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301ST GENERAL MEETING

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

301ST GENERAL MEETING

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

Friday, May 10, 1985

The general meeting of the ACRS convened at 8:30 a.m., David A. Ward, chairman, presiding.

ACRS MEMBERS PRESENT:

DAVID A. WARD
JESSE C. EBERSOLE
ROBERT C. AXTMANN
MAX W. CARBON
WILLIAM KERR
HAROLD W. LEWIS
CARSON MARK
CARLYLE MICHELSON
DADE W. MOELLER
DAVID OKRENT
GLENN A. REED
FORREST J. REMICK
PAUL G. SHEWMON
CHESTER P. SIESS
CHARLES J. WYLIE

PUBLIC NOTICE BY THE

UNITED STATES NUCLEAR REGULATORY COMMISSIONERS'

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

FRIDAY, MAY 10, 1985

The contents of this stenographic transcript of the proceedings of the United States Nuclear Regulatory Commission's Advisory Committee on Reactor Safeguards (ACRS), as reported herein, is an uncorrected record of the discussions recorded at the meeting held on the above date.

No member of the ACRS Staff and no participant at this meeting accepts any responsibility for errors or inaccuracies of statement or data contained in this transcript.

P R O C E E D I N G S

MR. WARD: The meeting will now come to order. This is the second day of the 301st meeting of the Advisory Committee on Reactor Safeguards.

During today's meeting the committee will hear about and discuss the consideration of extreme environmental events in emergency planning, prepare for and meet with the NRC Commissioners, hear about and discuss the resolution of certain issues relating to the Palo Verde Nuclear Generating Station, hear about and discuss scram system reliability, discuss the format and content of the ACRS report to the NRC regarding the proposed safety research budget, discuss the National Academy of Sciences study of human factors research program, discuss the future schedule of ACRS activities, hear about recent experiences at operating nuclear power plants and discuss the prioritization of a new group of generic safety issues.

The schedule for Saturday is posted on the bulletin board outside this meeting room. The meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act and the Government in the Sunshine Act.

Mr. John McKinley is the designated federal official for this portion of the meeting. A transcript of portions of the meeting is being kept, and I request that

each speaker use one of the microphones to identify herself or himself and speak with sufficient volume, so that he or she can be readily heard.

We have received no written statements nor requests to make oral statements from members of the public regarding today's sessions.

Before we go on with the agenda, there are a couple brief items. First, I'd like to welcome Dr. Jack Perry to the ACRS staff. He is a fellow, I guess a senior fellow -- Mark, is that the same as the Sidney Perry whose biography we have here?

MR. PERRY: Yes, it is, sir.

MR. WARD: One and the same. I think many of you have had an opportunity to meet him. He is sitting over here. Welcome, Jack.

Second, there is a revised schedule for the interviews of the panel today, and I call your attention to that.

Third, Dave Okrent had something.

DR. OKRENT: Three short questions.

Do we have a handout on Item 11, I guess it is, on the National Academy study?

MR. FRALEY: No, I don't have anything.

MR. WARD: There is one. Where is it? It's not in the book, but there is one prepared.

DR. OKRENT: Is it on the table?

MR. FRALEY: I'll check with the project manager.

DR. OKRENT: A second question. Now that the Commission has taken action on Indian Point 2 and 3 and the Committee never itself expressed an opinion, are individula members, therefore, free to express their own opinions on this subject?

MR. WARD: Well, let's see.

Mr. Fraley, did you hear that? A new procedure is being tested and about to be used.

DR. SIESS: Why don't we discuss that when we discuss that?

MR. WARD: I think that would be a good idea. We are going to talk about that tomorrow.

DR. OKRENT: I won't be here, but would you have this as a specific part of your discussion? The question is as follows:

The full Committee never took any action, never provided the Commission with any advice concerning the ASLD hearing on Indian Point 2 and 3 and the things related to this, on which they have just now taken a position.

Therefore, are individual members free to provide advice as individuals, not as ACRS members, if they so wish?

DR. AXTMANN: Was there an Indian Point Subcommittee?

DR. OKRENT: There was an Indian Point Subcommittee that had one or two subcommittee meetings on it, but the committee did not.

DR. SIESS: The committee heard from them.

DR. OKRENT: The committee heard about it though.

DR. SIESS: It wasn't just that the subcommittee had to have the opportunity.

MR. FRALEY: I will check the record. I would think -- my off-the-cuff reaction is, yes, that the members are now free to comment as they see fit, but I would like to check that before I stand behind it.

MR. WARD: He's got to run that through his logic diagram.

DR. OKRENT: One last question. I happen to have received a copy of a memorandum with respect to Mr. Johnson, dated May 3. Did everybody on the committee get this? Basdekas to Johnson, PGS Review of H. P. Robinson 2, RRG meeting of April 18, 1985.

Will somebody take this and make copies for the full committee for next month's meeting and see whether there is something in here we want to ask about. Please get me a copy back.

DR. SIESS: Dave, on the Indian Point thing, did the Commission specifically decide not to do anything or just didn't do anything by default?

DR. OKRENT: I can only give you an opinion, by default.

MR. FRALEY: I would guess it would be by default.

DR. OKRENT: I know of no intent of the committee to do with it, and I must say --

DR. SIESS: The chairman of the subcommittee can bring it up.

MR. WARD: Who is chairman of Indian Point?

DR. KERR: I am.

DR. SHEWMON: Would you care to comment on whether it was by design or neglect or whatever the words were? Benign neglect, of course.

DR. KERR: We asked informally, the Chairman of the Commission, if he wanted comments from us, and the answer we got was that it might be helpful not to have any additional comments. We did look at a number of questions that were raised during the consideration of that point and did not comment specifically.

MR. WARD: We will discuss it further later.

Bob?

DR. AXTMAN: Was my notebook all filled with this Tab 6.1, Civilian Radioactive Waste Management?

MR. MERRILL: I can answer that. Nothing was put in the notebook. We prepared a handbook just yesterday in

response to Mr. Fraley, so they could provide material to the Commissioners, and that same material was provided to you. So I have got a handout here. As soon as we finish the emergency preparedness, I will hand this out.

MR. WARD: Anything else?

(No response.)

MR. WARD: Let's go ahead with Agenda Item 5.1.

Dr. Moeller.

DR. MOELLER: Thank you. I think I will move along rapidly, so that we can give our NRC Staff members as much time as possible to summarize this situation for you and also to answer your questions.

Let me just point out a couple of things. The main item that I plan to use in my discussion is this Handout No. 2 for Agenda Item 5.1. It is a loose pink sheet, and it is Agenday Item 5.1 and Handout No. 2, "Emergency Planning for Diablo Canyon and San Onofre Reviews."

Let me point out that in March of 1981, the Committee wrote a letter to the EDO expressing our interest in having the NRC Staff examine the potential impact of an earthquake on the off-site responses during an accident at a nuclear power plant. And then in December of that same year, the Commission reached its conclusions on the San Onofre Nuclear Generating Station. Those are summarized as

the first page of text in this supplementary handout that I brought to your attention.

So that was issued in December. We had written our letter in March. They concluded that their current regulations do not require consideration of the impacts on emergency planning of earthquakes which cause or occur during accidental radiological release. It is also of interest to note that in December 1980, one year prior to the issuance of the Commission's conclusions, the NRC Staff had written to the utility in charge of San Onofre and had asked them to "evaluate the potential complicating factors which might be caused by earthquakes, which either initiate or follow the initiation of an accident or accidents.

So a year even before the Commission issued its decision that we did not need to consider earthquakes, the Staff had already spoke with the utility and asked them to respond to specific questions on that subject. And on page 2 of my handout, the utility response is given for San Onofre. Their review reached the following conclusions:

One, they identified areas where potential problems may arise that would disrupt primary transportation routes, bridge structural failures or unstable bluffs. They identified alternate routes which bypassed the potential problem areas, and they assessed the impact of potential transportation route disruption on evacuation time

estimates. Then somewhere along in this whole process, PG&E for Diaglo Canyon, arranged with the Terra Corporation to issue a several-volume report on earthquake emergency planning at Diablo Canyon. They looked at the impact of an earthquake on evacuation times, and so forth. As far as I can tell, they did this on their own. I don't know of any formal request from the NRC Staff for such a study.

So let me give that as background.

If you will go on to page 3 of my salary report, I have already mentioned a letter to the EDO.

Another item I want to mention, which is number to on that page, was that at our request, inquiries were directed to at least six foreign countries asking what do they do or how do they treat earthquakes, in terms of emergency planning. These were Japan, the Federal Republic of Germany, South Korea, France, Sweden and Italy.

We were particularly, of course, interested in Japan, because of the potential for earthquakes there, and I have several of those reports.

We have heard from most of the country, and they are all pretty standard.

This one is from Taiwan. I guess maybe it is not even listed, but they say, "The coincident occurrence of an earthquake with nuclear emergency planning has not been considered in nuclear emergency planning."

As I say, that's essentially the response we've received from essentially all of the countries.

DR. OKRENT: Is that what Japan said?

DR. MOELLER: Have those been passed out, the foreign country responses?

DR. SIESS: It is in the handout, starting with page 31 in the meeting handbook.

DR. SHEWMON: What color is that?

MR. MERRILL: It is in the meeting notebook. It is white. Japanis on page 43.

DR. MOELLER: Could you read to us what it says?

MR. MERRILL: "In Japan, local governments offsite emergency plans, as well as applicants onsite must best be able to cope with any event, for example, fire, earthquake, nuclear accident, and so on. The earthquake will not have any special consideration in the plans."

DR. SIESS: There is also a letter from Japan, page 7 of the yellow.

MR. MERRILL: Yes, that is another.

DR. MOELLER: Now in the Commission's decisions on San Onofre and Diablo Canyon, there were dissenting opinions among the Commissioners. For example, John Ahearne dissented from the San Onofre decision and Commissioner Asselstine dissented from the Diablo Canyon. There were other additional comments in each case, as I recall. I

think the important points for the Committee to consider shown on page 3 of my summary, is what is meant by the word "consider."

I think the NRC obviously looks at the word in terms of how the lawyers would define it. To me, personally, as an engineer, I look upon consideration in a different light. It doesn't mean going out and rebuilding every bridge, but I consider it to mean assessing the impact upon emergency planning, should that bridge fail.

DR. SHEWMON: Dade, the thought is not that the soundness of the bridges would anybody keep the reactor safe, but what would happen if you have to evacuate people.

DR. MOELLER: Correct. And I think another item that we need to clearly keep in mind is the difference in frequently occurring natural phenomena and infrequently occurring. Most people classify floods, snowstorms, fog, as frequently occurring. In the remarks which I will get to in a moment from the public on the proposed rule, many people put earthquakes and tornadoes in a category as infrequent. I also think you might look upon naturally occurring events, in terms of those that are predicted, or you know they are coming, like a hurricane.

Of course, you have warning and a flood, you supposedly would have warning. You might not as much for a tornado. I don't know.

DR. SIESS: Ten minutes.

DR. MOELLER: Okay. Ten minutes for a tornado. Now please turn to page 4, and on pages 4 through the remainder of the report through page 7, I summarize the public comments which were rather voluminous, because I thought it might be helpful to us.

GA technologies said the situation is complex. If we press emergency planning too far, it can become a device by which applicants, licensees, local governmental agencies and commissions can harass one another, and to exclude earthquakes might imply that all other natural phenomena must be considered, and there may be other exceptions. PG&E did something, at least interesting to me. They looked at the frequency of an OBE, and the said 3 times 10 to minus 6 per year. So the frequency per week will have been sometimes 10 to the minus 5, according to them.

And the reason they chose the frequency or probability per week was, they figured that in order for the earthquake to have any significant impact upon emergency planning, concurrent with an accident at the plant, that the earthquake would have to occur within one week of the nuclear power plant accident.

Well, then, if you multiply the 7 times 10 to the minus 5 for the probability of the earthquake occurring within the one-week time span, with the 10 to the minus 5th

per year that they used as the probability for a serious core melt accident, you come out with 10 to the minus 9, and they say, therefore, this is so improbable that it need not be considered, if they did the same type of a calculation for the SSE.

DR. SHEWMON: That assumes that the two are completely independent.

DR. MOELLER: Correct. It assumes that the two are independent; right.

DR. SHEWMON: I consider that unlikely.

DR. MOELLER: Then Stanley H. Mendes, Incorporated, stated their second item. Their report made it clear that in the event of an earthquake, related radiological release, early evacuation of the San Luis Obispo area would be extremely difficult.

DOE looked at it, and they wanted tornadoes excluded, as well as earthquakes.

DR. AXTMAN: Excuse me, Dade. Number 3 says "Stanley Mendes." It then talks about the Terra Corporation. Who is Stanley Mendes?

DR. MOELLER: I don't know who Stanley Mendes is.

DR. OKRENT: He is an engineer who lives, I think, somewhere in the vicinity between San Luis Obispo and Santa Barbara, who has participated in one or more subcommittee meetings, in which he objected to certain aspects of what

PG&E was proposing to do with regard to technical factors in the seismic design.

DR. AXTMAN: What is the linkage between Stanley Mendes and the Terra Corporation?

DR. MOELLER: Excuse me. None, as far as I know. PG&E contracted with the Terra Corporation to issue a report on Diablo Canyon, the impact of earthquakes on emergency planning. Stanley Mendes read the report or mentioned the report and then said that the Commission's --

MR. MERRILL: If you look on page 45 of the meeting notebook, under Tab 5, there is the letter from Stanley Mendes. The paragraph which you mentioned.

DR. MOELLER: My fifth group, and we need to get over these in a hurry, if we are going to have time for the Staff. This Coordinating Group on Emergency Preparedness Implementation I had never heard of, but they are a group, apparently, supported by the utilities, and they said, tornadoes, as well as hurricanes, as well as earthquakes, should be ruled out.

The Edison Electric Institute supports the rule not to include the earthquakes.

Then the Union of Concerned Scientists, on pages 6 and 7, issued a quite lengthy report which is in your notebook, and I found it of interest, because they cite in their items, which I call Item 7(c)(d)(f), et cetera, much

the same philosophy that I believe the Committee has used for earthquakes in the past, pointing out that an earthquake can have impacts on many aspects of the plant and emergency planning. It is not just like rain or flood or snow or fog. They point out, it can effect transportation as well as communications. It can effect the houses in which you are hoping to seek shelter. It could destroy your ability to monitor the radiation releases, destroy your ability to monitor meterological conditions, and so forth.

So I think with that, I will cease, unless there are burning questions.

I would like to call upon the NRC Staff. We have two people here, Mike Jamgochian, seated at the table in the brown coat, who is with the Research Division of Risk Analysis and Operations. He will brief us on the present status of the proposed rule change.

Then we also have William H. Briggs, Jr., Solicitor of the Office of General Counsel, who will discuss the legal aspects, particularly the litigation regarding Diablo Canyon.

DR. OKRENT: Are there any DPOs on this model among the Staff?

DR. MOELLER: Go ahead, Mike.

MR. JAMGOCHIAN: To date I haven't seen any formal differing special opinions.

DR. OKRENT: Are there any informal ones?

MR. JAMGOCHIAN: We argue constantly.

DR. MOELLER: I might comment. As a subcommittee, we've seen the pendulum swing back and forth so there are arguing, as Mike says, and they're trying to honestly formulate a good position.

MR. MICHELSON: Dade, over with the people who worry about LOCAs, it's my recollection that you do not postulate the concurrent LOCA and earthquake; is that your understanding?

DR. MOELLER: No. We, perhaps, consider it that the commission paper, as I understand it, essentially ruled it out. If the earthquake causes the LOCA because they said the probability was low.

MR. MICHELSON: I think you're agreeing with me then that you do not postulate concurrent earthquakes and LOCA.

DR. MOELLER: For what?

MR. MICHELSON: For the design of piping and system responses and that sort of thing.

DR. SIESS: We do postulate simultaneous LOCA and earthquake now. There is a proposal coming out of the piping review committee that we do not postulate simultaneous LOCA and earthquake but the present regulations require both.

MR. MICHELSON: They require both for design purposes but in analyzing system response I think you do not face a system response to a LOCA in the face of the earth also shaking or having just finished shaking.

DR. SIESS: Anything outside category 1, Carl?

MR. MICHELSON: Oh, yes, the calculation.

DR. SIESS: Anything that's not seismic category 1 is assumed to be non-insistent.

MR. MICHELSON: Not when you do a system response, you crack all the tanks and dump all the water in the plant and so forth; you're out of business.

DR. SIESS: A seismic category tank category 1 is not assumed to be cracked and a non-seismic category 1 tank presumably is.

MR. MICHELSON: You remember when they did back and they did plate break analysis and component failure analysis. They assumed one failure at a time and it showed the plant could safely shut down. When they went back and took all these failures simultaneously, they found the plants couldn't shut down, therefore, they ruled out that

possibility. Maybe the Staff could clarify.

MR. EBERSOLE: I dug in this for so many years I hate to think of it. What has been done is there has been an arbitrary combination of the concept of LOCA and an earthquake without the LOCA being caused in any way by the earthquake, per se. Because if you do that then you're automatically trapped into the realization that you're causing the best pipes in the plant to break whereas the worst pipes in the plant will probably break, like service water or otherwise, and you're trapped because of the multiple challenge to the concept of redundant systems.

So it's been an arbitrary combination with no causative relationship. That's they way I've always understood it.

MR. MICHELSON: Jesse, are you agreeing or disagreeing with me then?

MR. EBERSOLE: I'm saying it's just a funny configuration. One of the traps you get into if you do postulate a LOCA and an earthquake with these old plants, is you have a LOCA, remember that the main coolant pumps and their circuit breakers are tripped by DC systems which are non-1A. You have electrical faults in the containment which are not tripped and you proceed to fault conditions and inevitably the penetrations are the lowest fuse link in the circuit and you blow big holes in the side of the

containment.

MR. MICHELSON: It's just not possible to cope with an earthquake if you start postulating that it will cause damage beyond one component. That was the way the analysis was finally done; I think with most utilities one at a time but not multiple components.

MR. EBERSOLE: So they had to be arbitrary.

MR. MICHELSON: So you don't end up with LOCAs and earthquakes together when you do that analysis although for this analysis apparently you are ending up with earthquakes and LOCAs together. I'm just trying to figure out the rationale on the part of the Staff as to why you do it one way one time and a different way a different time.

DR. SHEWMON: Because we don't rupture all of them doesn't mean we don't rupture none of them.

MR. MICHELSON: But you rupture one.

DR. SHEWMON: That's a LOCA; isn't it?

MR. MICHELSON: I'm trying to determine here now whether or not you do postulate a combined LOCA and earthquake.

DR. SHEWMON: It may not postulate all of the pipes breaking but why do you make the statement that there's no LOCA if one pipe is broken.

MR. EBERSOLE: You can't even postulate one. Let me take a service water pipe.

DR. SHEWMON: Let's stay with this. The LOCA is usually a primary system pipe; they do postulate.

MR. MICHELSON: When the pipe break analysis outside of containment was done for non-safety related equipment, it was done one at a time on the assumption nothing else happened in the plant and they found they could safely shut down. If you take that and combine it with a LOCA at the same time, for instance, there are cases where you can't shut down and they said, okay, we won't have combined earthquakes causing these kinds of breaks and LOCAs.

DR. SHEWMON: The analysis has been done with an earthquake providing there's a LOCA and the LOCA is one pipe broken. Have you said anything that says that isn't true?

MR. MICHELSON: Yes. What I'm saying is that that analysis ignores entirely the non-safety related equipment.

DR. SHEWMON: That's quite possible but there is a LOCA and it's combined with the earthquake.

MR. WARD: Just a minute. Is anyone convinced this is immediately germane to the topic of the agenda?

MR. MICHELSON: Just trying to establish the assumptions here. I'd like to know if the Staff agrees that it is credible, that the design for combined earthquake and LOCA concurrently.

DR. MOELLER: I'm not sure we have the proper Staff here.

Why don't we go ahead with Mike and Mr. Briggs?

MR. JAMGOCHIAN: Thank you, gentlemen. Good morning.

My name is Mike Jamgochian. Since my time is up, I'll take any questions.

(Laughter.)

MR. JAMGOCHIAN: Dade, you did a very good job on your comment analysis and therefore I really don't need half of my presentation so I'm really on time.

My name is Mike Jamgochian. I'm from the Office of Research. I was requested this morning to make a presentation relative to the public comments that we received from a proposed rule on earthquake considerations and emergency preparedness.

A proposed rule was voted on in December by the commission and published in the Federal Register late in December of 1984. It was given a 30-day comment period. After approximately 28 days a significant number of public commenters requested an extension to that comment period. The commission granted another 30-day comment period. The second comment period closed approximately February 22, 1985. The Staff is now presently evaluating those comments and preparing to formulate the Staff recommendation for a

final rule change.

I will be talking from a handout that was given out this morning.

The second page, I'd like to review the rationale that was used in the proposed rule. I made the presentation to this committee prior to publication of the proposal so much of this may be redundant.

The first element for the rationale used in the Federal Register was that the plans are flexible documents. They are not rigid. They concern themselves with capabilities of organizations; capabilities of transportation of movement of people; capabilities as it relates to training; as it relates to assessment, capabilities, notification capabilities.

The second point was that the low probability of earthquakes and coincident releases.

Third, that FEMA has an active program of earthquake preparedness.

The third slide of the third page of the handout. The focus of the proposed rule and I quote, "Was that neither emergency response plans nor evacuation time analysis need consider the impacts of earthquakes." Now I think and on Monday morning quarterbacking, I think if we worded that proposed rule a little bit different we would have received a little bit better input from the public.

The way this is worded, many of the newspapers, especially in California and many members of the public, perceive that we're simply voting earthquakes. We're outlawing earthquakes.

I think if we did our homework a little bit better and we said no additional emergency planning need be conducted for earthquakes and focused on the fact that earthquakes, to an extent, are considered an emergency response capability rather than saying no consideration for earthquakes will be given, the comments -- I've been evaluating comments a number of years in emergency planning. I've never received comments from the public, from the public sector that is, that focused on emotional type of comments where we should be ashamed of ourselves as an agency. There was public outcry; how dare we not consider earthquakes.

