REPORT
- REVIEW DOCUMENTED IN SECTION 6.2.1.8 OF SER AND SUPPLEMENT # 1 TO SER
- PLANT ASSESSMENT UTILIZING THESE VERY CONSERVATIVE LOADS IS PROCEEDING

JUSTIFICATION:

- THROUGHOUT THIS EFFORT WE HAVE FOUND OURSELVES IN A UNIQUE SCHEDULE PROBLEM
  - NOT CLASSIFIED AS A LEAD PLANT
  - NOT A LONG TERM PLANT
- BECAUSE OF THIS WE HAVE HAD TO AGGRESSIVELY ATTACK THE PROBLEM ON OUR OWN
  - T - QUENCHER DEVELOPMENT
  - GKM II M TEST

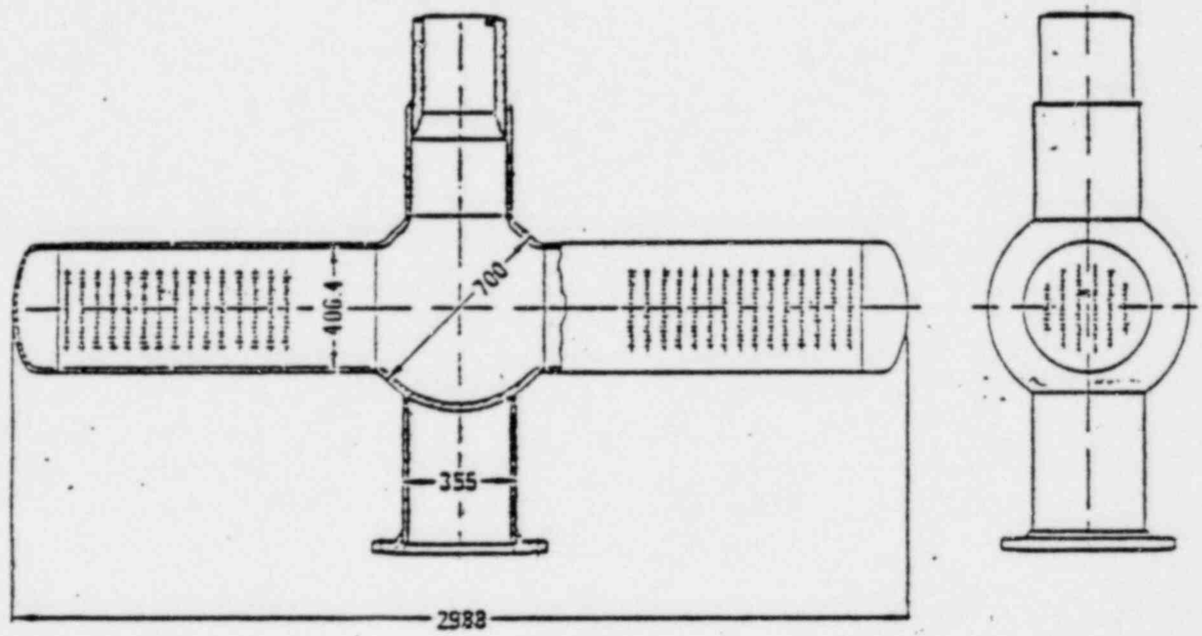
- T-QUENCHER DEVELOPMENT AND TEST PROGRAM