Again, a newspaper, I think a lot of it was generated as the result of a newspaper that had a headline, "NRC to void earthquakes" in California, no less. So the public was astounded that we were taking this position.

Again, if we did a little bit of forethought in wording the regulation a little bit differently, we will have accomplished the same that would have gotten the public to understand a little bit better where we were coming from.

DR. SIESS: To what extent is this NRC rule binding on FEMA?

MR. JAMGOCHIAN: FEMA concur to the proposed rules, sir.

DR. SIESS: That means that doesn't FEMA have the responsibility for reviewing offsite plans?

MR. JAMGOCHIAN: Yes, sir.

DR. SIESS: Why don't they write a rule? Don't they write rules?

MR. JAMGOCHIAN: Their rules are quite different than ours. Their rules basically how they're going to do business; our rules regulate the nuclear power plant. Our rules establish the need to have offsite preparedness. Our rules offset the formula that says we'll evaluate onsite preparedness. They'll evaluate offsite preparedness and the bottom line is we make a finding on determination that it is adequate preparedness.

DR. SIESS: In this rule, aren't you telling them how to evaluate offsite?

MR. JAMGOCHIAN: Appendix E on 50-47 does that, sir.

DR. SIESS: And they simply accept your criteria for offsite even though they have the responsibility?

MR. JAMGOCHIAN: The criteria were developed jointly by NRC and FEMA.

DR. SIESS: They don't promulgate the criteria, you do.

MR. JAMGOCHIAN: That's right, it's promulgated in our regulation. There, I think it's 44 CRF 350 that lays out how they will evaluate state plans.

DR. SIESS: This is one of the few times I wish I was a lawyer; I don't understand that.

MR. JAMGOCHIAN: Do you really wish that?

(Laughter.)

DR. SIESS: I just don't feel very good.

DR. MARK: The moment has passed.

(Laughter.)

MR. JAMGOCHIAN: The next page, we received to date approximately 60 comment letters, 25 favoring the rulemaking. These are typically from utilities, consulting firms representing utilities, I think two citizens and the Department of Energy. There were 36 letters against the rulemaking. Some were from environmental groups; many were from private citizens.

A few of these letters were a signed petition form where it was printed on top and approximately 20 signatures below but each page was considered as a letter.

When these slides were drafted we had only known about three foreign countries, France, Japan, and Sweden, and as Owen had mentioned he'd received input from

additional foreign countries. I found it interesting that Japan had said they do not consider that.

Now, I gave this presentation two days ago to the management at FEMA and I had brought this same point up and FEMA, as well as Mr. Ed Jordan from our Office of Inspection and Enforcement, noted that Japan does not focus much attention on emergency preparedness at all. They focus more on the desing of the plant. That's primarily, again, I've been told they have such huge densities of population that their focus is more on the machine itself and not on evacuation or emergency planning. So possibly that might explain their concentration on earthquake considerations and emergency preparedness.

Now, as far as where the Staff is going, the Staff anticipates on providing for commission consideration a three-alternative commission paper with a Staff recommendation. The three alternatives will be, one, to promulgate proposed rule into a final rule. If we do that, we will reword the regulation so that it better reflects what the Staff and commission had meant earlier. And I perceive that the wording would be that no additional emergency planning or preparedness would be necessary.

The second alternative is leaving the issue open for adjudication on a case-by-case basis.

And the third, to require limited consideration

of earthquakes and emergency preparedness.

The last alternative -- and it was interesting when you had mentioned is there any professional dissenting opinion. We argue this on a daily basis as to what is the proper alternative; what is the reasonable alternative, how it should be worded. The writing of this is going to have to be very delicate and very carefully thought out.

I hate to say it. A little bit more time has to be spent on it than on the proposed rule. We didn't do that good of a job on the proposed rule so the last alternative, the Staff is saying, now, how could we do that? The perception is -- and, again, I'm not saying this is going to be the Staff recommendation -- today I cannot honestly say what the Staff recommendation would be of those three. I haven't the slightest.

But focusing on the last, if we could envelope the types of considerations that might be given and therefore limit what is disputed, what does the utility have to look at; what do the offsite planning people, the decision-makers, have to look at and not simply say, yes. There's got to be a medium between "do not consider earthquakes" or "do consider complicating effects of earthquakes."

So I believe the third one is the middle-ground and if we limit the considerations to what the Staff had

proposed approximately 6 years ago in the San Onofre Staff opinion, where they were concerned about the safety of the machine, the capability of getting people back into the plant for continued operation or continued monitoring, the capability to continue communications between plant Staff and people that are offsite; fundamental capabilities. The Staff is looking in that direction as an alternative.

Another approach which FEMA management had suggested is looking at requiring that the nuclear power plants be included in the state earthquake plan rather than the nuclear power plant including the earthquake in its plan. States that are in high seismic areas, let's say California, have earthquake preparedness today.

In 1980, when we developed the emergency planning regulation, the huge rewrite of the emergency planning regulation, it said in the Statement of Consideration, "that nuclear power emergency planning and preparedness should be factored into the normal emergency planning of the state. It shouldn't be a separate entity." It is today factored into all kinds of emergency planning. So why not include the nuclear power plant.

Now, the gentleman from FEMA had said in most states emergency plans for earthquakes they had what is known as a critical facility. Now, why not include the nuclear power plant as it certainly is a critical facility

and therefore consider that as a chemical plant or a steel plant; that kind of approach.

Now, I've contacted FEMA. What I've got to determine is what is done in this state plan? Can the bottom line be met? Can a finding be made at the very end by NRC that there's reasonable assurance that protective measures can and will be taken for the health and safety of the public. That's our bottom line.

Now, we know if they meet our criteria in 50-47 and appendix E, yes, we can make that finding. Whether or not there's that adequate protection within this state earthquake plan and whether or not that's then litigable. In fact, I had mentioned it to the lawyer as you gentlemen wer debating and he said, yes, that still would be litigable. So, again, this is an alternative approach and we're looking at anything. So if you gentlemen can come up with some good ideas for me I'd certainly appreciate it.

DR. MARK: There have been previous discussions here some of which I've merely heard about. That word considers a real slippery trap. Whatever you say you've got to either avoid it or make it very clear what it means. You can say you consider it if you looked and flagged a few places where landslides might occur but you haven't taken the hill down. You've considered it but as you said, it has to be carefully worded and one thing, nothing important should hang upon various people's reading of the word "consider."

MR. JAMGOCHIAN: Definitely. In fact, again, looking back at the words that I quoted from the rule, from the proposed rule, we should have said "assess" the impact rather than consideration, okay. If you assess the impact and say, yes, those bridges will go down and we'll use an alternative route for evacuation.

DR. MARK: You know which bridges are likely to go down?

MR. JAMGOCHIAN: You've assessed it.

DR. MARK: But you shouldn't go down to show up the bridge.

MR. JAMGOCHIAN: Exactly. So the word "consideration" is inappropriate.

DR. MARK: It's dangerous.

MR. JAMGOCHIAN: Most definitely. It's caused a

great deal of problems. The proper terminology should be "assessing" the impact of the natural phenomena and that's good. In fact, that should be done for a decision-maker.

DR. AXTMANN: Still talking about number 3 on the Staff approach?

MR. JAMGOCHIAN: Yes, sir.

DR. AXTMANN: Limited in consideration.

MR. JAMGOCHIAN: Right. How limited and how are you going to word that? How are you going to envelope the word "consideration." You know, there's no limit to that so what we want to do is use the wording, what I'm perceiving anyway, is assessing the impact of the natural phenomena.

The next page, problems identified by commenters. Most of the utilities, in fact, all of the commenters, for the regulation, for the proposed rule. Again, this rulemaking was quite different. Usually that of a publish proposed rule on emergency preparedness and we lay out three or four rationale elements to shore up our reasoning for the proposed rule, the utilities, law firms, and consulting firms for the utilities, usually say, yes, we agree with you and here's a few more reasons to help you out. They're very helpful.

Likewise, the Intervenors or the public usually say, well, we think you're wrong and here's why. And they help me out too because then I realize where my deficiencies

were in my proposed rule. This time was very different. The utilities, the consulting firms said, yes, we agree with you; you're doing a good job. Very, very few of them gave me additional rationale to show up the position laid out in the proposed rule.

On the opposite side, the Union of Concerned Scientists did a very thorough job in their comment letter and if people want to focus on the comment letter that was one job that really lays out some of the weaknesses. Now, many of the arguments they lay out, they've misquoted or they took things out of context. But there are some legitimate weaknesses in our approach.

Now, that's basically why I've listed problems identified by commenters and these were both basically taken from the Union of Concerned Scientists letter.

Yes, sir?

DR. OKRENT: I'm interested in the Staff's position on the question. Is the seismic risk possibly significant; is the seismic risk possibly of the same order of magnitude as other sources of risk from nuclear power plants. And if it is, and if you feel it's appropriate to have emergency preparedness for these other sources, is there some rationale that says you need not have emergency preparedness for this source, for seismic.

MR. JAMGOCHIAN: If you'd stayed with the slide

it would have been much easier. Basically, in emergency preparedness you focus not on one individual accident or the worst accident. You focus on a spectrum of accidents.

Likewise, as far as natural phenomena, you should not focus on, let's say, a super SSE or an absolutely devastating earthquake because then your focus is maneuvered to a point where you are shoring up bridges; you are building super-strong roads; you have to concern yourself with entire spectrum.

Now the Staff perception is, yes, the seismic risk is significant. Nonetheless, the probability of a seismic event that is large enough to cause an accident at the nuclear power plant is significantly low. Likewise, the probability of a smaller seismic event and a coincident event at the plant is very, very low.

DR. OKRENT: Can I interrupt you for a moment? You said the probability of the seismic event which causes an accident at the plant is significantly low. I think those were your words.

MR. JAMGOCHIAN: Close enough.

DR. OKRENT: How does that compare with the probability per year of an accident which causes significant releases arising from a non-seismic event.

MR. JAMGOCHIAN: I don't know. The probability of earthquakes -- I've spoken to a number of experts. The

probability of an SSE is enormously different depending on the expert you talk to. I could not get a reasonable number.

DR. OKRENT: I'm not sure to whom you spoke.

DR. MARK: He must have talked to two people.

DR. OKRENT: But if you were to talk to the people who are familiar with the existing risk analyses, they can tell you at least what was found in those that analyzed seismic events. And I think you would find that some of the time important releases due to seismic events were of the same order of magnitude as important releases due to other cases. Sometimes they were larger in frequency; sometimes they were smaller in frequency.

So it varies from plant to plant but I think they would not say that significant releases when induced by seismic events are always a couple of orders of magnitude less frequent than significant releases caused by non-seismic event.

What I'm getting at is when I read the discussion that gives some of the supposed logic for whatever position it was that the commissioner's took, they seemed to have gone up to the SSE and stopped. And then other people have turned in combinations of probabilities where you have an earthquake which is a random event combined with an accident not due to an earthquake which is some other random event

and they get these ten numbers which I think are a discredit to whoever turned them in.

It's a logical discredit; it obfiscates the issue. In fact, they're abusing PRA when they turn that kind of result in.

I don't really have a problem with your third alternative. I think, in fact, there is something that can be worked out in that area; that's my own opinion. But I think a logic that says you only go up to the SSE in large earthquakes, it's so infrequent we don't have to worry about it. Or a logic that says we combine the random earthquake with the random accident to get a probability. This just won't hold water.

And that's the trouble in my opinion with the first alternatives because it seems to be built one or another or both of those premises.

MR. JAMGOCHIAN: It is.

DR. OKRENT: I would hope that you would find something that says something similar to what I seem to see being done in Los Angeles, that writing scenarios about what would happen due to earthquakes. They're saying certain reservoirs may fail; certain gas lines may fail, et cetera, et cetera. And then they try to lay out, given this, what kind of actions one might have to take. They are not emptying the reservoirs. They're not removing all the pipe

lines, et cetera, et cetera, which is not unlike what you said about assessing the impact.

But the people who are going to have to act given the event are supposedly have in hand a reasonable package of information as to what could occur due to the earthquake and in this case what could occur that related to a situation with the reactor.

Then coupling that with sustained communication by radio or like this, it would seem to me is a reasonable approach. I don't know what the lawyers would say. I would hope you could do it in a way that's not litigable, that it would be more logical than alternative 1.

DR. KERR: I don't necessarily disagree with anything you said, Dave, but if one looks for example at design, it is true that there the earthquake risk is a significant contributor, I think, isn't it.

DR. OKRENT: It's not negligible.

DR. KERR: Would one use the same logic to say that therefore in the design region on should in emergency planning look or whatever the appropriate word is.

DR. OKRENT: I guess I would take this as sort of a guiding rule if I was trying to find one. It seems to me even now in their emergency planning, they have some frequency of event that they say is sufficiently infrequent that we won't plan explicitely for it. The events that

they are planning for are of a higher frequency. I would take earthquakes in that context if there are sections of a country where you really expect to have to get to a rather low frequency of earthquake itself later on the accident in order to have a combination of both a serious event at the reactor and disruption to ability to evacuate.

DR. KERR: I misunderstood. I thought your criterion was going to be whether it was a significant risk contributor and if it was a significant risk contributor.

DR. OKRENT: I think to me that would flag it for thinking about it but then if the total frequency seems low enough that you're not, in general, looking at other things. And, by the way, I don't disagree with the people who say tornadoes shouldn't be explicitely included because in principle the Staff is trying, I think, to design for something of the order of ten to the minus sixth per year, in that vicinity.

So you don't expect a reactor accident with the very high frequency due to the tornado. You should have the coincident event.

DR. MARK: It didn't come through very clearly in anything that I read and I read one or two of the papers that appeared on this. In some parts of the country, the SSE of an earthquake bigger than the SSE is already not very much of an earthquake and would not be expected to shake

various kinds of civil structures. That may be the case anyway. In some cases I believe it is. In California, the SSE is big enough that you have the surrounding damage as well.

DR. OKRENT: You can redict that there will be surrounding damage if it's that big like Diablo Canyon, Avila Beach and so forth are going to be hurt.

DR. MARK: But you do need not to just wave a magic wand about the SSE. One needs also to think of that class of earthquakes which is to be expected because of disruption in the neighborhood. And now while you said combining the random accident and the random earthquake that arithmetic is perfectly good but it's irrelevant to what you should be talking about.

DR. OKRENT: That's my point, it obfiscates the issue.

DR. MARK: It really shouldn't be used to attempt to close an argument on this point. The earthquake that causes damage at the plant will cause disruption in the neighborhood, at least in Diablo Canyon and San Onofre and they deserve to be considered together. And the frequency of that combination is the frequency.

MR. WARD: You know, I don't think this argument that a random earthquake and a random plant event, I don't think that's such a totally specious argument. It closes

one side of the issue.

DR. MARK: But it's not the thing you should use to say, therefore, forget it because it's ten to the minus sixth.

MR. WARD: But we forget that aspect of it.

DR. MARK: We pointed out that it's so small we won't consider it.

DR. SIESS: When you could equally rule out the LOCA causes the earthquake. Of course, I'm not sure I agree with you that a two-tenths G or something in that neighborhood and a seismic zone zero would not cause damage to civil structures.

DR. MARK: It'll take power lines, for instance.

DR. SIESS: It probably won't take transmission towers out but I can think of some bridges and some buildings that would not very well survive. I can think of some hospitals where I'm pretty sure the elevators wouldn't work after a two-tenths G earthquake. We are zone 1 and we had to strengthen some hospitals.

DR. MARK: I really wasn't prepared to take a position.

DR. MOELLER: Do we have time to listen to Briggs for 5 or 10 minutes on the legal side?

MR. WARD: Perhaps we could concentrate the discussion on that and just take until 20 minutes to.

DR. MOELLER: All right. Is that all right?

MR. JAMGOCHIAN: That's great.

Thank you, gentlemen.

MR. BRIGGS: Let me be very brief.

What I'm going to talk about is something a little bit different than what you all have been talking about and what you properly should be talking about. I just want to advise you of the litigation that's ongoing, tell you the status of it, tell you what the issues are in the litigation. If you have any specific questions about the litigation, I'll try to answer them.

At the same time the commission entered their order which began this rulemaking back in August of last year, they also decided that for Diablo Canyon they would not allow adjudication; they would not allow litigation of this particular issue in the context of the ongoing dispute before the licensing board and the appeal board and the commission about whether to license Diablo Canyon. That decision was taken to court.

That decision is legally distinct and apart from the rulemaking. The rulemaking is going on; forget what's going on in the litigation for purposes of arriving at the conclusion you think the rulemaking should arrive at.

But here's what's going on in the litigation for your information not to direct you or guide you so much in

the rulemaking efforts you're now engaged in.

The Court of Appeals heard argument in the case in, I believe, it was late October of last year. Three judges sat as a panel to hear that argument about whether or not earthquakes and emergency planning should be considered as well as a number of the arguments related to the licensing of Diablo Canyon.

December 31 of this past year those three judges voted to allow the license for Diablo Canyon to issue. That vote was unanimous.

Two of the three judges said the Commission was within its authority in deciding not to consider earthquakes and emergency planning at Diablo Canyon and one of the three judges said the commission had exceeded its authority based on the record in that adjudication in making its decision.

That normally in 99.9 percent of the cases would be the end of the matter but the petitioners filed something called a motion to reconsider. That's done routinely in almost every case. It's virtually never granted.

But in this case a couple of weeks ago, maybe less, the full court, which consists of 10 or 11 judges, voted to let the full court reconsider that one issue of whether the record in Diablo Canyon's adjudicatory proceedings supported the commission's decision not to allow litigation over the question of earthquakes in emergency

planning. That issue will now be briefed us again and argued, I assume, again before instead of 3 judges, 10 or 11 judges.

What the court asks for in the way of additional briefing; what the court asks for in the way of additional argument, is something that's very much in their bailiwick and very much up to them. I expect to hear something from the court along those lines probably in the next week or so. Right now all we know is that portion of the December 31 three-judge panel opinion relating to earthquakes in emergency planning has been vacated, that is to say, it is of no force and effect. The entire full court is going to reconsider that issue again.

That all sounds very simple to a lawyer but your heads may be swimming because you may have absolutely no idea what I'm talking about. So please ask me any questions.

DR. MARK: How did you manage to say the full court instead of all en banc?

(Laughter.)

MR. BRIGGS: I could have said en banc but I'm sure more has been as qualified said that other than the full court; but you're quite right.

Yes, sir?

DR. KERR: Is there something in the record that

would have led you to believe at this point that the full court would have decided to reconsider, you said, in almost all cases for reconsideration?

MR. BRIGGS: I think there are a number of things. This is pure speculation on my part. I think, frankly, the unauthorized release of the transcripts where the commission considered this issue and kicked it around back and forth among each other, the very bitter division on the commission, the very strident exchange of letters between various congressman and various commissioners and the commission itself, the complexity of the issue and the interestingness of the issue, the fact that people have gone back and forth, it's a close issue; it's a hard issue for some people. Others it's not a hard issue and they say the commission was right; others it's not a hard issue, they say the commission was wrong.

All these factors, I think, contributed ultimately to a conclusion by the court that, hey, this case is important enough and raises significant enough issues that we all want to take a crack at it. Whether one of those things is more important than the other, your guess is as good as mine.

Does anybody else have any questions about the litigation?

Mike?

MR. JAMGOCHIAN: If I may, how would this rulemaking, if we promulgated a final rule and pick any of those alternatives, how would that be considered by the court?

MR. BRIGGS: Technically as a legal matter it is a separate and distinct legal issue. It would be a separate and distinct case. Obviously, if that rulemaking comes out before the court acts, depending on how it comes out, it may, one, affect the commission's position before court. For example, if the rulemaking came out with option three, the commission might say we are reversing our position and therefore we're going to consider those in some litigation, and that would affect the court.

If it came out with option one they'd say, basically, that you don't have to consider because of all the reasons which you might come up with. That would have some implicit effect on the court's decision, I suspect. But technically it shouldn't matter as a practical matter. Judges are human beings and they would be affected by ongoing, even though technically legally unrelated events, technically related events, factually related events.

DR. MOELLER: Thank you, Mr. Briggs. Thank you, Mr. Jamgochian, Mr. Chairman.

I think that wraps up this item.

MR. WARD: Thank you. We'd better go right on to the next topic.

(Whereupon, at 9:40 a.m., the hearing was adjourned to go on to other business.)

AFTERNOON SESSION

(3:10 p.m.)

(REACTOR OPERATING EXPERIENCE -- ITEM 13.1 - REPORT OF ACRS SUBCOMMITTEE CHAIRMAN REGARDING RECENT REACTOR OPERATING OCCURRENCES AT NUCLEAR POWER PLANTS AND ITEM 13.2 - REPORTS BY REPRESENTATIVES OF NRC STAFF REGARDING RECENT REACTOR OPERATING INCIDENTS AND OPERATING EVENTS AT NUCLEAR POWER PLANTS)

MR. WARD: We will continue with the meeting, Agenda Item No. 13.

MR. MICHELSON: Thank you, Mr. Chairman.

We had a meeting of the ACRS Subcommittee on Reactor Operations on Monday of this week to discuss recent operating occurrences at various nuclear power plants. These discussions were held with staff members from I&E.

Jesse Ebersole is the Subcommittee Chairman, but was unable to attend. So I acted in his place and will take care of trying to give you a report of what happened at that meeting.

Other subcommittee members attending were Charlie Wylie, Glenn Reed and David Ward.

Eleven events were presented for detailed consideration from which the subcommittee selected four for the full committee to hear about today.

The events that were selected include a steam generator sludge buildup problem at Millstone, which is leading the tube degradation, premature criticality at the Virgil Summer plant, which occurred during a startup, pitting corrosion in stainless steel raw water piping at Palo Verde due to biofouling, which is leading to through-wall leakage at several locations, and the final item which we will hear about today is a report on the North Anna 2 diesel generators.

This is a follow-up on material which was presented to us earlier and I am sure you would find of interest.

Now even though we did not select the other items for detailed consideration, I would like to take just a moment to outline the other things that were discussed, but for which we felt that they were of lesser importance.

I think most of the subcommittee is here already, Mr. Chairman, and I am not quite sure whether it is worthwhile going through since most of us have already heard it and the rest of them are not here.

MR. SHEWMON: Do you want me to leave the room?

(Laughter.)

MR. MICHELSON: We have selected one particularly for you. So you don't want to leave.

Now the other items for which we are not going

to report today, but for which you may have some amount of interest, there was a considerable number of observations of HPCI and RCIC system failures which have been occurring, particularly in the last six months.

The situation was highlighted as being particular apparent at Duane Arnold, Hatch 1, Limerick and Peach Bottom 3 in the case of HPCI.

In the case of RCIC it was Grand Gulf, Hatch 1, Hatch 2 and LaSalle 1.

Now the problem seems to be test and maintenance related. We don't have much information beyond that. Studies of this HPCI and RCIC problem have been done in the past. So what I am going to suggest is that the Reliability Assurance Subcommittee put HPCI and RCIC on their agenda for a future item to look into and try to see if we can get some more information and see what work is being done and then report back to the full committee on what the meaning might be.

Another item we heard about is an increasing number of instances of station batteries not coming up to standards. These seem to be predominantly testing and equalizing and maintenance related events. It indicates that some improvements are needed, but it didn't seem to be worthy of our detailed consideration.

Another area in which there were two cases

presented were pipe blowouts due to erosion. There seems to be an increasing number of cases of this. Once instance recently was at Trojan in a 14-inch pipe, a rather large blowout. The other instance was at Hadem Neck with a smaller pipe rupture, again caused by erosion in the piping systems. These are in various parts of the feedwater system.

MR. SHEWMON: This is feedwater and not secondary?

MR. MICHELSON: Well, that is secondary, feedwater.

MR. SHEWMON: It is not in the steam/water mixture, it is in ---

MR. MICHELSON: Yes, it is on the water. Let me double check on the case of Trojan. That was also on the water side of Trojan, wasn't it?

MR. WARD: Yes.

MR. ROSSI: Yes. That was a heater drain pump discharge pipe.

MR. MICHELSON: Yes, they were both in the water part.

MR. SHEWMON: Was there some cavitation or what?

MR. MICHELSON: That is what it kind of has to be, but I was going to suggest that maybe since we have seen a number of these recently and some of them have been

large and people have been getting hurt, that we put it on the Metal Components Subcommittee meeting for future consideration and try to pull together a picture that the full committee might want to hear about. So I was going to suggest it for a subcommittee item at a later date.

There were some more cases now of check valve failures. These are the cases where small check valves have been failing and causing various kinds of problems. In some cases the check valves are used to retain accumulator pressure in an air system, for instance, and their leakage then causes the accumulators to lose their pressure.

The seating is of such a nature that if the differential pressure appears quickly, the valve will check, but if it appears slowly the valve will not check.

The other case with check valves recently was on a TDI diesel wherein the air check valve had cracked, portions of it cracked and got into some other parts of the operation.

I think that the Valve Subcommittee or Reliability Assurance Subcommittee is going to look into check valves and maybe again we could put together a coordinated picture of what is happening on this type of check valve.

The last item of major interest was on reactor vessel level indication at Browns Ferry where there was

some apparently maintenance related maloperation of the device perhaps such as leading to some incorrect level indication and it didn't seem to be particularly significant though, except from the maintenance viewpoint.

The subcommittee also heard about several minor situations that we had asked specific questions about, and one of these dealt with the non-radiological fatality that occurred at Browns Ferry recently wherein the crane hook was dropped and it killed an employee.

We did not receive much detailed information on this because Region II indicated that they were waiting for the OSHA investigation to see -- since it was a non-safety related piece of equipment, they were going to wait for OSHA to report.

The subcommittee indicated a concern, however, that if the preliminary information is correct which indicates that a maladjustment of the limit switch was at fault that caused a stripping of the crane hook, then why isn't the same mechanic adjusting perhaps limit switches on safety related cranes and so forth and leading to a potential danger in that respect.

So we felt that even though it was non-safety related equipment, perhaps greater interest should be shown in some of these events from the safety viewpoint.

One other event that we asked a little about

was interesting only because at Byron 2 there was a small spreading room fire caused by a pint bottle of trichloroethylene which was left on top of a small electric boiler being used as a humidifier and the bottle melted and caught fire. So it was kind of an example of a transient, a combustible that had done just the kind of thing ---

MR. SHEWMON: Trichloroethylene doesn't burn?

MR. MICHELSON: It burns apparently with a smudgy kind of fire and not a violent fire and it was put out I guess in a few minutes time. But of course it is the fact that, you know, you put it on top of an electric boiler and it did raise a question about what was the electric boiler doing in that area. We didn't get too much detail and perhaps there will be a little fill in today. I don't know. But it was mainly an indication that transient combustibles are real things. They are just not postulated situations.

MR. ROSSI: You might want to point out that plant was under construction. It was a plant under construction and not in operation, which I think is an important point.

MR. MICHELSON: Yes. This is Byron 2. It was only as an example of a combustible, a transient combustible that gets in strange places.

Now do any of the other subcommittee members

have any comments before we hear the actual presentations of the four selected events?

(No response.)

I see no indication. So why don't you go ahead and start your presentation, if you will, please.

MR. ROSSI: Okay. I am Ernie Rossi, Chief of the Events Analysis Branch in the Office of Inspection and Enforcement, and we have four presentations for you today.

In addition to the people that are going to actually be giving the presentations, we have a number of other people here that I will mention before we start. Shelley Schwartz is the Deputy Director of the Division of Emergency Preparedness and Engineering Response, and he is here. We have have Bob Bear and Alex Gromerick from the Office of Inspection and Enforcement. We have Dave Morreli from Region II and we have Ron Hernan and John Hopkins from the Office of Nuclear Reactor Regulation.

They are here both to listen to the presentations and to take part in the discussions that may occur.

We will go on now to the presentations. We have changed a little bit from the agenda I think that you have and we are going to have the presentation on the Summer Premature Criticality first this after, and that will be given by Paul Burnett from Region II.

MR. BURNETT: The D. C. Summer Station is a three-loop Westinghouse PWR located about 20 miles northwest of Columbia, South Carolina. It was first licensed in the summer of '82, completed its first refueling outage in the fall of '84 and the event I am going to discuss occurred on February 28th,1985.

During that time there should have been an ordinary plant startup with the control rods being withdrawn by an operator trainee under the direct supervision of the shift supervisor.

The facility underwent a rapid power rise which was terminated by the positive rate trip. The positive rate trip is not a period device, but a comparative circuit, a look-back circuit which determines the change in power over a two-second interval.

The requirement is that the trip occur if the power changes five percent of rated in two seconds with the limiting safety system setting at 6.3 seconds.

MR. EBERSOLE: May I ask at this point, that is a very interesting and I think valuable trip, but I don't think it is used very much.

MR. BURNETT: I have heard that it has been used one other time, but I am not even certain that that is true.

MR. EBERSOLE: It is in preference to a rate

trip because it is not sensitive.

MR. BURNETT: Well, basically that trip is in the plant for rod ejection. So that is the primary reason it hasn't been used all that much.

MR. EBERSOLE: But I mean at other plants is this type of trip used?

MR. BURNETT: That trip is used on at least the more recent, all the more recent Westinghouse plants.

MR. ROSSI: Yes. It is a fairly standard Westinghouse trip.

MR. EBERSOLE: But the old plants don't have it, do they?

MR. BURNETT: The older plants, I am not sure how far back it goes. The newer Westinghouse plants, the two loop, three loop and four loop all have it, but the earlier ones, I just don't know about them.

MR. EBERSOLE: I am just trying to put this event in place as it might affect other plants which don't have this nice trip you just mentioned.

MR. BURNETT: Now this power excursion got to a little over six percent of rated power, as indicated by the computer printout which prints out about even two and a half seconds. So it could have been a little bit higher than six percent power.

This event is still well bounded by the

analyzed accident of the continuous rod withdrawal from a subcritical condition. That accident is based on a supposition or assumption of a reactivity insertion rate of 105 BCM per second, which leads to a peak power of about 600 percent in the Summer analysis.

But it does not lead to a heat flux that will bring your DNBR below 1.3, in fact, I think the maximum heat flux, because really it is a low energy and there is a storage effect that is only about 45 percent.

So this event is pretty well bounded by the accident. Now the accident makes no analysis and makes no mention of the positive rate trip. Whether it was overlooked or whether that event takes place so rapidly that the two-second interval is too long for it to have an effect.

Peak power is limited by doppler. The trip comes in from the low power setting on the power range nuclear instruments at roughly 25 percent power.

So in comparison with the accident, this is not very significant. However, in the absence of equipment failure, we would expect there would be at least two barriers to an event of this kind. We would think that operator attention and procedures would prevent this sort of an event. In this case both failed.

I would like to drop back just a little bit in

time now. The unit had been shut down on the 27th of February after operating a full power for some time, effectively in full power equilibrium on Xenon and it was shut down for maintenance.

Roughly 24 hours later at 6 o'clock in the morning it was started up with a predicted critical position of 150 steps on debank and they achieved critical at 132 steps. No big difference. So there both people and procedures seemed to work just fine.

The reactor was operated at a couple percent power for a couple hours, and then because the maintenance hadn't been completed it was shut down again.

At 1300 restart took place. The predicted critical position of 168 steps on debank, and in the interim about 20 parts per million of boron had been added to the coolant.

The licensee has estimated the reactor was critical at 40 steps, and my calculations were 37. I just think we corroborate one another, and I am not going to argue with the difference.

Somewhere at about criticality the P-6 permissive came in allowing them to bypass the source range trip and take power off the source range instruments. When that occurred the shift supervisor instructed the operator trainee in what he was doing and why he was doing it. They

were probably quite close to critical at that point.

The shift supervisor then instructed the trainee to pull the rods to 100 steps. You can see that in his judgment this was probably conservative. He expected it to be critical at 168 steps.

Based on the reactivity insertions that I got from the rate increases, I got a startup rate of 16.4 and the licensee calculated 17. The administrative limit, by the way, is 1, but I think the limit on the startup rate meters is 3.

So I estimated that they got the rods just on a reactivity balance basis and rod work basis to 80 steps and the step counter showed 76 steps. So I don't think anything unusual was happening here. It was just that something took the shift supervisor's attention away from the instruments and he did not recognize he was critical or very close to critical when he very casually said okay, take them up to 100 steps, and that is what caused the event.

We have reviewed with the licensee the procedure used for calculating the estimated critical position and have concluded, and remember it worked well earlier in the morning and it worked well on other occasions, but it really wasn't appropriate for a reactor with an operating history of intermittent operation at variable power levels.

The so-called power block method of trying to come up with an equivalent Xexon equilibrium condition from which to do the decay simply doesn't work in this case, and in fact part of the licensee's corrective action in this area is going to a more sophisticated computer calculation of the Xenon history. Looking back I remember their procedure at 36 hours, which probably is adequate.

MR. EBERSOLE: Did I hear you say that a component of this event was that there was a range shift by the operators while it was in a rising transient?

MR. BURNETT: The chart recorders operate at one inch per hour. You can see where this switching takes place, but it is hard to get a good resolution at times. So I can't tell you whether they were critical in rising slightly at the time they did this or whether they were rising a lot.

MR. EBERSOLE: But there was a range shift?

MR. BURNETT: There was a bypass of the source range instruments and they went to totally on the intermediate range.

MR. EBERSOLE: That precise event was one taken up by the Alice Chalmers folks with the old gas reactor in Oak Ridge and a determination was made that it would have to have a time delay on the effectiveness of that range shift. There was no such thing?

MR. BURNETT: Well, they don't do an actual range shift. Your intermediate range instruments are there and operative, and you usually have one intermediate range and one source range displayed on the chart recorder. When you get to P-6, which is simply a permissive that says, hey, I have got strong signals out of the intermediate range instruments, and if we can get rid of the source range, and ---

MR. EBERSOLE: Yes, you get rid of it.

MR. BURNETT: --- and that is what they were doing.

MR. EBERSOLE: In essence it is ---

MR. BURNETT: You get rid of the source range and putting the second in the same range on the recorder.

MR. EBERSOLE: It is the same effect. Okay.

MR. ROSSI: Well, I am not sure what your point on the range change is, but the point is that all of these trips when you start to pull the rods are all in service, and what you do is as you go up and find out that the next higher range is actually working, then you are allowed to bypass. Like once the intermediate range is verified to be working and you are above a certain level, then you can block the source range.

So, you know, nothing is ever inoperable until you have verified that the next range is working.

MR. EBERSOLE: Yes.

MR. ROSSI: At that point there would still be an intermediate range trip at a nominal 25 percent of power and also the low setpoint trip on power range estimates at 25 percent.

MR. EBERSOLE: But the intermediate trip is not designed for coming out of the black hole, is it?

MR. ROSSI: Yes, I think it is. Oh, yes. I believe all of these trips are ---

MR. BURNETT: Very few safety analyses take credit for either the source range or the intermediate range trip. In fact, I don't think any of them do. They all look to the power range, but they are there and they work.

Really, I think I have described to you the event and how we view it. The licensee's corrective action was primarily to review and improve the estimated critical position procedure and they took some disciplinary action against the shift supervisor who is now back on service.

MR. MICHELSON: Any questions?

MR. SHEWMON: What was the main reason they were off by 100 notches in their calculation of criticality?

MR. BURNETT: The way Xenon was handled in the estimated critical position, and that was the major thrust of the procedure change.

MR. MICHELSON: And what alarms did they get as

they proceeded to go on these faster periods and rates?

MR. BURNETT: There is no startup rate alarm. It is strictly a matter of reviewing it. They are right there to be seen.

MR. MICHELSON: Is there some classical reason why there is no alarm on exceeding your rate?

MR. BURNETT: I have no idea.

MR. MICHELSON: Because clearly there are limits on these rates and I would like if you had greatly exceeded the limit, there would be an audible indication as well as a visual indication in case you weren't looking at the meter.

MR. SHEWMON: You would find more human factors research that probably told that.

MR. BURNETT: The usual startup proceeds so slowly that you are very close to -- it is usually a struggle to get up to the one decade per minute startup rate. This just had Xenon complicating the situation at that point in the plant's history and the way they calculated it.

MR. MARK: You mentioned that they had revised their procedures for taking account of the previous operating history.

MR. BURNETT: Right.

MR. MARK: And gone all the way back to 36

hours.

MR. BURNETT: I believe that is right. It may be longer.

MR. MARK: I was going to ask what had they been doing before and what is usually done on just that point?

MR. BURNETT: They have been using what is called a power block method of averaging the power. It is something they got from Westinghouse and it is something I have seen used at other plants, but never looked that critically because it has never been a problem before.

But when you really come out and apply this method to this situation and ignore the intermediate operation at low power and simply decay the Xenon from the full power operation over an additional seven hours, then you get a considerably different answer of what the Xenon inventory is in the core, and that was the major cause of this difference.

What also made it worse was that the rod worth curves are at a peak right around this 40 step withdrawal. so they were at a point where they were critical and adding reactivity at the maximum rate.

MR. MARK: It doesn't seem like a particularly novel situation, and one would expect there would be a fairly well worn procedure for just that point.

MR. BURNETT: I think, while there is no

requirement, more people have gone to using computer calculations for the Xenon, but it is a matter of utility choice, and we have also had some problems in that area with a proliferation of little hip-pocket computer programs on this cassette and that cassette and getting some quality assurance and getting some control over them.

And this had been this licensee's concern. They were trying to get their quality control to make sure they were controlling their computer programs before they instituted them. They were aware that they needed to improve it, but the timing was bad.

MR. AXTMANN: What was the appropriate disciplinary action against this event?

MR. BURNETT: What the licensee did was to lay the man off for three days or give him three days off without pay. Then it was I think fortunate that his normal rotation schedule was into the simulator training. That was where his shift went. And they were able to demonstrate, and the simulator did a very good job in demonstrating the event, and they were able to demonstrate to him and I think finally convince him that, yes, he had made a mistake, that the instrumentation was there and that the indications were there.

MR. MICHELSON: Okay. Ernie.

MR. ROSSI: The next presentation will be given

by Mary Wegner from the Office of Inspection and Enforcement and she is going to talk about some steam generator tube defects and eddy current measurements that were made at Millstone Unit 2 and differences in the eddy current measurements after they did cleaning in the secondary side.

Mary.

(Slide.)

MS. WEGNER: My topic is the chemical cleaning of the secondary side of the steam generators at Millstone 2.

(Slide.)

I will discuss the preliminary test, the cleaning process for the steam generators and the post-cleaning test results.

Millstone 2 is a two-loop, 2700 megawatt thermal PWR licensed in 1975. Secondary water treatment has been all volatile since startup.

The licensee has plugged 941 tubes in steam generator one and 759 tubes in steam generator two and has sleeved 891 tubes in steam generator one and 1128 tubes in steam generator two prior to this outage.

MR. SHEWMON: What was the main requirement, or why did they plug them? Were they leaking or was there denting or what?

MS. WEGNER: They failed to meet the ASME requirements and had to be plugged or sleeved according to the code.

MR. SHEWMON: There are a couple of requirements that lead to plugging, and I think one is excessive denting and another is probably leaking. Which were they, do you know?

MS. WEGNER: During the earlier years of startup of operation for the plant, I heard that they had some denting problems, but now the problem is pitting. Why these tubes were plugged, I haven't looked that up.

(Slide.)

The deteriorating condition of the tubes has been attributed to the buildup of sludge containing principally copper and iron. A sludge pile, the source of the crudants causing denting and pitting existed in the secondary side of the tube sheet and around the tubes to a maximum depth of 13 inches. Condenser and feedwater heater tubes made of a copper alloy I thought to be the source of the copper.

Before the cleaning in April of 1985 the licensee eddy current tested all of the tubes in steam generator two and a statistical sample of tubes in steam generator one had projected the need for sleeve 300 tubes in each steam generator.

For the basic cleaning process, the licensee selected the Electric Power Research Institute's steam generator owner's group generic process. The cleaning process involves the use of iron and cooper solvents in a specified number of applications under controlled conditions.

The procedure was designed to remove the sludge pile with few adverse effects on the steam generators or internals. The iron solvent uses an inhibitor to protect the base metals while a copper solvent has been virtually non-corrosive to carbon steel, an inconel 600, in tests according to EPRI. Corrosion of the inconel tubes has been less than 1/10th mil in sludge cleaning tests conducted by EPRI.

This is the first use of this cleaning process at any nuclear plant. The concentration of the various chemicals in the solvents were adjusted to yield the most efficient cleaning of the site specific materials and configuration.

The licensee qualified the specific solvents in processes for use at Millstone 2 prior to their use. Sludge lanting was used to remove part of the sludge from the steam generators and chemical cleaning is said to have removed the remainder.

Following the chemical cleaning, eddy current

testing of each of the steam generator tubes was again performed. The licensee reported that 1661 ends will be sleeved in steam generator one and 12 tubes plugged. 1235 ends in steam generator two are to be sleeved and 7 are to be plugged. 99 percent of these defects were found within 13 inches of the tube sheet.

Following the outage these are the totals.

MR. EBERSOLE: Before making this finding and before you doing this sleeving and so forth, what are the implications of this thinning in respect to what would happen if a sudden depressurization occurred on the secondary side and thus applied a 1,000 pound additional DP on the tubes other than what existed immediately prior to that, you know, the sudden imposition of an additional DP?

Is there any potential here for sudden multi-tube failures coincident with a sudden steam system depressurization? That is a nasty event to have happen to you. Do you follow me?

MS. WEGNER: Do you mean in a secondary loop blowdown should we expect a tube rupture because of thinning?

MR. EBERSOLE: Yes, the sudden imposition of 1000 psi additional differential on these thinned tubes.

MS. WEGNER: I don't know, but maybe, Mr. Conrad, you could help.

MR. CONRAD: I am Herb Conrad from the Materials Engineering Branch. The plugging limit for this particular plant is 40 percent per wall, and the plugging limit is set by calculating just exactly what you were asking, the minimum wall that you would have to have before you could get a rupture during one of the accidents.

Then to that minimum thickness is added an extra thickness of approximately 10 percent in most cases to account for the inaccuracies of the eddy current testing, and then an additional percent, and in this case I believe it was about 10 percent, to account for any growth of defects between inspection periods.

So our experience has been that this has been satisfactory in preventing multiple tube failures certainly since we haven't had one.

MR. SHEWMON: What as the change in observations that lead to the requirement of 2800 additional pluggings or 2900, sorry, sleeving and not plugging.

MR. CONRAD: Sleeving, yes. Well, a tube ends with indications greater than 40 percent for sleeve and, in addition, there were certain sleeve ends plugged where the eddy current signal was uninterpretable.

MR. SHEWMON: I am only asking about the sleeving for now, and you are saying that the wall thickness down in the sludge area was low enough after they

sludge cleaning so that it was felt if you sleeve these then the rest of the tube would be sound enough. Is that the philosophy?

MR. CONRAD: That is exactly correct. We had done the sleeving review about a year and a half or two years ago. And when that was done the calculations were again made for defective tubes with sleeves.

MR. SHEWMON: And how deep was the sludge before you started to clean?

MR. CONRAD: Well, they reported a maximum sludge height of 13 inches.

MR. SHEWMON: And the sleeve, the indications then that you saw were mostly under 13 inches?

MR. CONRAD: Well, the indications are reported in depth of through wall. Now, I am sorry, I misunderstood you I guess, but this sludge height was 13 inches from the lower tube sheet, and all the pitting defects were found within that 13 or 15 inches.

MR. SHEWMON: Now have there been many tests that indicate how effectively this -- what do they call the pulse, the eddy current, the EC technique is -- the EC technique is no good if you are down in the tube sheath?

MR. CONRAD: There are definitely problems down in the tube sheath.

MR. SHEWMON: Now you also probably have thermal

magnetic material in the sludge outside, and is it also established that this sludge inhibits the ability to detect the thickness reliably?

MR. CONRAD: Well, that is exactly what is established in this instance here.

MS. WEGNER: It is the point of my talk.

MR. CONRAD: They did an eddy current test.

MR. SHEWMON: You mean if I listen she will get to that, or that is what she thinks she is showing me?

(Laughter.)

MR. CONRAD: Well, I think that was kind of in there, but it wasn't ---

MR. SHEWMON: Because we still haven't gotten anything on whether indeed the cleaning technique thinned it out that much more or whether ---

MS. WEGNER: I am getting to it.