  - IN 1977 WE INITIATED A PROGRAM TO DESIGN A SPECIFIC QUENCHER DEVICE FOR USE ON SUSQUEHANNA

  - A FULL SCALE TEST PROTOTYPICAL OF SUSQUEHANNA WAS PERFORMED TO VERIFY THIS DESIGN

  - THIS QUENCHER DESIGN IS NOW BEING USED BY SIX OF THE SEVEN OTHER MARK II PLANTS

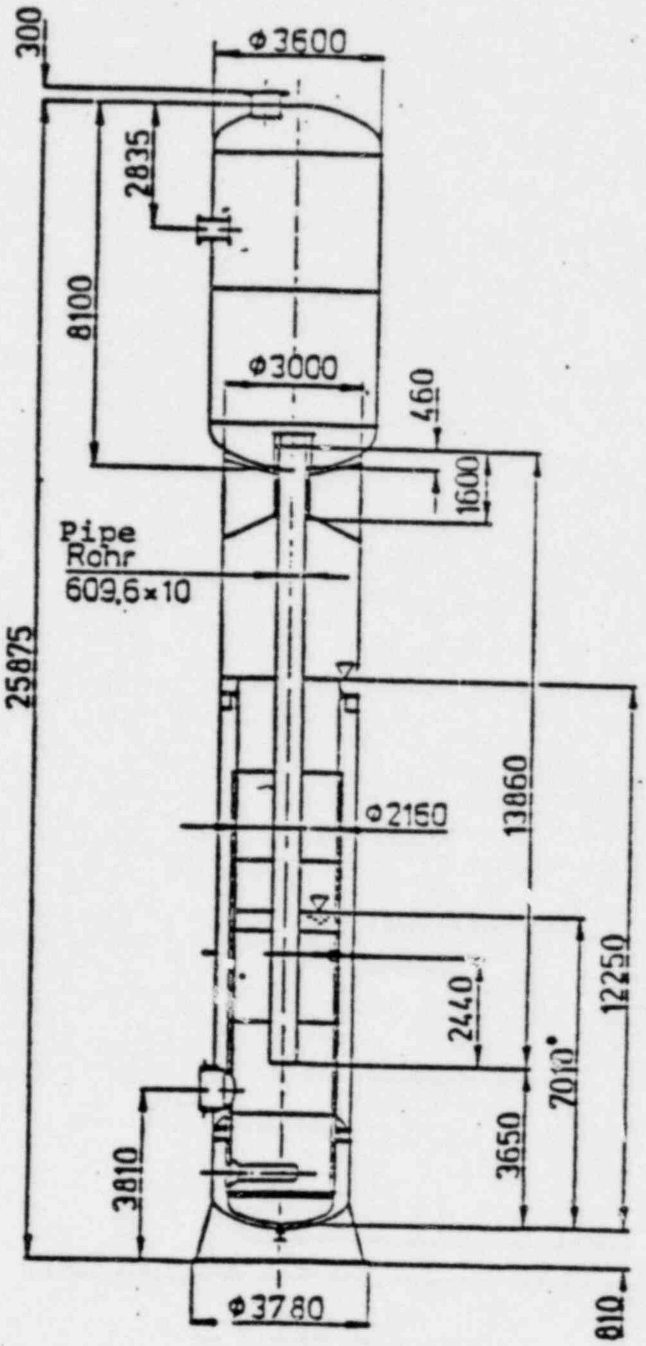
  - NRC STAFF ACCEPTABILITY



NOTE: All dimensions in mm.

SSES QUENCHER

- GKM II M TEST PROGRAM
  - THESE TESTS WERE FULL SCALE SINGLE CELL LOCA TEST PERFORMED IN A PROTOTYPICAL TEST FACILITY AND UNDER PROTOTYPICAL CONDITIONS
  - THESE TESTS HAVE PROVIDED US WITH AN EXTENSIVE DATA BASE FOR SPECIFICATION OF A VERY CONSERVATIVE LOCA STEAM CONDENSATION LOAD
  - THIS LOAD HAS BEEN ADOPTED AS OUR DESIGN BASIS LOCA LOAD FOR PLANT ASSESSMENT



GKM II-M-Condensation Tests

Test Tank

*Normal Water Level

- UPGRADING OF PLANT DESIGN TO INCLUDE HYDRODYNAMIC LOADS HAS RESULTED IN SIGNIFICANT CHANGES
  - ADDITIONS AND MODIFICATION TO CONTAINMENT CONCRETE REINFORCING BARS
  - RE-ROUTING OF SRV LINES
  - INSTALLATION OF T-QUENCHERS ON SRV LINES
  - RE-DESIGN AND REPLACEMENT OF DOWNCOMER BRACING S.STEM
  - UPGRADED SUPPRESSION POOL TEMPERATURE MONITORING SYSTEM
  - REMOVAL OF MAJOR EQUIPMENT FROM POOL SWELL ZONE IN WETWELL
  - RE-DESIGN AND MODIFICATION OF A LARGE NUMBER OF CONTAINMENT AND REACTOR BUILDING PIPING SYSTEMS