MR. SHEWMON: ---it was because you couldn't detect it anyway.

MR. CONRAD: Okay. Well, apparently she hasn't hit on it yet.

MR. SHEWMON: Okay.

MR. EBERSOLE: Before you sit down, let me ask you this. Before you did this, how many tubes would you have at least theoretically failed prior to making this finding the day before if you had experienced massive steam

generator main steamline failure?

MR. CONRAD: I am not sure I can answer that question.

MR. SHEWMON: Jesse, the answer is none.

MR. EBERSOLE: Well, he didn't say he answered it.

MR. SHEWMON: They have got a factor of safety that ---

MR. EBERSOLE: Let me use your technique and let him answer the question before you answer it for him.

(Laughter.)

MR. CONRAD: Well, we believe that the pitting type defect is much less critical in degrading the strength of the tube. As you might expect, these pits are 50 mils or 75 mils. When you are plugging them and making the calculations of minimum wall, you actually assume a uniform thinning of 360 degrees around the tubes. So we believe in this case that criteria is very considerable.

In looking at what they have reported on some of the deeper flaws, at the first inspection there were some up to 90 percent. There was one reported at a good 90 percent within the range of 80 to 87. Since these were pits, I wouldn't expect that even a pit indication of that deep to give you a problem.

MR. EBERSOLE: It may be just some minor leaks

at the most.

MR. CONRAD: Well, our experience has been that you get a through-wall leak which is detected and the plant is shut down before you reach the point where you get a burst.

MR. EBERSOLE: Thank you.

Now, Paul, have you got an answer?

MR. SHEWMON: There has been a lot of work that hasn't been his responsibility that we have heard before, but if you got the answer you want, that is all we need.

MR. EBERSOLE: I am done. Carry on.

MS. WEGNER: The large difference in the results of the pre-cleaning and post-cleaning eddy current testing raises two questions. Did the cleaning harm the tubes and, if not, was there something wrong with the eddy current testing before or after?

In answering the first question, the licensee has stated that the cleaning process did not cause new defects or enlarge existing defects, and EPRI has tests to back them up.

With respect to the second question, the newly found defects are characterized as being small in volume. The copper and iron constituents of the sludge generated signals which match the signals of these small defects.

The eddy current equipment is characterized as

being state-of-the-art. Even so, the equipment cannot detect such small volume defects in the presence of copper. Therefore, because of the copper the precleaning test did not detect the smaller volume defects.

The licensee presented an informational report to the NRC on May 1st, 1985. I&E will issue an information notice, No. 8537 on May 14th to inform licensees of these events.

NRR's review of the licensee's evaluation will determine whether any further action is needed, and that is ongoing.

MR. MICHELSON: Excuse me, was the cooper then in the sludge itself?

MS. WEGNER: Copper and iron were the principal components of the sludge, yes, sir.

MR. MICHELSON: Well, maybe I misunderstood, but I thought they weren't particularly successful in removing the sludge.

MS. WEGNER: They stated that they removed all of the sludge.

MR. MICHELSON: Oh, they did. Okay, they were successful. Okay.

MR. ETHERINGTON: Can you say what the copper allow in the feedwater heater was?

MS. WEGNER: No, I am not sure.

MR. CONRAD: I don't know the exact allow, the copper/nickel alloy. However, it has been our experience that any copper containing allow in the feedwater stream can lead to problems with the copper. The copper not only ends up in the sludge, but it has actually plated onto to the tubes, and in this case the plating was apparently in bands according to the utility and this made it especially difficult when they did their first examination because you would get variations.

Since eddy current is really only measuring the conductivity, and when you have a defect there the conductivity drops, and you can see that indication, but---

MR. ETHERINGTON: The sludge was primary iron and copper with no nickel or ---

MR. CONRAD: Oh, it had small quantities of just about everything of the ions you would expect from the materials in the whole train.

MR. ETHERINGTON: Well, I thought that would be included in the material.

MR. CONRAD: The plating out on the tubes, when the eddy current measures the conductivity, it is of course increased if there is copper plated out on it and it looks like the tube is getting thicker.

Well, in this case the operator can see that something is wrong, although this may be masking other

defect signals that are there. So in this case the utility did the conservative thing and went to a chemical cleaning procedure.

MR. SHEWMON: Fine. Thank you. Now you said this was state of the art. Does that mean it was a mode of two frequencies or three or one frequency?

MR. CONRAD: It was multi frequency. You know, they can go back and either switch between coils and read the absolute or differential. They even when they have difficulty with the standard ---

MR. SHEWMON: It was multi-frequency. The answer is yes.

MR. CONRAD: Yes.

MR. SHEWMON: Thank you. Now you referred to this a couple of times of iron. Don't you really mean it was iron oxide?

MR. CONRAD: Yes, it was ---

MS. WEGNER: FE_3O_4.

MR. SHEWMON: Thank you. Copper is copper and zinc is zinc oxide and nickel is nickel oxide.

MR. MICHELSON: You said the copper plated out at the bends I believe you said?

MR. CONRAD: No, I am sorry. It plated out in bands in this lower area.

MR. MICHELSON: Oh, in bands. Oh, okay. I am

with you. Thank you.

MR. MOELLER: How much did the dose rates go down?

MR. CONRAD: This was done just to remove the sludge. It wasn't a decontamination. It was effective in removing that sludge pile, and that is we expect them to have less of a pitting problem in the future.

MR. AXTMANN: What is the conductivity of the water in that operating reactor?

MR. CONRAD: Well, it is the standard pressurized water chemistry as recommended by EPRI. I am not a chemical engineer so I don't know the exact ---

MR. SHEWMON: Coming in or going out?

MR. CONRAD: The conductivity?

MR. SHEWMON: No. When I say coming in or going out, coming in it is relatively pure and going out in what they call the blow-down its purities are concentrated at the spot.

MR. CONRAD: That is one of the parameters that they can check and monitor to assure water purity.

MR. MICHELSON: Any other question?

(No response.)

I believe we are ready for your next event.

MR. ROSSI: Okay. Next we have a discussion of some weld leaks in the ultimate heat-sink piping at Palo

Verde, Unit 2, and this will be given by Joe Collins from the Office of Inspection and Enforcement.

(Slide.)

MR. COLLINS: First of all, I would like to show you a schematic of the train we would be talking about very quickly here and then step right into the discussion.

I will be talking about the spray pond piping that is in this vicinity here on these particular redundant loops that service the emergency cooling water area and the diesel generator systems.

What I would like to do in the course of this is cover the licensee's inspections that they have undertaken as a result of the leaks that they have observed during the preoperation testing, the outcome of these inspections and of course their analysis as to the cause of the problem and some of their strategies to control the problem and prevent reoccurrence.

(Slide.)

Now as a start here, during the operational testing back in March the leaking welds identified in the essential spray ponds, there is the north and the south spray ponds, the piping at that particular situation is a 316L stainless steel. It is a Schedule 10, having a 308L weld filler metal for joining.

The leaking weld was located in an eight-inch

diameter piping section. The headers are made up with six-inch, eight-inch and a 14-inch diameter piping in the spray ponds.

(Slide.)

As a consequence of the leaks that were observed in the weld in this eight-inch piping, they expanded the inspection then to look at the other piping in the systems.

I have tabulated here the total numbers of welds in the systems and the numbers that they have inspected. Certain welds are inaccessible due to supports on the system.

The findings are shown that in Unit 1 there were 2 leaking welds in the south pond and in Unit 2 42 in the north pond and 4 in the south pond. And given the total leaks, there were some welds with suspect areas which they see small surface pits, some rust and of course some non-leaking holes.

(Slide.)

The further inspection, they conducted a radiographic examination of a number of welds in the different headers, examining 57 in the south pond and finding that 47 of the welds revealed pitting on the ID of the piping surface at the welds.

And of course the tabulation on the Unit No. 2

was inspected with 20 and was given 18. So they have identified a condition which shows that the welds are being degraded locally due to corrosion pitting attack of the type that I will explain to you here very shortly.

MR. MICHELSON: Which portion of the weld was being attacked?

MR. COLLINS: Primarily it is the ferrite phase and then the subsequent austenitic. It is a two-phase weld material consisting of the austenite ferritic phase, and it is the initial attack on the austenitic phase subsequent to consuming of the ferrite phase.

MR. MICHELSON: Well, does that mean that it is predominantly in the weld metal itself then?

MR. COLLINS: Yes. They find some isolated small pits out in the piping, but there again the majority of the attack was localized in the welds.

(Slide.)

Due to the pitting found in the piping in the examinations, they went back and reviewed some of their past records of their maintenance and made a check on the records of the other safety related systems.

This included the plascite lined carbon steel piping that makes up the headers of the spray pump and of course is the major portion of the piping that is contained in the loop through the pumps and the heat exchangers.

They did a periodic visual examination of the heat exchangers and the valves and they showed no evidence of any pitting due to any bacteria and they are in good condition.

The auxiliary feedwater pump in Unit 2 showed some minor pitting about two years ago that was believed to involve the bacteria, but the welds on both sides of this pump and subsequently additional welds that they had examined showed no evidence of any unusual deposits or pitting.

In the fall of 1983 the NRC during a construction audit required them to examine 23 pipe welds and 10 socket welds in the safety injection, charging and the spent fuel cooling system and these also showed no evidence of the pitting attack that was observed in the spray ponds.

In March of 1985 there were two welds on the safety injection valve that were examined and this also showed a clean condition.

So on the basis of this previous work and the conditions, the licensee indicates that the microbiological influenced corrosion is actually confined to the spray pond piping.

(Slide.)

In the examination of the piping they removed

two sections of 14-inch diameter headers and did a biological analysis of the corrosion products that were removed from the pits which showed the very positive identification of the iron bacteria, gallionella, in both of the welds.

The metallography examination showed a very characteristic pattern of the type of attack that case histories have shown that are produced by the type of iron bacteria.

The tubercles themselves surrounding the points of attack by the bacteria also showed the presence of the carcasses, and this has led the licensee to believe that the presence of the iron bacteria initiated the problem in which the water itself, which is identified, has about 350 ppm of calcium carbonate containing about 115 ppm of free chloride present in the water such that it really is a two-step process, initiation of the corrosion attack, and I have a diagram here to show you how that occurs, is accomplished with the removal of the oxide film by the activity of the microbes and subsequently the interaction of the chloride with the excretions that they make that forms a very aggressive ferrite chloride which leads to the aggressive pitting attack that we see.

This, as I have mentioned, the case histories of this have been very, very similar.

I want to show you a simplified drawing. I think, Dr. Michelson, you have one in your handout, but this one may be clearer.

(Slide.)

This is the normal corrosion that takes place. It is just a simply oxidation process, and once the film is formed the oxidation is a self limiting situation.

In the MIC corrosion the gallionella interact with this oxide, primarily the iron as one of their nutrients, and then of course the formation -- and this may not be entirely correct, this is somewhat of a controversial situation because this interaction here is not totally understood in many, many cases -- but nevertheless the formation of this in the prehydrogen conditions formed with water.

However, in the presence of chlorides here it can form a ferrite chloride which is a very aggressive material to the stainless and also the sulfate reducing bacteria, if present, can also furnish the sulfide iron to which you have another very aggressive condition.

MR. SHEWMON: Joe, while you are there could you explain why it was that this attack the weld metal and not the pipe, the rest of it, or does that come later or not at all.

MR. COLLINS: I have a postulated scenario here

and I will go through it very quickly for you.

(Slide.)

Really the nutrient is there for them, principally the iron situation.

MR. SHEWMON: Is it the iron in the weld?

MR. COLLINS: Yes.

MR. SHEWMON: The weld metal is different than the base metal?

MR. COLLINS: Yes.

MR. SHEWMON: Why?

MR. COLLINS: Well, it is essentially the ferrite phase. Really it is the iron ions that are released as in all metals, as you are aware of, in the early vapor pressure. When they are released into the solution, the gallionella are attracted to it and tend to consume them and this causes more ions to be immediately released in the same areas. And as the iron ions are released rapidly in this area, it becomes an anode with respect to the surrounding metal surfaces.

MR. ETHERINGTON: What kind of welded condition is conducive to the existence of the bacteria?

MR. COLLINS: Sir?

MR. ETHERINGTON: What kind of welded conditions are favorable to the existence of the bacteria?

MR. COLLINS: I have their physiological

conditions here. They can colonize in warm waters in moderate temperatures, and they have a temperature range of their existence. This water is pulled from wells. They do occur in natural fresh waters, lakes, rivers and streams. They are quite prevalent and the sulfite reducing bacteria are also quite prevalent.

MR. ETHERINGTON: Do they require oxygen?

MR. COLLINS: Yes. The chloride ions are then further concentrated by the gallionella by the chemical reactions that are talking place, and of course the chloride ions then further help to break down the acidated film on the material and then of course the ferrite chloride begins the pitting attack.

Of course, the lower the pH and the reduction of the oxygen in the pits, then of course it creates more of a concentration and the rapid acceleration. And, as I have shown you, if there is a sulfate reducing bacteria in the water, they can further accelerate the reaction of the process.

So it is really a two-step process that one sees occurring. It is very characteristic of these gallionella to build a tubercle that one sees. It looks like an active oxygen cell also in the carbon steel. It is almost quite similar.

They can build this habitat, these types here.

They can be both anaerobic or aerobic. In this case with the oxygen level one assumes that there is aerobic types here. They can assist in the further attack by generating acid concentrations that further assist in the pitting.

The tubercles also when they are formed have a tendency to make the oxygen by the action and the anaerobic types can exist in this particular habitat. So it is a cross-feeding mechanism that can occur.

MR. MICHELSON: Was there any indication of actual slime formation inside the pipe?

MR. COLLINS: No. They had caught it pretty early. We had a discussion with the licensee just as late as this morning and I asked that question. They see no slime forming conditions.

MR. MICHELSON: Now this is the same water that is used in what type of heat exchangers in the plant?

MR. COLLINS: This is principally just used for the ultimate heat sink and for shutdown and cooling purposes.

MR. MICHELSON: But isn't this an open cycle spray pond where the water passes through heat exchangers and then goes out and gets sprayed and cooled and repumped?

MR. COLLINS: Just sprayed and then it is recycled.

MR. MICHELSON: But it is recycled through heat

exchangers such as diesel engine heat exchangers or whatever. It was on your first drawing, but you didn't give us a copy of it. So I couldn't refer back to it.

MR. SHEWMON: They pipe that water out in the sewage treatment plant, but they sure don't have another flowing river to dump it into.

MR. MICHELSON: I assume this is the stuff that goes through all the heat exchangers, and therefore you have to kind of look to see what is happening in each of those heat exchangers.

MR. SHEWMON: That is why they did look at the heat exchangers.

MR. COLLINS: The heat exchangers have the admirality material in there.

MR. MICHELSON: Okay. That was the question I was leading to. I wanted to establish the word. Now is the admirality metal used in both the diesel generator and the RHR heat exchanger, or ECW as they call it here?

MR. COLLINS: Yes. That has caused them in using their biocide now. In presently treating to control the gallionella they have to have an inhibitor. But these are closed loops only achieving cooling through the spraying action and of course it is recycled through the pumps at the head of the pond and brought back through. These ponds themselves are big concrete swimming pools. They don't

communicate with any other natural streams and therefore they are not controlled by EPA requirements and they have no restrictions on their biocide treatment, which I will get into in just a few minutes.

MR. ETHERINGTON: Is this the same bacteria that causes the very bulky growths which you sometimes get in carbon steel pipes?

MR. COLLINS: Yes.

(Slide.)

Well, there are several remedies that have been used to control the bacteria and the microorganisms in water in the various plants.

The licensee's strategy at Palo Verda is to operate the spray ponds on a routine basis to avoid the stagnation that was felt had brought the gallionella in contact with the surface of the materials where they could proliferate. This situation occurred after they had done their preoperational testing and had cleaned and flushed the pipes.

They now have instituted a rigorous program for water chemistry controls and the regular use of biocide in the control of microorganisms. They are presently indicating utilizing a sodium hypochloride at about 2 ppm which they had available and they were disturbed to find this problem because this chemical was available to them

and was presumably supposed to have been used.

MR. AXTMANN: Is this problem unique to Palo Verde?

MR. COLLINS: No. As a matter of fact, you will see in the handout there is about five or ten case histories of this problem. Let me finish this and we can go through some of them if you would like.

They have set up a base line data on the pressure versus flow conditions. They plan to do this continually now on a quarterly basis to ensure that the spray pond piping will perform its intended function at all times.

MR. MICHELSON: What will that tell them, pressure versus flow?

MR. COLLINS: Well, it is the manner in which they have set up their test bed. They set their pressure test and went through a series of tests removing nozzels to reflect a bypass flow that one may get from say a degraded pipe.

MR. MICHELSON: They are really looking for a lot of holes then.

MR. COLLINS: Yes. They calculated statistically the current activity in these cavities, and even though they have controlled the bacteria, the chlorides in the natural cavity being a crevice condition they will

ultimately gain full penetration.

MR. MICHELSON: That is only good if you are looking for a swiss cheese problem. I mean that has got to be gross before you will see it that way.

MR. COLLINS: They plan to also go back and do a radiographic examination of the welds that they have previously RT'd and make a direct comparison to see that there is no further activity from the bacteria.

(Slide.)

This is some background information on the different types of these bacteria. I think there is now somewhere upwards of 37 strains of the different bacteria in the different groups.

They occur in just about all your natural waters, fresh waters. They are in sea water. They are in petroleum products, the natural petroleum products.

They can tolerate any temperature from 10 degrees Centigrade to 90 degrees Centigrade. They have a very wide range of pH values, oxygen levels and hydrostatic pressure.

There are about six different groups. They are the acid producers, both organic and inorganic and you will see this spoken to in the restressed concrete reactor vessel at Ft. St. Vrain. These conditions were present to cause rupture of the wires by stress corrosion cracking.

There are hydrocarbon feeders, sulfate reducers, and of course the one we are dealing with here is a metal ion oxidizer, and of course slime formers and mold growers, and I think I mentioned these.

The most prevalent ones we are seeing now are the sulfate reducing bacteria primarily and the type of gallionella, which is the iron oxide types.

Of course they do form a very cavernous pit. The interest point is almost just a pin hole in the one section. The area is a big cavity, and it really distinctly different from the chemical pitting corrosion in which one sees a shallow open pit here. It is designed almost like a cavern with a very fine small entrance.

MR. EBERSOLE: May I ask a question. Some time ago, last year it was, we had a lengthy report from TVA on growths in the carbon steel piping systems down there, unusual growths that were described as sort of bulbous pitting. It eventually formed a pit, but it formed nodules to begin with.

MR. COLLINS: Yes.

MR. EBERSOLE: There was no mention made of the really root positive reasons for this. Are we looking at the same thing?

MR. COLLINS: It is a distinct possibility. They may have a sulfate reducing bacteria in the ---

MR. EBERSOLE: See, it was reported out as just an occurrence without the root causes.

MR. COLLINS: Yes. It is a distinct possibility because in the H. B. Robinson they had quite a great deal of the problem.

MR. EBERSOLE: The end result of this was that lots of pipes were coated with mortar, the big ones, and a lot of the smaller pipes were changed to stainless. And I am beginning to suspect that the latter cure is not going to work. Will it?

MR. COLLINS: That is correct. In one of the plants for the case histories I believe they did change some of the cement lined pipe out in the chill water units to the stainless and they encountered the problem. But there are certain bacteria that will attack the cement lined pipe because there is a peculiar nutrient there that is available for them.

MR. EBERSOLE: Even the cement?

MR. COLLINS: Yes. Some of these bacteria in looking at them indicate they are capable of living and thriving and regenerating themselves under numerous different types of conditions and habitats.

MR. EBERSOLE: I recall one attempt to prevent corrosion and degradation of carbon steel piping was to sterilize the waters and put it in wet storage under

sterile water. Would that reduce it?

MR. COLLINS: Yes. They have temperature limitations, the different types.

MR. EBERSOLE: Well, this was deionized sterile water. That would help?

MR. COLLINS: Yes.

MR. EBERSOLE: Thank you.

(Slide.)

MR. COLLINS: Well, just quickly. H. B. Robinson was on an extended outage for piping replacement in the steam generator and some other general maintenance work. Their piping was stagnant for about 11 months, the same type of materials.

Inside and outside of containment was quite well perforated. It took some 800 sleeves to repair all the leaking welds. They have definitely identified the iron bacteria, the gallionella, and they have a sulfate reducing bacteria in the water, plus they have some slime forming bacteria. So they have all the ingredients of a very aggressive water. They are now looking at having to have to do a systematic change, a replacement of the piping.

Wolf Creek in 1984, and this plant is not on line yet, the carbon steel water boxes were attacked, the copper nickel tubing was attacked requiring the damaged components to be replaced, and they immediately went on a

chlorinating treatment to control the problem.

MR. ETHERINGTON: The attack on copper nickel tubing, does that suggest they don't really need iron?

MR. COLLINS: There are different types of feeders, the different types of bacteria involved.

MR. MICHELSON: Chlorination, is that a continuous heavy chlorination or once or twice a year or just what?

MR. COLLINS: No. At Palo Verde they are going to use a 2 ppm one shot a day.

MR. MICHELSON: Yes, but in cases where you have to be much more careful, is there a chlorination solution for this problem that works?

MR. COLLINS: Yes. They have shown at Wolf Creek that they have to maintain this type of ---

MR. MICHELSON: And that is at 22 hours every day?

MR. COLLINS: Yes.

MR. MICHELSON: And they are allowed to put that much chlorine into the water?

MR. COLLINS: yes.

MR. MICHELSON: Maybe that is a closed cycle, too. I don't know.

MR. COLLINS: One of the problems is the EPA in the summer months limits them to the amount of the chlorine

that they can release, and this simply wasn't enough to control the bacteria.

MR. MICHELSON: Okay. Thank you.

At Ft. St. Vrain of course there was a heavy general corrosion and the stress corrosion cracking in the highly stressed tendon wires. They had postulated the organic acid formation that was due to the bacteria interaction with the tendon grease. They indicate this by the high CO_{2}*, hydrogen and low oxygen levels in the gas samplings that they continuously take.

The tendon grease, the neutral pH and the oxygen level in moisture seems to be the right combination of ingredients of nutrients for the activity.