CONCLUSIONS:

- SUPPRESSION POOL HYDRODYNAMIC LOADS HAVE BEEN THOROUGHLY INVESTIGATED BY MARK II OWNERS GROUP AND PP&L OVER THE LAST 6 YEARS

- SUSQUEHANNA HAS BEEN DESIGNED TO ACCOMODATE VERY CONSERVATIVE LOADS AND LOAD COMBINATIONS BASED ON A WIDE RANGE OF EXPERIMENTAL DATA AND ANALYTICAL APPROACHES

- BECAUSE OF THESE CONSERVATISMS AND RESULTING PLANT MODIFICATIONS THE PLANT WILL FUNCTION SAFELY IN THE EVENT OF ALL POTENTIAL SAFETY RELIEF VALVE DISCHARGES AND LOCA'S

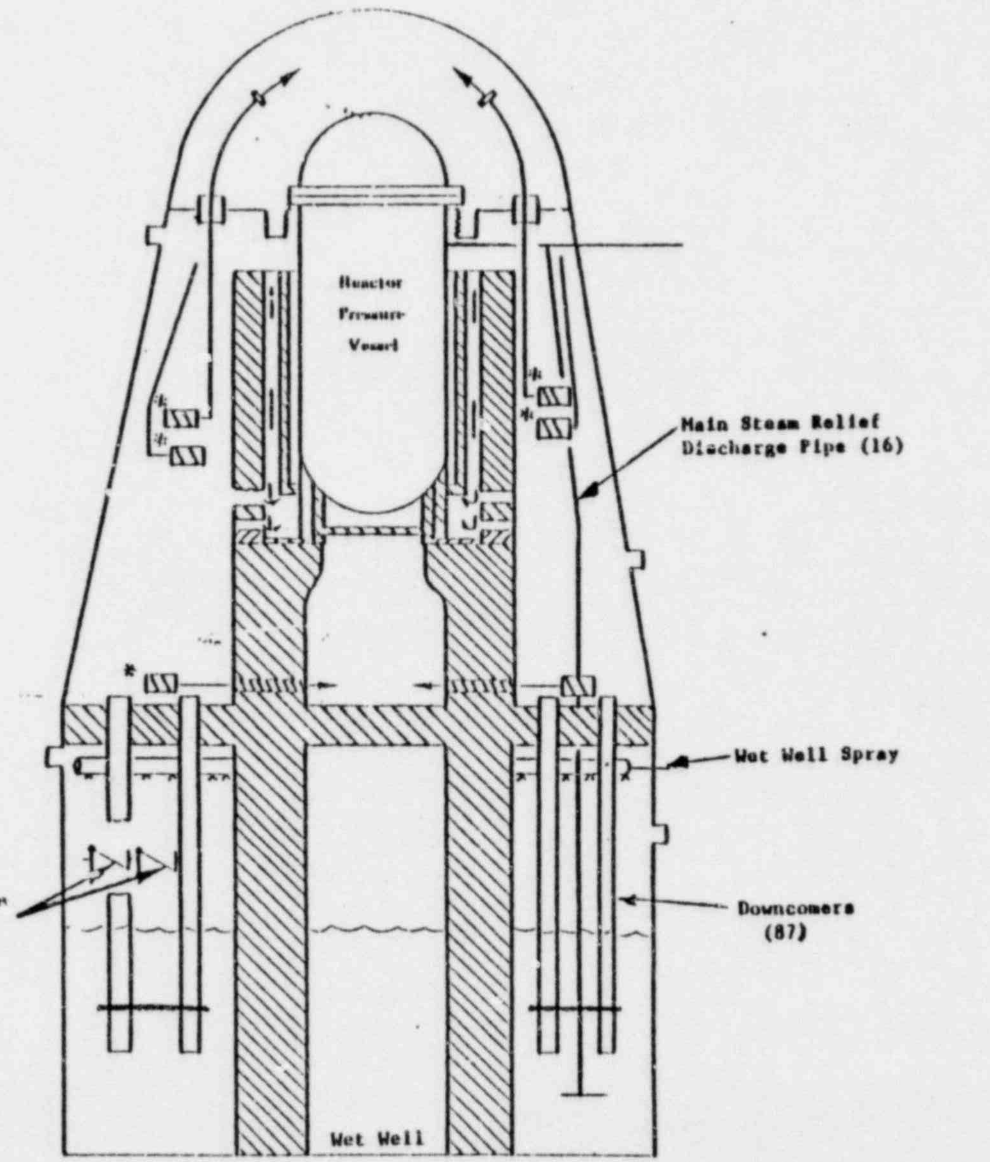
HYDROGEN

CONTROL

HYDROGEN SOURCES

- METAL - WATER REACTION
- RADIOLYTIC DECOMPOSITION OF WATER
- CORROSION OF ALUMINUM AND ZINC
- RELEASE OF FREE HYDROGEN IN COOLANT