They believe it is psudominas genus. That is another sulfate reducing bacteria that may be in the water. They have only seen one sample of others, but they don't believe it is as viable as this strain.

MR. MICHELSON: Now that water is the water of condensation, isn't it, or what?

MR. COLLINS: Yes. It is an intrusion because they don't have good protecting covers.

MR. MICHELSON: Humidity I guess alone, although it is not cold. So I guess it has got to be rain water. Is that it?

MR. COLLINS: It is predominantly the rain

water.

MR. MICHELSON: Okay.

I just put this one up here. This is a potential problem they are now looking at there. Their main condensers are extremely pitting and of course Comanche Peak is still in construction.

(Slide.)

Prairie Island, that occurred during construction, pulling water from deep wells and storing it in the condensate storage tank which is a source of potable water for the construction.

They encountered severe pitting corrosion at the weld seams. They had both the iron and the sulfide bacteria there.

At North Anna it is a continuing problem. Of course the water here has sulfate reducers and they have analyzed and they both the ensheathed and filamentous iron bacteria and these combinations are causing the severe pitting corrosion in their carbon steel piping.

MR. EBERSOLE: I don't seem to have these slides in my handout. Am I supposed to have them?

MR. COLLINS: Yes.

MR. EBERSOLE: They are not in the handouts.

MR. ROSSI: Joe, are you sure you included all of these in your handouts? I thought you had some extra

ones.

MR. ETHERINGTON: I don't think they are here.

MR. COLLINS: I believe they are.

MR. EBERSOLE: I checked through all of them here and I didn't find it.

MR. COLLINS: If they are not, I will certain see that you get them.

MR. EBERSOLE: I would like to get copies of this because I am going to spread the word a little bit.

MR. ETHERINGTON: These are all nuisance problems I take it and it is difficult to make a safety problem out of it, isn't it?

MR. COLLINS: That is correct. It really impacts on plant availability and that is the impetus for getting this understood.

MR. EBERSOLE: Let me pick up that matter a little bit. I have long wondered if progressive pitting or really universal pitting can't proceed, but with no leaks revealed until the general strength of the pipe is down to a point where a sudden hydraulic knock or the classical seismic event reveals the fact that most of the metal is gone in a sudden and catastrophic failure.

So how can you say these are nuisance events unless you make a continuous detailed surveillance as to how much metal you have got left?

MR. COLLINS: Well, the history that we see, the case histories that we see, that the pitting itself if a random distributed type of pitting. It occurs very, very rapidly in many cases riffling the welded areas. Of course there is sufficient ligament strength that the piping is of a low pressure and low temperature conditions, and of course you do see leaking.

This is what occurred at H. B. Robinson. During the startup condition, the startup of the plant you see this condition occurring and of course they immediately shut it down to correct the problem.

MR. EBERSOLE: So it is not a general membrane degradation.

MR. COLLINS: It is not a general wastage type of situation.

MR. EBERSOLE: Thank you.

MR. MICHELSON: Is it limited to certain type weld metals?

MR. COLLINS: Well, no. It just depends on what the bacteria is in the water. There are specific species of these in the different geographical localities.

MR. SHEWMON: My question is to why the weld metal -- what is the composition of the weld metal? You implied it was different from the ---

MR. COLLINS: It is 308.

MR. SHEWMON: Well, that is an 18-8 roughly, too, isn't it?

MR. COLLINS: Yes.

MR. SHEWMON: So there is not a gross difference in composition.

MR. COLLINS: Not that much, no.

MR. ETHERINGTON: There is free ferrite though, isn't there?

MR. SHEWMON: Yes, there would be some free ferrite, but 10 percent or something.

MR. ETHERINGTON: Ten or 15, yes.

MR. COLLINS: Yes.

There is an electro potential that can be measured between the types of weld, and of course with the oxygen levels there it is a natural in the entrapped nutrients in the rough surface conditions.

Also, as you are aware, when you weld the stainless steel you destroy the passivated coating and in the natural restoration you see a light rust patina in that particular area. So you have everything there to encourage their colonization.

MR. MICHELSON: What I am wondering about is could one expect that in other components or in other parts of the system, you know, in certain parts of the valve construction, for instance, or pump construction?

MR. COLLINS: Well, in a stagnant situation if the utility left the system stagnant, yes, there is a potential there. The problem shows that it has a potential at Palo Verda when the valve was stuck.

MR. MICHELSON: Some of these systems are essentially in stagnant conditions most of the time. They are lay-by waiting to do something.

MR. COLLINS: Yes. This is what we have done, is to note this in the information notice to the industry to focus attention on this particular problem.

(Slide)

At Limerick the main condenser is admirality brass tubes, and they had cracking and pitting because of the fouling by organic organisms which contain a bacteria, including the iron bacteria, yellownello that is attacking.

That is about all I have to present.

Are there any more questions?

(No response.)

MR. ROSSI: Okay. If there are no more questions, then we will go on to the last discussion, and that is on revisions to the diesel generator testing requirements on North Anna Unit 2. That is going to be given by J. T. Beard of the Office of Nuclear Reactor Regulation.

MR. MICHELSON: We got started about 15 minutes

late I guess it was. So we are still running a little behind schedule. This will probably take about 15 minutes?

MR. ROSSI: It may be a little less than that.

JT, can you give them an estimate on the time for this one?

MR. BEARD: It depends entirely on questions, but I know we can do it in 15 minutes.

MR. ROSSI: Okay.

MR. BEARD: I want to just say that the reason we are down here this afternoon is because we were down in front of the ACRS a couple of months ago about the simultaneous failure of both diesels at North Anna Unit 2. There were serious mechanical damages within the engine, and the committee asked us to come back after that and give them a follow-up report.

What I would like to do this afternoon is give you a one-page summary of the chronology so we can get a feel for exactly where we are coming from, and then I would like to highlight for you just a flavor of the technical specification changes that we have made to relax the stresses with regard to testing the emergency diesels.

I understand there has been a lot of concern about reliability of diesels and the testing thereof.

(Slide.)

All right. In this listing all I have tried to

do is to give you a brief chronology of the dates. The Unit 1 stuff is generally in the middle column and the Unit 2 stuff is generally in the right and that is why you can see it is so heavy.

We had the two failures in December of the 2H and 2J diesels. Both of them had major failures involved with the replacement of components such as the pistons, the rings, the bearings, the bushings and the whole nine yards.

This did require a plant shutdown and they lost several days of power generation.

After we got into this we did find out historically that there had been a significant overload on a diesel in Unit 1 where they inadvertently took it to about 131 percent of its rated power and left it there unknowingly for about a half an hour before they realized what was going on and then shut it down.

We had the briefings, and shortly after the briefings there was another major engine failure on Unit 2. This not only caused an engine failure, but it got their attention in the sense that the testing requirements for a routine testing of the diesels put them into a three-day test cycle which everybody seemed familiar with and it is very unpopular.

And because of the experiences of failures they have had and being in a three-day test cycle, the licensee

came in immediately with a request for some relief from the testing.

I would like to point out that the licensee's argument at this point was that on Unit 2 the diesels had experienced a large number of major engine failures and that plant was licensed with the Reg. Guide 1.108 testing schedule in it which says, among other things, that the number of times you test the diesels is directly related, or I guess I should say inversely related to the failure experience you have had. By that I mean the more failures, the more testing.

Their case was basically that the other units, sister Unit No. 1 had a different testing requirement which was basically to test it fairly benignly only once a month and they claimed there had been no failures. So they felt like that obvious deduction the testing is the culprit.

We found out this was not the case, and in our safety evaluation we concluded that the testing was not the problem. We think that the diesels have a number of problems. They could be maintenance related, they could be related to overloads, they could be related to a number of things.

Now those basic causes could have been aggravated by the testing, or the testing caused them to be revealed earlier, but we do not believe that the testing

per se caused the failure of these engines.

So that the result of this is that while we granted as tech spec license change to reduce the testing requirements, it is not for the basis that the licensee proposed.

There is some more stuff down here. They did have an engine failure in Unit 1 that was related to the previous overload. We went down to the plant and had some discussions with them and we observed the so-called slow start, which I will explain in a minute and some other problems and they had to put in a secondary supplemental submittal.

There was another failure on March 15th, and this also required a plant shutdown because they couldn't get it fixed within the allotted 72 hours.

There is one bit of good news here. On March 23rd the station experienced an actual situation where they lost offsite power, not totally, but on some buses. It affected some buses in Unit 1 and some buses in Unit 2. The associated diesels were asked to start up. They did. They came up on their buses, they powered them and they did everything you could have ever asked for.

MR. ETHERINGTON: What make are the diesels and how are they operating in other plants?

MR. BEARD: These diesels are manufactured by

Colt Industry or Fairbanks-Morris Division thereof. They are the 2750KW size. They are at a number of different operati g plants and their history is average to maybe a little on the high side of failures compared to other diesel designs.

MR. ETHERINGTON: Thank you.

MR. BEARD: Does that answer your question?

MR. ETHERINGTON: Yes.

MR. BEARD: Okay. So much for this.

(Slide.)

Now let me just repeat for a second. I am not going to go into all the gory details of the testing that we have done, but we have given copies of the actual safety evaluation that has the exact tech spec changes to the staff. So that those of you who are particularly interested in the details, that is available to you.

My intent this afternoon is only to give you a general flavor of the nature of the kinds of changes that we are making because this I guess you would call it state of the art. This is the only plant in the country that has this kind of testing right now.

The general areas that we looked at and made changes in were when you do a routine test how do you do that test and how do you conduct it. It it, for example, a fast start?

The second area was how often are you going to do such a test, the major bus routine test.

The third area was non-routine testing, that being an action statement in the tech specs where part of the electrical system at the plant is in some sort of a degraded mode that is allowed and what sort of special testing can we do then.

And the last area that I want to talk about is a little bit on reliability improvement.

In the first area on how a test is conducted, I presume that you have a general familiarity with what the testing is today. What it amounts to is basically you push the button, the diesel cranks up fully within 10 seconds, then you shift it over, synchronize it and put it on the grid and load it up to full load within 60 seconds.

Now there are three important characteristics here. You crank it up from ambient condition. You do a fast start, if you will, in the sense the engine accelerates to full speed within 10 seconds, and then you do what you call a fast load. That is you put a load on it and ramp it up within 60 seconds, which is just about as fast as an operator can get it there.

All three of these areas have been modified.

In the next tech specs we are allowing and in fact requiring that for every planned start of the diesel,

a planned start, that they should preload the diesel.

The second thing is they would do a slow start in terms of engine acceleration. By slow start we mean things like the air start system would start it up to some intermediate speed, for example, in this case 450 rpm. The licensee originally wanted to go for 300 and he found out he didn't have enough lube oil pressure.

But at any rate, he would start it up at some slow speed. The governor would then be manually readjusted locally at the diesel by a mechanic or an operator or somebody and gradually over a several minute period get the engine up to full speed rpm-wise. This is the slow start.

This is no longer required as a matter of routine testing on a monthly type basis at all.

The fast load, which was to ramp the load on the generator and hence stress the engine side will not be done in 60 seconds, but will be done over a several minute period as the diesel manufacturers have recommended. You might consider this a staircasing. If you want to visualize it, you will ramp it up over a couple or three-minute period to say 50 percent load, let it sit there for a few minutes, maybe 10 minutes and then ramp it up to 75 percent and staircase your way on up in three or four steps to 100 percent load.

Another item was the tech specs were written

basically back in the 1975 type time frame when it was perceived that the biggest problem with diesels is their ability to start. At the time the statistics indicated that. That is no longer the case.

So the tech specs were basically centered on a start to diesel. This is based on the perception that if it can start, most likely it can go on and pick up load and carry load and run for several hours or days if necessary.

We have since then learned also about problems that can be experienced at light loads or no loads. So we have combined the one-hour load run with a start. Now what this does is have the effect of saying if you start that engine you must load it, or at least if you start it because of an NRC requirement, you must load it.

The other thing is that when you do this run, the rated full load on the diesel is 2750, as I mentioned earlier. The licensee has found at this particular plant they have a problem they believe with overloading the engine on a fairly routine basis. What they have run into is a couple of things.

One is an instrumentation problem. The instrumentation channel that tells them what load is on the diesel has got some significant inaccuracies in it because, in my opinion, it never was set up right. But that can be looked at.

The other thing is the way the legal language in the tech specs say that it shall be operated at or greater than 2750. Now because of compliance actions over the years in various regions and various inspectors, the operators know dadgum good and well that unless they want a ticket from their friendly inspector they had better be above 2750. So they are in sort of a setup there to ride it on the high side.

The total of these two types of sources of errors ends up with about a 200 KW uncertainty, plus or minus 200. So for routine testing we said a better way to skin the cat is to specify a band of 2500 or 2600 which corresponds to the two smallest divisions on the output meter anyway and say put it in that band.

To compensate for the removal of the fast start/fast load and all those kinds of things that we look away from the monthly testing, once every six months we will do a fast start/fast load test. This is a 10 second/60 second on the loading.

Do you have a question, Charlie?

MR. WYLIE: What is their LOCA load or their shutdown load, their blackout load?

MR. BEARD: I have one more and then I will hit it.

MR. WYLIE: Okay.

MR. BEARD: This is one that I think Jesse had asked about also. In the 18-month load test where they run a 14-hour load run, the way that is set up in the standard tech specs is the first two hours it is 110 percent of rated load. They remaining 22 hours are a continuous duty. And there have been some questions raised about the LOCA loads, how often do you test against the LOCA loads, et cetera, et cetera.

The LOCA loads at this plant are calculated to be 2938 KW. Now the licensee proposed that they would run this test -- well, let me back up.

The present specs say at or greater than 3025, and here again they were on the high side. They proposed, because of the uncertainties we talked about earlier, to have a band of 27 to 28 I believe it was, or maybe it was 28 to 29. We rejected that concept on the simple basis that if we had approved it, that would result in a testing scheme in which the diesel would never be asked to load on a test basis to at least the LOCA loads. So we did not accept their proposal in that area.

What we did was to reduce from the 3025 down to what we call a target value of 2950 to give the operator the knowledge that this is what you are shooting for, Charlie. And again we specified for compliance and inspection purposes, if he keeps it between 2900 and 3000,

which are again the smallest increments on the meter, that is acceptable, but we are telling him to shoot for that so that he matches LOCA loads.

MR. WYLIE: But it is a 2500 rated machine?

MR. BEARD: 2750 continuous.

MR. WYLIE: Oh, okay. That is the rating?

MR. BEARD: Yes. This is below the 2000 hour rating and the other ratings also.

Yes, sir.

MR. SHEWMON: What is the 2000 hour rating?

MR. WYLIE: That is 10 percent over, isn't it?

MR. BEARD: No, not on this diesel, it is not 10 percent.

Where is Dick? Do you have a copy of that document I gave you? I believe the top of the header is 3000.

MR. SHEWMON: The test is well within the specs for the machine that the vendor gives you?

MR. BEARD: Yes, sir. What we are trying to do is tailor the NRC's requirements for testing plus what the vendor recommends and also make sure that the licensee's maintenance program and testing program is in harmony with what the vendor recommends and that hasn't always been the case.

This is basically how a test would be

conducted. This is a summary of this.

Early in the SER there, Dick, is a table of what all the ratings are in the diesels, the first five or six pages.

(Slide.)

Any any rate, going on here to the second question, which is how often are you going to run one of these jewels.

If you remember the Reg. Guide 108 and now the standard tech specs, they have a table in there that says basically with one or less failures you test monthly and then it graduates on down to where I think it is at four or five failures you are testing every three days, and a lot of people feel this is not a good way to do it.

That test schedule was a reliability goal of .99 per nuclear unit. This would be the plant, two diesels. We have changed that goal to .95 per emergency diesel generator.

Now let me point out in passing the numbers are deceptive here. .95 per diesel is more reliable than .99 per nuclear unit based on two diesels. So don't let the numbers fool you. If you go through the arithmetic it turns out that way.

The other thing is in that chart, we took out the 14-day test cycle and we took out the 3-day test cycle.

So that what you end up with is you are either on a monthly routine basis or in certain conditions and a lot of failures you would accelerate that to weekly. That is it. It is very simply and very straightforward.

Again, going back to the .95 per diesel, if you get more than five diesel failures in the last 100, or if you get two or more failures in the last 20, then you would change from a monthly test frequency to a weekly. That is it.

As you may remember, and I know Dr. Kerr does, the intent of Reg. Guide 108 was to encourage utilities to take corrective actions for a diesel that had shown problems, and we may not have had real good luck with that.

In these tech specs we have a direct explicitly stated incentive that if the licensee chooses to overhaul the diesel comprehensively top to bottom and rebuild it like new, he is allowed to do that and encouraged to do that, and in return for that he would be able to wipe away the slate from his previous failure record and therefore go back to monthly testing.

Now that may not sound like much, but when you stop and think about if you have got six failures as in the old system and you had to run off that at a 3-day rate and then a 7-day rate and 14-day rate, that can take months and maybe even over a year to get out. So this does represent a

significant incentive.

MR. KERR: The thing that bothers me about the old incentive is that I don't think it is conducive to increased diesel reliability. While it might give me and the staff a warm feeling to know that I was encouraging this guy to do right, I shudder to think of what he is doing to the diesel, and I can't help but be a little concerned about that.

MR. BEARD: Excuse me, sir, are you referring to the overhaul itself?

MR. KERR: No. I am referring to the penalty that he accrues if he does not overhaul, and not everybody will be able to overhaul immediately. So they will be starting these diesels up about every whatever.

MR. BEARD: Once a week at the maximum. The maximum frequency would be once a week. We had a meeting with the vendors ---

MR. KERR: But I thought we sort of agreed informally, and maybe we did it in a whisper, that starting it up every week doesn't really make the diesel any more reliable. It is there to encourage people to do something about it. And if it actually makes the diesel less reliable, which I think is quite possible, I guess I sort of wonder why we are doing it.

MR. BEARD: One of the reason why you want to do

it, and I remember Ms. Trepper talking about this years ago, one of the purposes of the surveillance test is to have an early detection of a failure that has occurred on a single failure basis and do it frequently enough so that you don't have a double failure occurring and you have a problem.

MR. KERR: But there isn't any evidence that one week is better for this than one month, particularly ---

MR. BEARD: I am not certain that the diesel manufacturers would agree with that.

MR. KERR: I am not certain that they would either, but I am not certain that they disagree with it. I think the staff ought to set this testing period to some extent out of consideration for the diesels rather than as an effort to encourage people to be surveillant, if I can invent a word.

MR. BEARD: Well, I think by a large part we have taken one hugh giant step in these tech specs of reducing the amount of testing requirements, as I am trying to present here to accomplish just exactly what I think your purpose is.

MR. KERR: I commend the staff for this progress. I am simply encouraging them to go even further.

MR. BEARD: All right.

MR. SIESS: I gather, Bill, you think it is a

small giant step rather than a hugh one.

(Laughter.)

MR. KERR: I am on the staff's side. I think they are doing the right thing.

MR. EBERSOLE: Well, let me ask in the setting of these test intervals, is any consideration given to organized study of the full events in time that degrade the installation you are testing? Now the period of time itself is not going to hurt anything, corrosion in time, rats building nests in the critical equipment in time. I am talking about the flow of events in time that make time meaningful. Does anybody do anything like that?

MR. BEARD: That is one of the topics I am going to touch on in a minute.

MR. EBERSOLE: Oh, good.

MR. MICHELSON: We are going to have to wrap up fairly shortly here.

MR. BEARD: Okay. Well, let me get on this real quick and then we will get off it.

Let me go on to the action statement, and this is a situation where the plant electrical system, either the offsite or the onsite system is degraded.

The present tech specs for the majority of the plants say that if you have basically any problem in your electrical system what you do is test all diesels within

the first hour and then repeat that every eight hours thereafter.

We have cut this back now to where you will do a test not within the first hour but within the first 24 hours. However, this test is now mandatory. In the past you didn't necessarily have to do that.

And because the action statements in which this degradation is allowed to persist is limited to only 72 hours, we do not feel that this is a long enough period to justify any follow-up testing at all.

So basically what it amounts to is that instead of doing nine tests on every diesel during an action statement, you do one, and we think that is a significant reduction.

(Slide.)

This is the reliability improvement program, and basically the problem or the situation we had here was that we were a little uneasy with reducing the testing requirements when a plant is in the experience of having multiple significant engine failures.

So what the licensee has now agreed to do is to immediately implement a reliability improvement program consisting of these general elements. Let me just try to get a couple of them for you.

The trending of parameters would be a situation

where at the end of the one-hour test run after everything has stabilized they will take a lot of measurements and then trend those values from test run to test run to test run, and the man manufacturers and the experts say this is the best way to detect failures or potential problems before there are failures.

Some of the other things in the evaluation of pa[illegible]tices and other things that they are going to be evaluating, their lube oil, for example, taking lube oil every quarter and seeing what kinds of metal flakes are in it.

MR. KERR: Mr. Beard, excuse me. What frequency is being measured in bullet No. 2?

MR. BEARD: I believe that this is a mechanical vibration type situation. I am not real sure on that.

MR. KERR: But the people who are running a test know what it is?

MR. BEARD: Presumably so.

MR. SHEWMON: The Japanese experience exchange is something that will come under EPRI's aegis or the NRC or what?

MR. BEARD: As I understand from this utility, and I stand to be corrected, but my understanding today is that this is a VEPCO unilateral sort of deal. This is not in concert with EPRI or the NRC. I understand they have

already sent people over there, for example.

I have seen some of the tech specs they have brought back from Japan, but I don't have any other information on what they brought back.

One of the things, and this gets to Jesse's question on nuclear guidelines. We feel very strongly that the way the diesel manufacturers have specified doing preventative maintenance and the like is basically based like an aircraft engine. After "X" number of hours of operation you do something.

For a nuclear application, unlike a locomotive or a tug boat or something like this, they don't get a lot of hours. They get a lot of starts. As one of the manufacturers said, all we are doing is starting and testing it for the run that we hope we never have.

They are relooking now at how the manufacturers could better specify what sort of preventive maintenance could be done on the per start basis, and they just re-examined the whole concept of how to specify how often to do what.