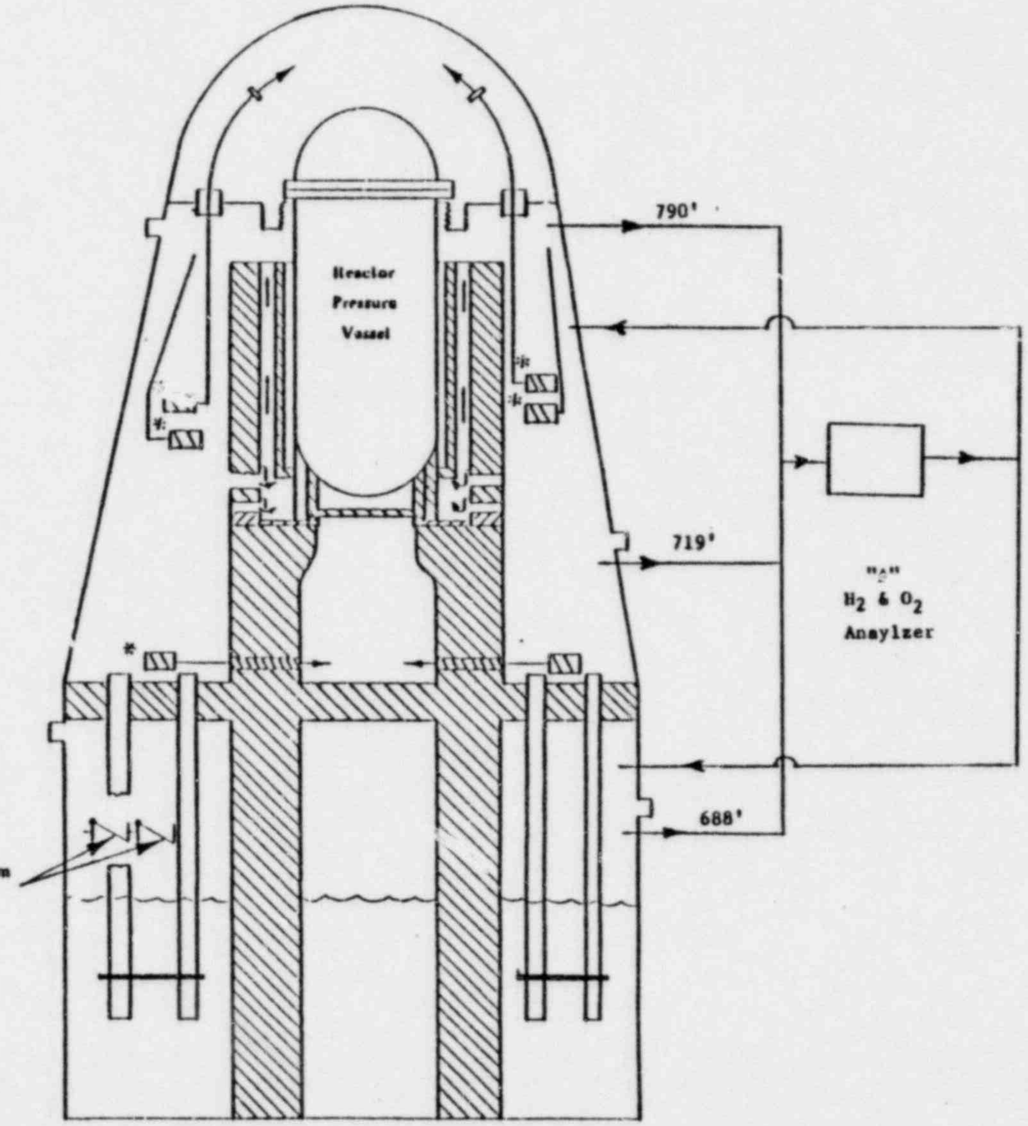
HYDROGEN MIXING