What they have come up with is directly along your line, Jesse. I think early indicates we are getting is they are going to come up with after "X" number of days, clock days you do something, and this will encompass starts, standby operation, running operations, et cetera.

Now my guess is they are going out with some options here. It is like changing the oil. You know, 6,000 miles or six months, that kind of thing. But this is a significant improvement in the way the manufacturers are telling these users how to take care of their machines.

MR. EBERSOLE: Let me comment on something I learned in Japan, but not enough about it. They claim they have a virtually perfect record of starts and runs, a think hard to believe. I understand, however, that their diesels, their diesel generator sets may, or my impression is that they are designed for the purpose of being applied to these nuclear plants. I am not dead certain about that.

I think we need to know, one, the basis for that claim first and see if it is really true and, if it is, how in the world they are achieving that. I think we should take steps to find that out.

MR. SHEWMON: Jesse, the Japanese are famous for the carefulness of their annual whatever and they take a long, long time. Do you know whether they rebuild them every year or ---

MR. EBERSOLE: I am not sure, Paul.

MR. BEARD: I think it is close to that. And to answer your question, Jesse, there are steps being taken, they are well underway to get that kind of information. I know exactly. Less Rubenstein is heading that effort up.

One thing I will point out to the subcommittee is one problem we have not had is a lack of volunteers to make the trip to Tokoyo.

(Laughter.)

Okay. Let me just say in closing I gave you a couple of supplementary sheets here in the back of the handout, and I just want to show one as an example.

(Slide.)

The only idea here is to give you sort of a flavor of what the actual work said. This is sort of before and after setup and I have underlined some pertinent points. Here is a thing like do the test start within one hour and every eight hours thereafter, and down here it says if it became inoperable for failure reasons, then do something within 24 hours. So you can get some flavor for the kinds of changes that I have been trying to talk about here today.

As I said, the actual tech specs and the SER are available to the ACRS at their asking.

Any other questions?

MR. EBERSOLE: I have got one observation to make. I think it has been realized now after we have studied the complete loss of AC power case that a long-standing recommendation to provide relatively slow starting oil fired peaking units at nuclear plants, if that

could be practically and reasonably done, would be a substantial improvement to the overall problem.

I don't know what is being done in that connection, but I hope the staff is maybe doing a little leading to see whether or not they can get this done to sort of alleviate the problem.

MR. BEARD: At the risk of taking more of your precious time ---

MR. MICHELSON: We aren't going to have much more to take, unless it is important to get that answer.

MR. BEARD: We have looked at the area and it is looks like that is not a good way to go.

MR. EBERSOLE: Okay.

MR. MICHELSON: With that we will close. Thank you, Ernie. And we have got to give Chet back some of his time. I believe we have encroached on it to some extent. Sorry about that.

MR. EBERSOLE: Both of the Chairmen are gone and I am the acting one.

MR. SIESS: We have got a two-hour job ahead of us. Do you want to give them a break?

MR. EBERSOLE: Oh, yes. Let's have a ten-minute break.

(Recess taken.)

SUBCOMMITTEE CHAIRMEN REGARDING PROPOSED PRIORITIZATION OF A NEW GROUP OF SAFETY ISSUES

MR. SIESS: Gentlemen, may I have your attention. I said two hours. I hope we can do it. I am going to take five minutes and then we have got 23 generic issues at five minutes apiece, that is 115 minutes, and that is two hours.

Paper, Tab 14 in your notebook. That is one piece of paper that you will want to refer to. We have also agree to Item 14 on there. Those two documents have copies of recommendations from subcommittees regarding the prioritization of generic items.

Some of you have pink. If you have pink that means you are a subcommittee chairman, and in that collection you have generic issues that were assigned to your subcommittee.

In addition, everybody has a white one, or two white ones, one of them with 102 and HF-1 and the other with 59 et cetera. Those are six generic issues for which we have no response from the subcommittee chairmen and we will consider en banc. Is that the right word?

(Laughter.)

MR. MARK: Does that reduce the 23?

MR. SIESS: That is 23 total. Look, these have been sitting around for a year and we are not going to hold

them up.

I would like to start with Mr. Kerr who has 49 and 58, and I would like the chairman to describe the generic issue briefly, give his recommendation and then see if anybody has questions about it, or if they want further explanation he can give it and we will see what happens. His recommendations are in the green handout. Kerr's recommendations are in the green handout. They are the last item on the green. It is a memo to Sam from M. El-Zeftawy.

Bill.

MR. KERR: Okay. No. 58, and I am having difficulty finding the other one, had to do with ---

MR. SIESS: They are both on the same sheet in the green handout.

MR. KERR: Okay. I think that is the best way to handle it.

MR. SIESS: Then if you have questions you can go to this one.

MR. KERR: I am going to describe it. The way I will describe it is the following.

Issue No. 49 is interlocks and limiting conditions for operation for Class 1E tie breakers. That is the description. The staff proposes a medium priority and I agree.

MR. SIESS: You realize that medium means it is

not likely to get much work done on it in the near future?

MR. KERR: Yes.

MR. SIESS: Any objection?

MR. MINNERS: I don't know what you mean by not much work. It is scheduled ---

MR. SIESS: The Commission has told the Congress that there is no work to be done on medium items.

MR. MINNERS: New medium items.

MR. SIESS: New medium items, okay, fine. Thank you for the clarification. These are old medium items.

MR. MARK: An old medium item will require what, a year or so to finish on them?

MR. MINNERS: I think there is something in the operating plan, but I forget the numbers. It is more than a year, maybe two years.

MR. SIESS: It will be worked on. Thank you for the correction, Warren.

MR. KERR: Issue No. 58, containment flooding.

MR. MINNERS: I can probably give you schedules for any issue.

MR. SIESS: Not now.

MR. KERR: This grew out of the Indian Point incident in which the sump level failed. After looking carefully at that the staff decided that enough had been done about it, and it seems to me from what they said that

I agree that enough has been done.

MR. SIESS: Any objections to that, gentlemen?

(No response.)

Incidentally, what we will do is what we did the last time. We will send a letter to Mr. Dircks from Mr. Frayley. We will put these items in three categories, those with which we agree with the prioritization, zero, clear, those in which we agree, but have comments, and the third, those with which we disagree and of course they will have comments.

In the white and green here in some cases there are comments. Those comments at present are for the benefit of the ACRS members. We might want to modify them somewhat before they go to the staff. So keep that in mind.

Next Mr. Mark, Issue 81. That is the first item in your green handout.

MR. MARK: Item 81, impact of locked doors and barriers on personnel safety. That I think derived from the request the Commission sent out to study this interaction between security and safety, and in particular access in the case of need.

I have written two sets of comments. I think that there is a possible point to making comments. The staff has recommended "Drop." They have a seven-page piece of work as to how they got to drop.

Now this thing on locked doors and barriers, you might think it included the security arrangements, but it does not. The security things, the barriers for vital areas we are assured by Burnett are being handled under A-29, and they are trying to make provisions for rapid access in case of need through the security doors.

What other doors and barriers there are, I don't know. It isn't said or made clear in the things that we have, but they would have to do I expect with things like health physics barriers, for instance, or fire protection and stuff of that sort.

The staff, as I say, has recommended "Drop." What I have said here may not be what you want to see said, but I say we don't necessarily disagree with the drop category.

I had great complaints, and they were written at length, on the argument they presented as to how they got to the drop. Thinking these are to do with plant and personnel safety, the benefit that they assign to possibly letting those door swing free is 1.4 man-rems or less per reactor over the whole length of its 28 years of life. They don't mention anything to do with plant personnel or safety whatever.

You can believe that number or not. It is very hard to believe. They will cut down the core melt

probability by making it easier for a guy to get through the door.

They say it is a small reduction because in case he has forgotten his key, as long as he finds some proper tools, like a jackhammer, which are usually available at plant sites, it would not take more than 15 or 20 minutes to defeat a lock or a barrier, whereas it usually takes more than 15 for a sequence to build up to where you can't recover from it. So there is a very small gain in core melts. That leads to the 1.4 man-rems per reactor life.

In order to give out the number of keys and things, it would cost $1.7 million per plant. It is $625,000 for additional keys, $400,000 for cross training of security and operating personnel where the security people have to be trained on this.

MR. MOELLER: These are gold keys.

MR. MARK: $300,000 to ensure future reductions of safeguards impacts. Well, since they didn't discuss safeguards impacts, one wonders why they have to ensure future reductions, and $200,000 the NRC connects as a Commission.

(Laughter.)

So there is a very small value impact, .82 man-rem per million bucks. And if that is anything like the

case, then it is dropped of course.

MR. KERR: I am surprised, Carl. That sounds like a very thorough analysis to me, and I thought you were objecting to it.

(Laughter.)

MR. MARK: Well, I complained because they didn't seem to mention what one might have led to by reading the title of the issue, and they don't tell you how many locked doors and barriers or why, in any detail anyway, that might cause trouble by impeding access in the case of need, why they need so many keys and why they need any cross-training and why they need future reductions. None of that is explained.

So I say I don't necessarily disagree with the present assignment of the "Drop" category, but we consider the basis presented to be irrelative, ridiculous and to a serious degree embarrassing.

Now that is what I wrote to you, and on the second page is a pale reflection of that. It seems to me something like that should go here in case this document ever finds its way out of the shop and somebody else should read it.

MR. SIESS: Okay. So you propose that the agreement would be dropped and sending comments as on the 5/9/85 draft?

MR. MARK: Yes, on the 5/9/85 draft where it doesn't explain why we say it and let them find that out.

MR. SIESS: Any discussion?

(No response.)

Any disagreement?

MR. SHEWMON: Yes. It seems to me if we don't agree with it, I don't see why we want to drop it so quickly.

MR. SIESS: We agree with the answer.

MR. MARK: It is just their rationale for arriving there seems to be so strange that it would be ---

MR. SHEWMON: You feel that indeed it is okay to go find the jackhammer or crowbar or superintendent or whatever to get through the door, or that getting through the door won't constitute any safety hazard; is that it?

MR. MARK: I think the whole thing is malarkey. They don't need jackhammers very often, and since these aren't security doors, you don't have to protect the keys down at the security center. You could hang keys on strings by these doors.

MR. SIESS: Not if it is flood protection.

MR. MARK: Well, you could at least have in case of need break glass.

MR. SIESS: The recommendation is drop with a comment and agree with the comment. The comment will be on

the record if it ever comes up again.

Any objection?

(No response.)

Approved.

Carl Michelson has got Generic Issue 70. That is also in the green, along with some others, on the next to the last page. Do you find it? He has comments on 70. We will take it up first, Carl, and then we will do the others.

MR. MICHELSON: Okay. The issue deals with PORV and block valve reliability. We discussed this issue in a subcommittee meeting with the staff. The staff has assigned it a medium priority.

Our bottom line is yes, we do agree with the medium priority, but we were assured during this meeting that they were coordinating it with the resolution of station blackout and decay heat removal, which they clearly need to do.

But I think we should express some amount of concern that the thing is moving along extremely slowly and that a medium priority is certainly the minimum priority that ought to be applied to this thing and not allow them to drag out much longer.

So I think we need to push that, but I have no basis to believe it is other than a medium priority, and

that is the way I came out.

MR. SIESS: I think this type of comment should be in there for the record for follow-up purposes.

The proposal is to agree with comment on No. 70.

MR. EBERSOLE: Haven't I heard somebody say that if it is low or medium it doesn't make any difference?

MR. MINNERS: No. High and medium are both being worked on. Low or drop, it doesn't make any difference.

MR. EBERSOLE: Okay.

MR. SIESS: Any comments or questions?

(No response.)

Do you agree?

(Members nodding affirmatively.)

Okay. No. 70 -- that is the one we just did. No. 35.

MR. MICHELSON: I really didn't have 35. I just put it down there because I was asked for a comment on it.

MR. SIESS: Okay. That is Glenn's.

MR. MICHELSON: I did have 36.

MR. SIESS: 36 is the one you had. It was originally assigned to Okrent.

MR. MICHELSON: It is an issue that came up a long time ago in AEOD concerning the loss of service water at Calvert Cliffs. AEOD wrote a very detailed report, made

five recommendations. So all I did is check back to see how they were coming along because basically the staff proposes that the resolution be depending upon the A-45 issue and 67.

So I checked with AEOD to see whether or not the last three recommendations have been met, and they have already been met. The two outstanding recommendations do relate to the items that the staff cited. So it looks like it is moving along in a satisfactory fashion.

MR. SIESS: What isn't on here is what is the ranking?

MR. MICHELSON: Well, that isn't on here. It is not on your material either, and I wasn't quite sure.

MR. SIESS: 36?

MR. MICHELSON: Yes.

MR. SIESS: It is in the status report.

MR. MICHELSON: It is covered with comments. So I didn't know how they ranked it as such, but it is being covered and it is being monitored by AEOD and they are waiting to get the answers. So I think it is being adequately covered and I would have no comment.

MR. SIESS: Any questions on that?

(No response.)

Okay. 98 then.

MR. MICHELSON: 98 is another one I think I only

commented on, but didn't have the lead responsibility for.

MR. SIESS: It was originally assigned to Okrent and he asked that you do it. So we will take your word for it.

MR. MICHELSON: Let me collect my thoughts here real quick then.

MR. SIESS: Sam will give you a copy. You should have it there.

MR. MICHELSON: I should have it here somewhere.

(Pause.)

MR. SIESS: It should have a pink cover on it.

MR. MICHELSON: I thought I was just looking at a form. Okay. This is the check valve problem.

MR. SIESS: I think Okrent got it for GE or something and asked you to ---

MR. MICHELSON: I didn't have any problem with the resolution being cited here, but I didn't chase it in great detail because I had a misunderstanding apparently. I thought I was just asked do I have a comment on it, and the answer was no. It looked to me like the material they had here was fine. So I can't discuss it in any great detail. I just buzzed through it and thought it was okay.

MR. SIESS: Well, that is good enough for me.

Does anybody else have a question?

(No response.)

What is the disposition of that one?

MR. MICHELSON: As I recall, the key to all this is that it has got to happen to an awful lot of valves to begin to even become a problem.

MR. SIESS: That is your problem?

MR. MICHELSON: Yes. I would think that the dropping of it is appropriate.

MR. SIESS: Okay. Any questions?

(No response.)

That is dropped with no comment.

I want to finish up with the green collection here, and that does, does it not? That is everything that is on the green?

MR. DURAISWAMY: Yes. It is taken care of.

MR. SIESS: Okay. All the others you will find the letters in the white.

MR. MICHELSON: You passed up No. 35.

MR. SIESS: Glenn has got it.

MR. MICHELSON: Oh, it is somewhere else then.

MR. SIESS: Yes.

MR. DURAISWAMY: It is in Tab 14.

MR. SIESS: In Tab 14, page -- it is not here.

MR. DURAISWAMY: That is on page 6 from Alderman.

MR. SIESS: Okay. Glenn, would you like to

comment?

MR. REED: I have reviewed these. This is a secondary outside of containment through the steamlines and back through the feedlines and so on, these parts and what they could do and what they might mean to risk. Now they say that this should be low, and I certainly agree with that and so informed Chester.

MR. SIESS: Any questions or comments or disagreement?

(No response.)

MR. REED: Do you want me to do the other one?

MR. SIESS: Yes.

MR. REED: The other one is HF-02. I don't know what HF-02 means.

MR. DURAISWAMY: Human factors.

MR. SIESS: Human Factors 02.

MR. REED: Human Factors 02, and that is the maintenance and surveillance program. They have given that a high. I agree with that. The emphasis of course, and it doesn't come out all that clear here, is that there is a draft maintenance surveillance program out now. I have read it and I have met with the engineers from the staff on it and we are going to have a meeting shortly.

The staff program for the next couple of years is general issues and then to try to follow what INPO is

going to be doing as the lead active people in the activity.

They have given it a high priority and I think it should be a high priority, and even the issue of selection and training of personnel is involved in the plan.

MR. SIESS: Any questions or comments or disagreements?

(No response.)

Okay. The next item I have got here would be B-65, which is Dade Moeller's, and that is page 7 of the white.

MR. MOELLER: Well, this is on iodine spiking. The staff has looked at it and of course they first pointed out that it would not be of significance in a core melt accident because iodine would get out anyway. It is only in non-core melt accidents.

And they did calculations if they sampled more frequently. So they had a better handle on the iodine concentrations. They showed a very small change in public risk, 10 millirem in one case for the PWR and essentially nothing for the BWR.

The bottom line was that the total public risk reduction, if this issue were resolved, is insignificant. The value impact ratio is poor. It is something like 7 rem

for a million dollars.

The estimated increase in occupational exposure due to the assumed resolution is large compared to the population does that you would know about. So they propose "Drop," and we went over it back and forth and we concurred.

MR. DURAISWAMY: But without comments.

MR. MOELLER: Right. We had comments at one time, but not now.

MR. SIESS: Any objections?

(No response.)

Okay. Now the next one will be Shewmon's Items 66 and 86. The letter there is on page 5 in the white. This is a memo from Igne and Shewmon has concurred in.

Do you want to tell us what they are, Paul.

MR. SHEWMON: No, because I just found this and I don't know what page 5 you are referring to.

MR. SIESS: Page 5 in Tab 14 of your notebook, and you have the issues before you in the pink folder.

MR. SHEWMON: Why don't you go on to the next one.

MR. SIESS: Okay. Mr. Ward has got several. They are on page 9 in Tab 14, and we will take them up in order.

84, Dave.

MR. WARD: Well, let's see, 84 is the CE PORV's.

We have agree for the last two years that this could be referred to A-45 and be part of that.

MR. SIESS: Okay.

MR. WARD: So I don't have any different position from that.

MR. SIESS: Fine.

Any objection? I think we covered that previously.

MR. REED: Just a point of clarification. Did I hear today that the System 80 is in A-45?

MR. WARD: It is not one of the sample plants I guess. I don't know that that necessarily means that this issue won't be resolved as part of A-45, but I think that is a good point.

MR. REED: We are agreeing in saying it is part of A-45, and it isn't a part of A-45.

MR. BOEHNERT: No, no. It is just not one of the lead plants, Glenn. It will be resolved as part of A-45 because the A-45 resolution will apply to all operating plants, but it is not one of the lead plants of the seven or nine plant group. It is not in that group.

MR. REED: I guess what you are saying is that even though the nine plants that might be considered all have PORV's, and the resolution comes out with all of them with PORV's and that somehow resolves the plant without

them.

MR. BOEHNERT: Well, no. I think I am saying that somehow this would have to be factored into that resolution.

MR. MINNERS: Could I get a clarification. A-45 and 84 are two different issues. A-45 is going to do its thing, and then after that decision is made, people will then begin to resolve 84. So 84 is not part of A-45. It is a separate issue and I think, as you have illustrated, since the CE plants are not being specifically looked at in A-45, it is going to be hard to come to a resolution.

One of the purposes of this I think is after you have decided what to do with PORV's generally, then let's look at the specific case of system interaction. So it is a different issue.

MR. KERR: If A:45 was resolved by requiring feed and bleed for operating plants, and if it doesn't require PORV's, and that after all is the reason we want PORV's, isn't it, for decay heat removal, or do we want it for some other purpose?

MR. REED: Well, I have read the A-45 product on one plant, a PWR, and it seems to use the feed and bleed very extensively as a part of the final analysis.

MR. KERR: I am saying let's suppose hypothetically that A-45 came up with a resolution of decay

heat removal which did not require PORV's.

MR. REED: I don't see how it is going to, but okay.

MR. KERR: If it can't without it, then the CE thing is automatically taken care of because you have got to have a PORV in order to satisfy the resolution of A-45 I think.

MR. MINNERS: Well, I don't think it is quite that automatic.

MR. WARD: Well, it has got to be pretty close to that. This is sort of new to me. Very explicitly about two years ago when we were pressing for the staff to come to some resolution on the CE PORV at that time, you know, there was a study made and the staff convinced us that it wasn't necessary to come to some emergency resolution, but that resolution as part of A-45 would be good enough.

But now this is the first really I have understood or the first I have heard that it is not going to be part of A-45, what you just said. That is new to me.

MR. SIESS: The words in the statement that we were asked to review, the conclusion reads as follows: "This issue is deferred pending resolution of USIA-45" That is very clear. The next sentence isn't. It says "Therefore, a resolution has been identified."

If the resolution is to defer it, I guess that

is true, but I thought a resolution, that is more than deferring.

MR. MINNERS: I think, now that you point it out, "therefore" is not therefore.

MR. SIESS: Yes. I don't think the resolution has been identified.

MR. MINNERS: The resolution has been identified, but we are going to defer a decision on that resolution until A-45 is done.

MR. SIESS: What is the resolution you have identified?

MR. MINNERS: We are going with PORV.

MR. SIESS: Okay. I see.

MR. MICHELSON: It may be that we want to put a few comments on this item instead of just blanketly accepting that.

MR. SIESS: What we would agree with if we didn't comment was that they are deferring it pending the resolution of A-45. If we don't agree to that, then -- I mean Warren just said the resolution is to put the PORV's on, but the decision is deferred pending the resolution of A-45.

MR. MICHELSON: This is very similar to the question of how to answer Item 70, which I attempted to put into my answer as a comment. It has to do with the

timeliness of the solution as well as the clarity of the solution when they finally arrive at it. I don't know, but maybe you will want to comment on this one in a similar fashion and maybe not.

MR. SIESS: It is up to the committee what they want to say, and if somebody wants to write a comment ---

MR. EBERSOLE: Let me ask a question about this. You know, we are already talking about Palo Verde on another basis here.

MR. SIESS: It is hard to believe it is going to be forgotten.

MR. EBERSOLE: Let me ask another question of the staff here. Is consideration of augmentation of the water supply system to the secondary sides not a possible override to putting on PORV's, you know, augmenting the reliability of aux feed water and low-pressure water to keep the secondary flooded? You sounded like you had honed in already on adding PORV's.

MR. MINNERS: Well, I guess I am not as familiar with the report on the CE PORV's. I will have to go back and read it.

MR. SIESS: This simply says a resolution has been identified. It doesn't say the resolution.

MR. EBERSOLE: Oh, a possible resolution among many maybe.

MR. SIESS: Yes.

But, Carl, if you want to try a short paragraph, we will have a place to put it tomorrow morning.