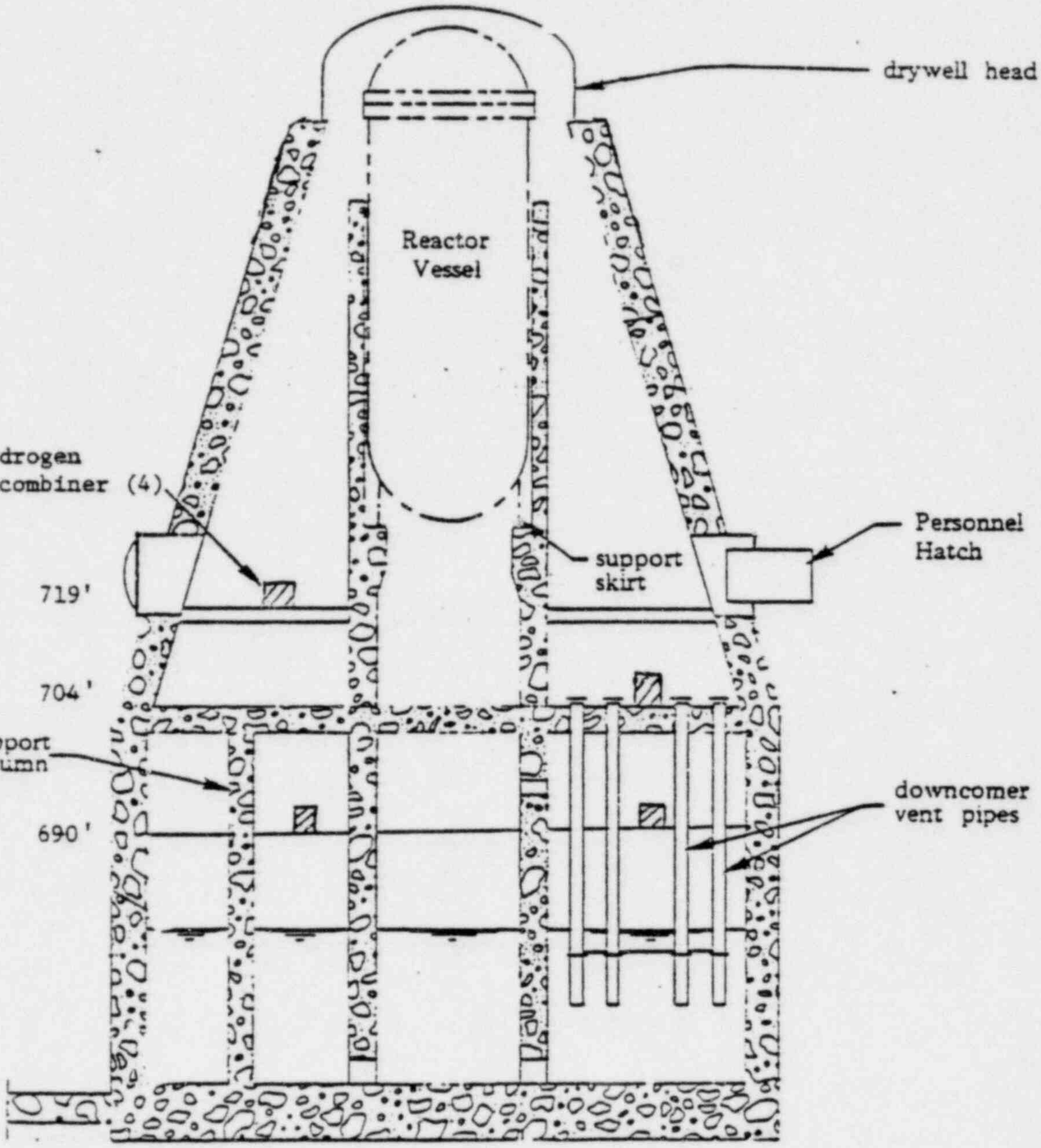
* [\\\] Drywell Unit Cooler (Safety Related)