MR. MICHELSON: Well, I think David would have to think about this. I am just saying that maybe he wants to think about whether or not to add any additional words.

The reason I had added additional words is of course you have got to get this safety grade question business resolved and so forth, and it is not clear where it is all going to come out.

But we are given a lot of warm feelings that everything will be all right after A-45 is figured out, and I was just trying to caution that it is not clear that even after A-45 is figured out that the answers are all now clear.

MR. SIESS: Well, this will still be an open issue then.

MR. MICHELSON: Yes. I think it is going to be an open issue after A-45 is resolved, and I just thought it would be well to point out that we really would like to get the whole job done quickly.

MR. SIESS: They say that the decision is deferred until A-45.

MR. MICHELSON: And thereafter.

MR. SIESS: They don't want to think about it.

So if you want to think about whether you want to add anything.

MR. MICHELSON: Maybe not. I don't know.

MR. WARD: If you have got something to suggest, I ---

MR. MICHELSON: I don't have anything to suggest.

MR. WARD: Okay.

MR. SIESS: That was 84, right?

MR. WARD: Yes.

MR. SIESS: Next is 92.

MR. WARD: That is fuel crumbling during LOCA. It is given a low ranking and I guess we agree with that. I really don't have anything else to say.

MR. SIESS: Any questions or comments or disagreements?

(No response.)

Hearing none, 108.

MR. WARD: BWR suppression pool temperature limits. The same sort of thing. I think they have given a low.

MR. SIESS: That is a low.

MR. WARD: We don't have any problem with that.

MR. SIESS: Does anybody else have any problem with that?

(No response.)

Okay. B-19 you agree with comments. That is thermal hydraulic stability, which doesn't sound very specific to me.

MR. WARD: Well, I don't know if a comment is necessary. All we are saying is ---

MR. SIESS: We can say that is for the committee.

MR. WARD: Yes. Why don't we just leave that as for the committee. We have said we think we ought to review it.

MR. SIESS: I am sure we will review it.

MR. WARD: I think just agree would be all right.

MR. SIESS: Okay.

MR. MINNERS: For your information, I just saw a closeout memo on that issue on my desk today.

MR. WARD: We just want to review what the resolution is and that is all.

MR. SIESS: Paul, I didn't get you all at one time, but on page 5 are two more items from Shewmon -- no, we have already got those -- no, we didn't. I am sorry.

MR. SHEWMON: I said to come back to me.

MR. SIESS: That is right, you said to come you. Okay. Are you ready?

MR. SHEWMON: Yes. 66, the staff has sent out half a dozen different things for regulations and suggestions. Al Igne talks about one item there which is the water chemistry part. I don't have any problems with the resolution they give to it. I think they are looking at it and that is under control.

MR. SIESS: How is the resolution characterized for that?

MR. SHEWMON: I think they have it as a no-never-mind because the probability of failure is very low, or three times ten to the minus six is the contribution to core melt.

MR. SIESS: Any questions?

(No response.)

MR. SHEWMON: 86 is stress corrosion cracking. As I grow older I remember better Mike Bender's comment. When I told him that we knew how to cope with stress corrosion cracking, he said he was so old that he had seen the solution of it come up eight different times.

(Laughter.)

And maybe we can add nine now. They list a bunch of things, each of which are suggestful ones which includes hydrogen water chemistry, stress control and other things.

MR. REED: Is this high priority or what?

MR. SIESS: The resolution is available.

MR. SHEWMON: Resolution available. I don't know. That seems to be one of their categories.

MR. SIESS: That says we know what is available. All we have got to do is get it done.

MR. REED: Well, I thought they were dividing them into high and low priorities and medium and stuff.

MR. SIESS: No, there are several priorities. If you don't 960 we will get you a copy of it.

MR. MARK: They have done the work except for putting in on the official list of regulations.

MR. REED: Well, all I can say is that BWR pipe cracking is on my special list.

MR. SIESS: I have got several items where we have not had a formal response. Is Dick Savio here?

MR. SAVIO: Yes, sir.

MR. SIESS: There are two that were assigned to Okrent. Look at page 8. One of them is No. 68 on the postulated loss of aux feedwater system resulting from turbine drive aux feedwater pump steam supply line rupture. The other is 53, consequences of a postulated flow blockage in a BWR. The other two on page 8 were the ones that Carl reported on.

Has Okrent approved these, Dick.

MR. SAVIO: Yes, sir. This is his memo.

MR. DURAISWAMY: He wrote that letter.

MR. SIESS: Okay. I am sorry. Okrent agrees with both of these. One is a drop and the other is high.

Does anybody have any questions? I can't explain them, but somebody else might.

(No response.)

I hear no objections.

If Okrent agrees to a drop, I will agree to a drop.

(Laughter.)

Now I have got two sets of issues left. I have got a couple here from Mr. Ward, 102 and Human Factors No. 1 that we have heard nothing from you and I would suggest that we try to do something at this time on it.

MR. WARD: Well, 102, that is the one that Glenn just talked about, isn't it? Isn't that the same one?

MR. SIESS: It is human error in events involving wrong unit or wrong train.

MR. WARD: Which ones are we talking about here?

MR. SIESS: You have got a package there that says 102 and HF-1.

MR. WARD: Okay. HF-1 is the human factors program plan, and that has got a high ranking. I don't disagree with that.

(Laughter.)

MR. SIESS: It would be a little hard to, wouldn't it?

MR. WARD: Yes, but I think they have actually gone through the process and calculated some reduction in human error that all this stuff will do and run that through as a reduction in risk. We heard that a couple of years ago and it probably hasn't changed much.

I guess what I don't understand is why is this an issue that we are reviewing today?

MR. SIESS: Because it was sent to us by Mr. Denton and we were asked to review it.

MR. WARD: Wasn't it categorized three years ago or something?

MR. SIESS: No. This was an NRR item that was not on the original list and it came to us in February and asked for comments.

MR. MINNERS: To a degree it is an administrative action. The human factors program plan was written up some years ago, and this is just an effort to get it through and into the generic issues program and try to get it agreed to. It is still going on and they are still revising the human factors program plan.

MR. WARD: Okay. Well, we agree with the high ranking. I don't have any reason to disagree with that.

MR. SIESS: Okay. Any questions on that?

(No response.)

What about 102?

MR. WARD: That has been put into the one Glenn was talking about as combined with HF-02 as part of the maintenance program plan.

MR. SIESS: It is combined with HF-02, and that satisfies you?

MR. WARD: Yes.

MR. MICHELSON: Well, I haven't looked at the program plan for a while, but as I recall, it was a staged sort of thing, phase one and phase two.

MR. SIESS: Are you back on ---

MR. MICHELSON: Well, I am really going to address HF-02 now, which is supposed to have been incorporated in 102, as I understand it.

MR. SIESS: Right.

MR. MICHELSON: And HF-02 is a kind of a program that goes in phases, and at the end of each phase you decide whether you are even going to go another step to another phase and so forth.

Is the wrong train wrong unit kind of work going to be done in phase one? I don't recollect, but I thought that would be further down the road. I am just not sure. It may be if it is in phase one that I guess we are reasonably sure it is going to happen because we know phase

one, or we think we know phase one is going to be done.

MR. MINNERS: There is a caveat on the letter, Mr. Michelson that addresses that. It says, "However, DHFS stated that they would re-evaluate this issue in the near future to determine if resolution as a separate issue would be appropriate."

We told them that if they decide to do that, then they have got to send it back to us and we will re-prioritize it as a separate issue. So they seemed to have qualms also that the staged maintenance program is going to do it like they want to.

MR. MICHELSON: So I guess what you are saying is that if there is a maintenance program, we will put it in there, but if the maintenance program disappears and doesn't proceed on, we will pull it back out and rethink it. I think that would be an acceptable answer.

MR. REED: From my point of view, and we are going to have a meeting shortly on the maintenance surveillance program, but from my point of view if it is in there, and I didn't realize that that specifically was in there, wrong train, wrong unit, we will cover it under something like selection and aptitude of people.

(Laughter.)

We have got consultants coming in for a meeting already.

MR. WARD: And I think John Schiffgens points out that this may be a problem of whether it is really covered. You know, I think we need to look when we review the program, we need to look to see that this is really covered in there.

MR. SIESS: If it isn't, then it reverts back to 102.

MR. WARD: Yes.

MR. MICHELSON: Part of that is in phases.

MR. REED: That is what I don't know myself. I am sort of surprised at the moment, and I don't have a copy of the maintenance surveillance.

MR. SIESS: You know, I am surprised that people are surprised. You have had this material for months.

MR. WARD: I am surprised you are surprised.

(Laughter.)

MR. SIESS: Okay. The resolution is acceptable.

MR. WARD: We are going to keep our eye on it.

MR. SIESS: They have got to bring it back. Do you want to comment that if it goes into the program you want it at a high level? See, if it doesn't go into the HF-02 ---

MR. WARD: We want it at a visible level I guess.

MR. SIESS: If the human factors people don't

take it, then it comes back to Warren and then they have got to reprioritize it and then we see it again. But it could go in there an get lost and you don't want it to get lost.

MR. WARD: No. We want it to be visible.

MR. SIESS: Well, maybe you need to write a sentence that will remind us to follow it.

MR. MICHELSON: We need to take this one with comments.

MR. SIESS: Yes. I think this one ought to have a comment that if it goes into the human factors program that we would like to see where it fits into it.

MR. WARD: You can be explicit. Sam will take care of it.

MR. SIESS: And if it doesn't go in, it automatically come back and that is no problem.

MR. HERNAN: Dr. Siess, regardless of what system it goes into, I know for a fact that this item is actively working within NRR. Today in fact there is a party at one of the plants, and I am sure which it is, as we sit here.

MR. REED: Well, there was just another recent event on wrong train which showed up in the morning report I believe.

MR. SIESS: Well, there is going to continue to

be such events whether they paint them green and blue or red and orange.

Okay. Don't laugh, Jesse, because the next item is yours.

(Laughter.)

MR. EBERSOLE: I have been anticipating that.

MR. SIESS: There are four items and you have got some recommendations from Rich Major.

MR. EBERSOLE: Item No. 1 is 59.

MR. SIESS: Okay. Take them in order.

MR. EBERSOLE: Technical specification requirements for plant shutdown when equipment for safe shutdown is degraded or inoperable.

In the long run I am going to agree with the staff recommendation that this be addressed as part of the technical specification improvement project, which is where it would have to rest eventually anyway. So I take no disagreement with the resolution of this issue. I think it has been widely advertised.

MR. SIESS: And no comments?

MR. EBERSOLE: No comments, right. I think that is a proper place for it.

MR. SIESS: Any objections?

(No response.)

MR. EBERSOLE: Now, when we get to the second

one, it is General Issue No. 80, and that is this weird one where we talk about the combined effects of a LOCA tearing or rather compressing or otherwise destroying the function of the control rod drives or a substantial part of them for a boiler.

This has been going on for some years now and lots of new information has come out about how a boiler behaves when it looses its water without boron.

As a matter of fact, just yesterday you heard Glen Sherwood say that they have found that they can get the reactor down to low power by depressing the pressure and keeping the level down and the plant will come to low pressure. That knowledge is not reflected in here anywhere, and I think maybe that ought to be relooked at in this context.

But I want to go to a more fundamental thing. I heard the safety goal presentation the day before yesterday and partly yesterday, and I notice here, as well as through all the other black holes of cost risk benefit analyses that we continue to use as the criterion for whether we do or we do not these 30 man-rem or "x" man-rem multiplied by the usual thousand bucks.

My understanding now is that we can do this a new way which will include the averted cost onsite and some estimate of averted cost offsite which represents a factor

of something like 10 in improvement and the possibility of making alterations and improvements and backfits to the plants.

I don't see this number reflected in this or I suspect any other of these studies we have been doing. What is going on here?

EVENING SESSION

(6:00 p.m.)

MR. MINNERS: The core melt frequency is too low to show up. The core melt frequency is 10 to the minus 8th. If you multiply the figure of $20 million by 10 to the minus 8th, it doesn't show up.

MR. EBERSOLE: It is 10 to the minus 6th here.

MR. KERR: Jesse, the document you are talking about is a proposal by the staff to the Commission.

MR. EBERSOLE: The question was raised were we in fact at this time in the course of doing this prioritization business doing what is now being I presume officially recognized as the right thing to do of estimating backfit expenses on the basis of not merely man-rem per year averted at the thousand dollars a man-rem, but also cost averted to onsite and offsite.

MR. REED: When was that, Jesse? That was yesterday?

MR. SIESS: No, that was on the safety goal.

MR. EBERSOLE: I know, I am talking about that.

MR. MARK: Yes, but this hasn't even gone to the Commission and it hasn't gone through the lawyers, it hasn't gone through public comments.

MR. REMICK: The statement was made that the staff in its own prioritization reviews is not limiting itself to just the thousand dollars per man-rem and that they were considering other costs.

MR. EBERSOLE: Right, represented by a factor of 10.

MR. REMICK: Well, I think the factor of 10 came in that if they did include that, it would be about a factor of 10.

MR. EBERSOLE: They did include it. So I am adjusting the numbers here and it makes things look a bit different and it would make all of these look a bit different if this is in fact true, Chet.

MR. SIESS: Not all of them.

MR. EBERSOLE: Well, not all, but quite a few.

MR. SIESS: It is 10 to the minus 9.

MR. EBERSOLE: Well, it wouldn't make this one go up very much.

MR. MICHELSON: How do we factor in this idea now of leak before break? If you get a leak before break you won't get this kind of an interaction then.

MR. EBERSOLE: That hasn't been attributed yet to these boilers with these cracking pipes.

MR. MICHELSON: Well, we are just about to do it.

MR. SIESS: Not to boilers.

MR. MICHELSON: No, that is right. Okay.

MR. SIESS: See, the main thing you have got going here is that you have got two sets of control rod drives and it is awful hard to get both of them.

MR. MINNERS: I assure you again, Jesse, that onsite costs are included in the prioritizations. They are not included in the ratios, but when they are significant they are discussed under other considerations unless we screwed up.

MR. EBERSOLE: Well, I just see here the terminal number of priorities call for 30 man-rem per million dollars and that is not enough.

MR. MINNERS: But the core melt frequency is 10 to the minus 8th in this case, and onsite damages won't come up to a big enough number to even come into this thing.

MR. MICHELSON: Is the core melt frequency so low because of the probability not necessarily of the break but of betting the right combination of lines? Is that how it got that role?

MR. MINNERS: I haven't read the issue in so long. I am sorry.

MR. MICHELSON: I haven't either.

MR. SIESS: Rich Major's comment was -- what did I do with it. Rich apparently read it and he said that for failure to scram to occur a pipe whip or missile or jet must exactly crimp the withdraw lines shut.

MR. MICHELSON: Yes, but you only have to get a group. You don't have to get them all. You have to get a sufficiently large group.

MR. EBERSOLE: Again, Chet, I point out that just today as a matter of fact, with GESSAR we make new findings about ATWS, and this is an ATWS of course. That is a post-LOCA ATWS.

MR. SIESS: Well, you might want Rich to explain it. He has read it presumably.

MR. EBERSOLE: It is certainly a new picture now that we have about how a boiler will operate when it is one third low on water and has no pressure and has no boron.

MR. SIESS: Has anybody here read the staff's analysis?

MR. EBERSOLE: I have read it and it is a complicated thing. It gets so weird I guess I lose touch about the 20th page.

MR. SIESS: So it is your gut feeling ---

MR. EBERSOLE: I don't think this is clean yet, and I have no real basis ---

MR. SIESS: Well, I think we had it once before and sent it back.

MR. EBERSOLE: One time we sent it back on the grounds that we -- what was it? I am trying to think now.

MR. SIESS: Mark I versus II I think, or Mark I's and II's versus ---

MR. EBERSOLE: Yes, that is right. We wanted to look at their earlier containments. That was it. I think I would just ask for a new look at that, just to go back to the physical analysis.

MR. SIESS: They have made two looks at it. Now what do we want them to look at?

MR. EBERSOLE: Well, look at the current findings on the operation of boilers when they are at low pressure and at low water levels.

MR. SIESS: Do you understand that?

MR. MINNERS: No.

MR. EBERSOLE: You don't? That is the finding now, that you don't need any boron in these boilers even with the rods out.

MR. MINNERS: Then that would even make it a lower priority.

MR. EBERSOLE: Well, that is true, if you could

manage to hold them together there. I am not going to argue with low priority as it stands.

MR. SIESS: Okay.

MR. EBERSOLE: And it sounds like it might even be better. As a matter of fact, I am sick of this thing and I think I am going to let it go.

(Laughter.)

MR. SIESS: You go along with the low then, Jesse.

Okay. Your next one is 90 then.

MR. EBERSOLE: Let me put it this way. I think there is much more trouble in the basic scram system design than in a fundamental ATWS by itself.

MR. SIESS: You don't think it takes a pipe break to mess it up.

MR. EBERSOLE: No.

(Laughter.)

MR. SIESS: Okay. You have two more.

MR. EBERSOLE: Let me go to the next one, technical specs for anticipatory trips. I can be happy with this being low on the groups that I see it as only a capital investment and operation damage problem with little or no real significance to the public.

It is something in which its occurrence would be punitive to the very people that need to be punished,

just like TMI-2. So I have no problem with that being a low priority.

MR. SIESS: Okay. Any other comments?

(No response.)

MR. EBERSOLE: And of course I never do have any problem with such a thing as the last one which is high priority. That is one that has to do with steam binding of the aux feedwater pumps, and I think that is entirely correct that we have a high priority to fix that.

I might mention that Palo Verde claims that they are not subject to that jeopardy because they operate with closed valves, but then Glenn doesn't like closed valves. So we have that conflict.

MR. SIESS: Any questions, gentlemen?

(No response.)

I think we have got a couple with comments and none that we disagree with.

MR. DURAISWAMY: You have got three items with comments.

MR. SIESS: Three items with comments and one we disagree with. So you can proceed to prepare a letter for tomorrow.

MR. DURAISWAMY: I have the letter ready.

MR. SIESS: He has got it all ready. This will be Version A. You will see it tomorrow, gentlemen.

I am through, Mr. Chairman.

Thank you, gentlemen. We will see you next year then.

MR. WARD: Did we finish this?

MR. SIESS: Yes.

MR. WARD: We have one more item of business before we recess for the evening. Max Carbon had proposed a motion and we thought it would be best to wait most all the members were back before we discussed it and voted on it.

Would you please restate that, Max?

MR. CARBON: The motion was that we take action to have the requirement that we write an annual report to Congress on the research activities, that we have that rescinded, however, if we go about doing that.

MR. SIESS: I will second the motion.

MR. WARD: Is there any discussion?

MR. REED: I would like to say that somewhere around the Harpers Ferry meeting, or wherever this originated I am not surprised that we now want to rescind because I thought we had our mouths too big for our stomachs at that point ---

MR. SIESS: The idea originated long before Harper's Ferry, I can assure you.

MR. KERR: This is the report on the research?

MR. CARBON: Yes, our report to Congress.

MR. KERR: And what is the significance of the motion?

MR. SIESS: We would like to ask the Congress to let us out of it.

MR. KERR: That we just request it?

MR. SIESS: No, it is legislation. It is in the Act. We will probably have to go and talk to Congressional Affairs and talk to the Commission about it. We could propose it.

MR. REMICK: Well, is it in the Act or was it an appropriation or authorization?

MR. SIESS: It is in the Act. I am sorry. I was corrected this morning on that.

MR. WARD: So I guess, Max, your motion isn't that we do it, but we figure out how to go about this. Isn't that the thrust of your motion?

MR. CARBON: Yes, figure out how to go about it and accomplish it.

MR. WARD: To start some action.

MR. SIESS: We can send the Vice Chairman up to talk to Mr. Udall.

MR. REED: Let me apologize. I think I am talking about something else than what you are talking about. There was another report that we thought we would write on the status of safety.

MR. SIESS: We have got a subcommittee working on that.

MR. WARD: Let's see, Max and a motion and it has been seconded.

All in favor signify by raising their hands.

(Show of hands.)

Opposed?

(No hands raised.)

It seems to be unanimous.

MR. SIESS: I just said in all seriousness, let Hal Lewis talk with Henry or somebody and explore it.

MR. MICHELSON: At least it has got the committee's support.

MR. CARBON: That is the kind of thing that I would envision.

MR. SIESS: He volunteered to do it at Harpers Ferry.

MR. CARBON: Henry has said that the report, that nobody pays any attention to it and it is useless. So somebody go there and say how do we get this whole think killed if it is useless.

MR. REED: In accordance with the Paper Reduction Act.

(Laughter.)

MR. WARD: Dr. Kerr.

MR. KERR: I want to thank the small number of people who have responded to our request for a list of safety issues.

(Laughter.)

MR. SIESS: If we didn't respond, that might mean we don't know that there are any safety issues. I was going to look at the agenda for this meeting, and I thought that would probably give me a start on a list. Obviously we are not spending time on things that aren't safety issues.

MR. WARD: Is there anything else that needs to be covered?

(No response.)

Okay. We will recess until in the morning.

(Whereupon, at 6:13 p.m., the committee recessed, to reconvene at 8:30 a.m., Saturday, May 11, 1985.)

- - -

CERTIFICATE OF OFFICIAL REPORTER

This is to certify that the attached proceedings before the UNITED STATES NUCLEAR REGULATORY COMMISSION in the matter of:

NAME OF PROCEEDING: ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
301ST GENERAL MEETING

DOCKET NO.:

PLACE: WASHINGTON, D. C.

DATE: FRIDAY, MAY 10, 1985

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission.

(sign) Mary C. Simons

(TYPED)
MARY C. SIMONS

Official Reporter
ACE-FEDERAL REPORTERS, INC.
Reporter's Affiliation

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(sigt) David L. Hoffman

(TYPED)

David L. Hoffman

Official Reporter

Ace- Federal Reporters, Inc.

Reporter's Affiliation

EARTHQUAKE CONSIDERATIONS IN EMERGENCY PREPAREDNESS

ACRS PRESENTATION

MICHAEL T. JAMGOCHIAN

MAY 10, 1985

RATIONAL USED IN PROPOSED RULE

- EMERGENCY PLANS ARE FLEXIBLE
- LOW PROBABILITY OF EARTHQUAKES AND COINCIDENT RELEASE
- FEMA HAS AN ACTIVE PROGRAM OF EARTHQUAKES PREPAREDNESS

FOCUS OF PROPOSED RULE

"NEITHER EMERGENCY RESPONSE PLANS NOR EVACUATION TIME ANALYSIS NEED CONSIDER THE IMPACTS OF EARTHQUAKES..."