HYDROGEN MONITORING SYSTEM

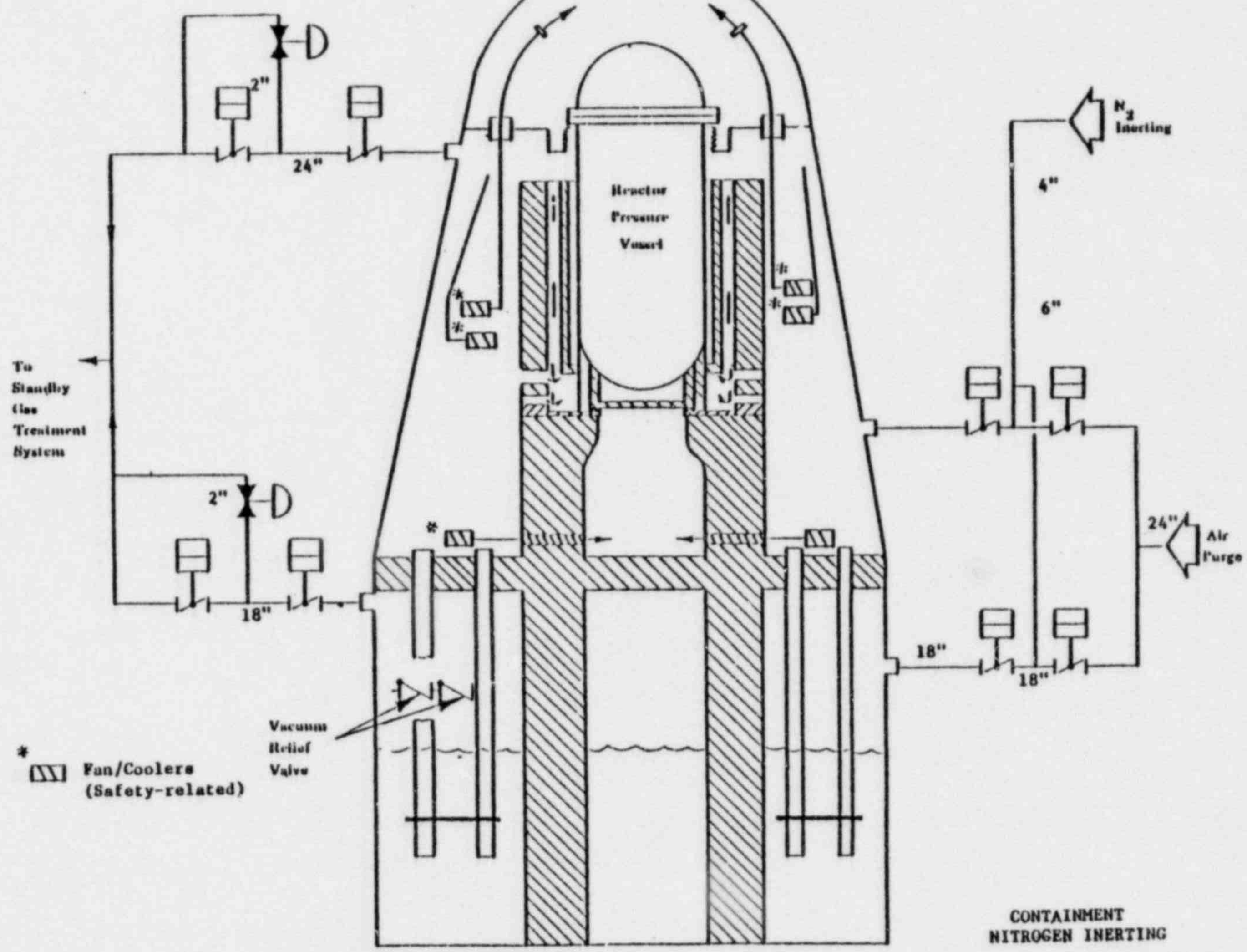
"B"
H_2 & O_2
Anaylzer
(Typical to "A")



* [hatched box] Cooler/Fans
(Safety Related)



HYDROGEN RECOMBINER



CONTAINMENT
NITROGEN INERTING