PUBLIC COMMENTS

- APPROXIMATELY 60 LETTERS RECEIVED
  - 25 FAVORED THE RULEMAKING
    - UTILITIES
    - CONSULTING FIRMS
    - CITIZENS
    - DOE
  - 36 AGAINST THE RULEMAKING
    - ENVIRONMENTAL GROUP
    - PRIVATE CITIZENS

(A FEW OF THESE LETTERS WERE IN SIGNED PETITION FORM)

- INPUT ALSO RECEIVED FROM FRANCE, JAPAN AND SWEDEN

STAFF APPROACH

- PROVIDE FOR COMMISSION CONSIDERATION A 3 ALTERNATIVE APPROACH PAPER WITH A STAFF RECOMMENDATION

  1. TO PROMULGATE PROPOSED RULE INTO A FINAL RULE.

  2. LEAVING THE ISSUE OPEN FOR ADJUDICATION ON A CASE BY CASE BASIS

  3. TO REQUIRE LIMITED CONSIDERATION OF EARTHQUAKES IN EMERGENCY PREPAREDNESS

PROBLEMS IDENTIFIED BY COMMENTERS

- LIMITED RECORD BASIS
- LIMITED PRA's
- RULE MAY VIOLATE EMERGENCY PLANNING PRINCIPLES (THE NEED TO ASSUME DESIGN FAILURE)
- THE MISUSE OF INITIATING EVENTS COMPARED TO CONSEQUENCES
- RELIANCE ON SEISMIC DESIGN
- SEISMIC RISK IS SIGNIFICANT
- CONSTRUCTION DEFECTS
- THE MISUSE OF FLEXIBILITY OF EMERGENCY PLANS
- EARTHQUAKES ARE DISTINCT PHENOMENA

PROBLEMS

- TRANSCRIPTS NOTED A LACK OF FACTUAL BASIS

- TRANSCRIPTS NOTED EMPHASIS ON THE SPEEDY LICENSING OF DIABLO CANYON

- TRANSCRIPTS NOTED THAT THE STAFF (IE & OGC) FELT THAT THE EFFECTS OF EARTHQUAKES SHOULD BE CONSIDERED IN EMERGENCY PLANS.

Agenda for ACRS
Meeting on May 10, 1984
3:00 p.m.
Room 1046, H Street

RECENT SIGNIFICANT EVENTS

	TITLE	EVENT DATE	PRESENTER	Page
1.	Summer Premature Criticality	February 28, 1985	P. Burnett, Reg 2	Not in Package
2.	Millstone Unit 2 S/G Tube Defects	April 10, 1985	M. Wegner, IE	2
3.	Palo Verde 2 Weld Leaks in UHS Piping	March [illegible], 1985	J. Collins, IE	5
4.	North Anna 2 Revision to EDG Testing Requirements	March 15, 1985	J. T. Beard, NRR	14

IE STAFF PRESENTATION TO THE ACRS

SUBJECT:

CHEMICAL CLEANING OF THE SECONDARY SIDE OF THE STEAM GENERATOR AT MILLSTONE 2

DATE:

MAY 6, 1985

PRESENTER:

MARY S. WEGNER

PRESENTER'S TITLE/BRANCH/DIV:

NUCLEAR ENGINEER

EGCB:DEPER

PRESENTER'S NRC TEL. NO.:

492-4511

SUBCOMMITTEE:

2

CHEMICAL CLEANING OF THE SECONDARY SIDE OF THE STEAM GENERATORS AT MILLSTONE 2

- CONDITIONS PRIOR TO CLEANING
  - TUBE HISTORY
  - CORROSION PROBLEMS
- THE CLEANING PROCESS
  - QUALIFICATION
  - RESULTS
- POST-CLEANING TEST RESULTS
  - STEAM GENERATOR 1
  - STEAM GENERATOR 2
- IMPLICATIONS
  - CLEANING
  - EDDY CURRENT TESTING
  - NRC ACTIONS CONTEMPLATED

CHEMICAL CLEANING OF THE SECONDARY SIDE OF THE STEAM GENERATORS AT MILLSTONE 2

Prior to 1985 outage

SG-1		SG-2
894 SLEEVED		1128 SLEEVED
941 PLUGGED		759 PLUGGED

Estimated 1985 repairs

SG-1		SG-2
1661 SLEEVED		1235 SLEEVED
12 PLUGGED		7 PLUGGED

Following 1985 outage

SG-1		SG-2
2555 SLEEVED		2365 SLEEVED
953 PLUGGED		766 PLUGGED

PALO VERDE NUCLEAR GENERATING STATION (PVNGS)
WELD LEAKS IN ULTIMATE HEAT-SINK PIPING (UHSP)
MAY 6, 1985 (W. J. COLLINS)

INTRODUCTION:

TO PRESENT LICENSEE'S INSPECTIONS UNDERTAKEN, OUTCOME OF INSPECTIONS, ANALYSIS AS TO CAUSE OF PROBLEM, AND PLANNED REMEDIES

o UNIT 2

-- DURING PLANT PREOPERATIONAL TESTING ON MARCH 1, 1985 A LEAKING WELD IN ESSENTIAL SPRAY POND (SOUTH SPRAY POND) WAS IDENTIFIED

-- ESP PIPING IS TYPE 316L STAINLESS STEEL, SCHEDULE 10, HAVING TYPE 308L WELD FILLER METAL

-- LEAKING WELD LOCATED IN EIGHT INCH DIAMETER PIPE SECTION

o EXPANDED INSPECTION - UNITS 1 AND 2

-- RESULTS OF VISUAL INSPECTION AVAILABLE TO DATE:

	UNIT 1 SO. POND	UNIT 2 NO. POND	UNIT 2 SO. POND
TOTAL WELDS	316	353	272
WELDS INSPECTED	299	353	272
INACCESSIBLE WELDS	17	2	5
WELDS WITH LEAKS	2	42	4
TOTAL LEAKS FOUND	3	55	4
WELDS W/SUSPECT AREAS*	8	39	14

*SMALL SURFACE PITS, RUST, AND NON-LEAKING HOLES

o EXPANDED INSPECTIONS (continued)

-- RESULTS OF RADIOGRAPHY INSPECTION (RT) AVAILABLE TO DATE

	UNIT 1 SOUTH POND	UNIT 2 NO. & SO. POND
TOTAL RT'D	57	20
TOTAL INTERNAL PITTING OBSERVED BY RT	47	18
NO INDICATIONS (RT)	10	2

o VT AND RT SHOW THE WELD DEGRADATION TO BE DUE TO LOCALIZED CORROSION PITTING ATTACK AT THE STAINLESS STEEL WELDS

o OTHER SYSTEM INSPECTED

DUE TO PITTING FOUND IN UNITS 1 AND 2 ESSENTIAL SPRAY POND PIPING, EXAMINATIONS WERE PERFORMED AND PREVIOUS MAINTENANCE EXAMINATIONS RECHECKED IN OTHER SAFETY RELATED SYSTEM. THESE INCLUDED:

-- PLASCITE LINED CARBON STEEL SPRAY POND PIPING OUTSIDE THE SPRAY POND STAINLESS STEEL HEADERS, DURING SUMMER OF 1984, WITH REMOTE CONTROLLED TV CAMERA. NO PITTING OBSERVED.

-- PERIODIC VISUAL EXAMINATION OF HEAT EXCHANGERS AND VALVES DURING MAINTENANCE HAVE SHOWN NO EVIDENCE OF BACTERIA RELATED PITTING.

-- AUXILIARY FEEDWATER PUMP IN UNIT 2 SHOWED MINOR PITTING, BELIEVED TO INVOLVE BACTERIA, ABOUT TWO YEARS AGO. RT OF PIPE WELDS ADJACENT TO BOTH PUMPS SHOWED NO EVIDENCE OF PITTING. ALSO VISUAL EXAMINATION OF PIPING INTERIOR AT ABOUT 10 WELDS IN EACH TRAIN, AFTER REMOVAL OF STRAINER FLANGED PIPE SPOOLS, SHOW NO EVIDENCE OF PITTING OR UNUSUAL DEPOSITS.

-- IN FALL 1983, 23 PIPE WELDS AND 10 SOCKETS IN THE SAFETY INJECTION, CHARGING, AND POOL COOLING SYSTEMS WERE RT'D. NO EVIDENCE OF PITTING WAS OBSERVED.

-- IN MARCH 1985, 2 WELDS AT A SAFETY INJECTION VALVE (UNIT 1) WAS EXAMINED WITH NO EVIDENCE OF PITTING OR UNUSUAL DEPOSITS.

-- BASED ON THESE EXAMINATIONS, APS BELIEVES THE MIC IS CONFINED TO THE SPRAY POND STAINLESS STEEL PIPING.

- CAUSE OF PITTING ATTACK

  -- TWO SECTIONS OF 14-INCH DIAMETER PIPE WELDS REMOVED FOR EVALUATION

  -- MICROBIOLOGICAL ANALYSIS OF CORROSION PRODUCT REMOVED FROM PITS DISCLOSED THE PRESENCE OF GALLIONELLA, AN IRON BACTERIA IN BOTH WELDS.

  -- METALLOGRAPHY EXAMINATION OF PITS REVEALED A PATTERN OF CONCENTRIC RINGS WITH PREFERENTIAL ATTACK ALONG DENDRITIC PATHS OF THE WELD, TYPICAL OF MICROBIOLOGICAL INFLUENCED CORROSION (MIC) PITTING OF STAINLESS STEEL.

  -- THE RUST COLORATION OF TUBERCLE CORROSION PRODUCTS, SELECTIVE NATURE OF ATTACK, CHARACTERISTICS OF CAVITATION AND THE POSITIVE IDENTIFICATION OF GALLIONELLA BACTERIA LEAD THE LICENSEE TO CONCLUDE THE WELD DEGRADATION IS A RESULT OF MICROBIOLOGICAL INFLUENCED CORROSION.

  -- STAGNATION OF UNTREATED WATER AFTER INITIAL FLUSHING OPERATIONS BELIEVED TO HAVE LEAD TO BIOFOULING AND SUBSEQUENT PITTING ATTACK

  -- REVIEW OF CASE HISTORIES OF SIMILAR OCCURRENCES IN SERVICE WATER SYSTEMS AT OTHER PLANTS SUPPORT THIS CONCLUSION.

MIC - CASE HISTORIES (continued)

- H. B. ROBINSON UNIT 2
  - -- EXTENDED MAINTENANCE OUTAGE (JANUARY 1984 - NOVEMBER 1984)
  - -- SCHEDULE 10, STAINLESS STEEL SECTIONS OF SERVICE WATER SYSTEM
  - -- 54 WELDS LEAKING; 22 OUTSIDE/32 INSIDE CONTAINMENT
  - -- ABOUT 800 SLEEVES TO REPAIR
  - -- MIC DETERMINED TO BE CAUSED BY PRESENCE OF SLIME FORMING BACTERIA, IRON BACTERIA, AND SRB IN LAKE WATER

- WOLF CREEK
  - -- MARCH 1984
  - -- HEAT EXCHANGERS SWS
  - -- CARBON STEEL WATER BOXES ATTACK
  - -- COPPER-NICKEL TUBING ATTACK
  - -- DAMAGED COMPONENTS REPLACED
  - -- CHEMICAL-STEAM-MECHANICAL CLEANING
  - -- 0.22 TO 0.35 PPM CL 22 HRS/DAY IN SWS AND ESW
  - -- 0.22 PPM CL 2 HRS/DAY IN CIRCULATING H_2O SYSTEM
  - -- SURVEILLANCE INSPECTION
  - -- BACTERIA - SRB

- FT. ST. VRAIN
  - -- OPERATIONS - 1984
  - -- PCRV TENDON WIRES - HEAVY GENERAL CORROSION AND SCC
  - -- ATTRIBUTED TO ORGANIC ACIDS (CABOXYLIC)
  - -- ORGANIC ACID FORMATION ATTRIBUTED TO BACTERIA INTERACTION WITH TENDON GREASE (SUGGESTED BY HIGH CO_2, H_2, AND LOW O_2 LEVELS IN GAS SAMPLING)
  - -- TENDONS SYSTEM HAS THE REQUIRED NUTRIENTS FOR BIO-ACTIVITY
    - ° 3% SULPHONATED GREASE
    - ° NEUTRAL pH
    - ° OXYGEN
    - ° MOISTURE
  - -- PSUDOMINAS GENUS AND POSSIBLY OTHER SRB

- COMANCHE PEAK UNIT 1
  - -- MAIN CONDENSER - MARCH 1985 - TENTATIVE PROBLEM

MIC - CASE HISTORIES

- PRAIRIE ISLAND UNIT 1
  - -- CONSTRUCTION
  - -- STAINLESS STEEL CONDENSATE STORAGE TANK (SOURCE OF POTABLE WATER FOR CONSTRUCTION)
  - -- DEEP WELLS CONTAINING IRON AND SULFIDE BACTERIA
  - -- SEVERE PITTING CORROSION OF WELD SEAMS

- NORTH ANNA UNITS 1 AND 2
  - -- OPERATIONS - APRIL 1981 - PROBLEM ONGOING
  - -- 1981 UNIT 1; SERVICE WATER SUPPLY HEADER "B" RETURN HEADERS TO LUBE OIL COOLERS
  - -- 1982 UNIT 1; SERVICE WATER SUPPLY HEADER "A"
  - -- 1983 UNIT 1; SERVICE WATER SUPPLY HEADERS "A" AND "B"
  - -- 1983 UNIT 2; SERVICE WATER SUPPLY HEADER "B"
  - -- LAKE WATER SOURCE: HIGH OXYGEN AND LOW pH
    - ° SULFATE REDUCERS (SULFIDE PRODUCERS)
    - ° ENSHEATHED IRON BACTERIA
    - ° FILAMENTOUS IRON BACTERIA
  - -- SEVERE PITTING CORROSION OF WELDS IN CARBON STEEL PIPING

- SALEM UNIT 1
  - -- OPERATIONS - DECEMBER 1982
  - -- REPLACEMENT 316 SS PIPING IN COMPONENT COOLANT WATER SYSTEM (REPLACED CEMENT-LINED PIPING TO HX'S)
  - -- SHOCK CHLORINATION CONCENTRATION LIMITED BY EPA IN WARMER MONTHS
  - -- MICROBES: IRON BACTERIA (POSSIBLY GALLIONELLA PRODUCING ACIDIC FERRIC CHLORIDE AND MANGANIC CHLORIDE)
  - -- SEVERE PITTING CORROSION OF WELDS

- LIMERICK UNIT 1
  - -- OPERATIONS - JANUARY 1984
  - -- MAIN CONDENSER - 3300 ADMIRALTY BRASS TUBES
  - -- CRACKING AND PITTING FROM OD SIDE
  - -- FOULING BY ORGANIC DEPOSITS (80 PERCENT) CONTAINING BACTERIA (20 PERCENT) INCLUDING IRON BACTERIA - GALLIONELLA

o PLANNED REMEDIES

SEVERAL GENERAL METHODS HAVE BEEN EMPLOYED TO CONTROL MIC IN SERVICE WATER SYSTEMS IN POWER PLANTS. THESE HAVE INCLUDED:

-- PROTECTIVE COATINGS IN CONJUNCTION WITH CATHODIC PROTECTION
-- WATER CHEMICAL TREATMENT WITH BIOCIDES
-- MAINTAIN CONTINUOUS ON-LINE CIRCULATION AT ALL TIMES
-- CLEANING, DEMINERALIZED WATER FLUSHING AND DRYOUT DURING OFF-LINE OPERATION, OR EXTENDED OUTAGES TO AVOID STAGNANT CONDITIONS CONDUCIVE TO BIOLOGICAL ACTIVITY

O APS STRATEGY

-- OPERATION OF SPRAY PUMPS ON A ROUTINE BASES TO AVOID STAGNATION
-- MAINTAIN RIGOROUS PROGRAM FOR WATER CHEMISTRY CONTROL
-- REGULAR USE OF BIOCIDES TO CONTROL BIOACTIVITY
-- PERFORM PRESSURE vs. FLOW MONITORING PROGRAM (QUARTERLY MEASUREMENTS) TO ENSURE SPRAY PONDS ARE CAPABLE OF PERFORMING INTENDED FUNCTION AT ALL TIMES
-- RADIOGRAPHICALLY EXAMINE A SAMPLE OF PREVIOUSLY RT'D WELDS AT FIRST REFUELING OUTAGE TO ENSURE MIC UNDER CONTROL

MICROBIOLOGICAL INDUCED CORROSION (MIC)

- CORROSIVE ACTION THAT OCCURS AS A DIRECT OR INDIRECT RESULT OF LIVING MICROORGANISMS IN CONTACT WITH MATERIALS OF CONSTRUCTION

- HABITAT

  -- SOILS - SEDIMENT
  -- NATURAL FRESH WATER
  -- SEA WATER
  -- NATURAL PETROLEUM PRODUCTS

- PHYSIOLOGY

  -- CAN TOLERATE - 10°C TO 90°C TEMP
  -- 0 TO 10.5 pH
  -- 0 TO 100 PERCENT OXYGEN CONC.
  -- EXTREME HYDROSTATIC PRESSURE

- METABOLIC PROCESSES OF MICROORGANISMS SUSTAINED BY CHEMICAL REACTIONS

  -- ACID PRODUCERS (ORGANIC-INORGANIC)
  -- HYDROCARBON FEEDERS
  -- SULFATE REDUCERS
  -- METAL ION CONCENTRATORS/OXIDIZERS
  -- SLIME FORMERS (FORM CONCENTRATION CELL CORROSION ACTIVITY)
  -- MOLD GROWERS

- EXAMPLES

  -- DESULFOVIBRIO DESULFURICANS - SULFATE REDUCERS/DEOXIDIZERS
  -- GALLIONELLA, SPHEROTILUS - OXIDIZE IRON TO FERROUS COMPOUNDS, GENERATE ACIDIC FERRIC CHLORIDE, AND MANGANIC CHLORIDES WHICH ARE AGGRESSIVE TO STAINLESS STEEL

- CORROSION MORPHOLOGY

  -- EXTREME CAVITATIOUS PITTING: DISTINCTLY DIFFERENT FROM CHEMICAL PITTING CORROSION

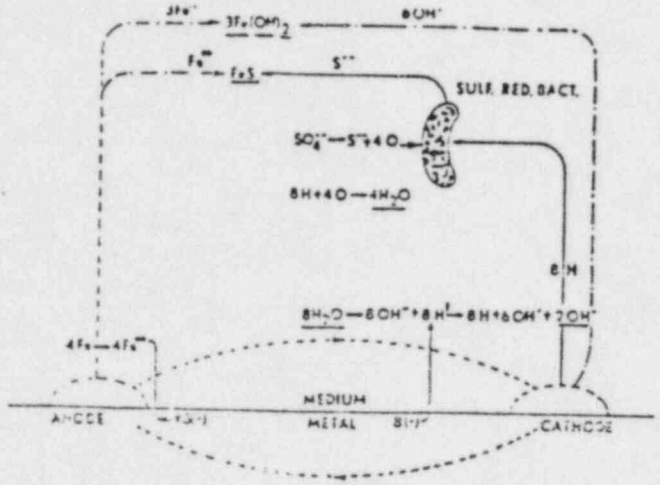

FIGURE 1 — Graphical presentation of the hydrogenase theory of corrosion by sulfate reducing microbes.[6]

$$8H_2O \rightarrow 8OH^- + 8H^+ \quad (1)$$
(electrolytic dissociation of water)

$$4Fe \rightarrow 4Fe^{++} + 8e^- \text{ (anode reaction)} \quad (2)$$

$$8H^+ + 8e^- \rightarrow 8H \text{ (cathode reaction)} \quad (3)$$

$$SO_4^= + 8H \rightarrow S^= + 4H_2O \quad (4)$$
(cathodic depolarization by sulfate reducing microbes)

$$Fe^{++} + S^= \rightarrow FeS \quad (5)$$
(corrosion product at anode sites)

$$3Fe^{++} + 6(OH)^- \rightarrow 3Fe(OH)_2 \quad (6)$$
(corrosion product at anode sites)

$$4Fe + SO_4^= + 4H_2O \rightarrow FeS + 3Fe(OH)_2 + 2(OH)^- \quad (7)$$
(summarized equation)

Some of the earliest investigations of corrosion by sulfate reducers were made by van Wolzogen Kuhr and his associates, of the Haarlem Water Works, in the 1920's and 1930's. His publications are considered classics in the field of corrosion science.

Van Wolzogen Kuhr[4] expressed his theory of the mechanism by which sulfate reducing microbes corrode metals with these equations:

NRR STAFF PRESENTATION TO THE ACRS

SUBJECT: NORTH ANNA --- CHANGES IN EDG TESTING

DATE: MAY 6, 1985

PRESENTER: MR. J. T. BEARD (X 27465)

PRESENTER'S TITLE/BRANCH/DIV: ORAB/OL

PRESENTER'S NRC TEL. NO.: 492-7465

SUBCOMMITTEE: RX. OPERATIONS.

-BACKGROUND-

CHRONOLOGY OF MAJOR EDG ITEMS AT NORTH ANNA

DATE	UNIT 1	UNIT 2
AUGUST 1984	"1H" OVERLOADED TO 131% (1/2 HOUR)	
DEC. 9, 1984		"2J" MAJOR ENGINE FAILURE. "2H" MAJOR ENGINE FAILURE. PLANT SHUT DOWN REQUIRED.
JAN. 9-10, 1984	ACRS BRIEFINGS	
JAN. 13, 1985		"2J" MAJOR ENGINE FAILURE. PLANT ENTERED EVERY 3-DAY TESTING
FEB. 1, 1985		EXIGENT T.S. RELIEF REQUESTED - LESS TESTING
FEB. 4, 1985	"1H" MAJOR ENGINE FAILURE	
FEB. 8, 1985	MEETING IN BETHESDA	
FEB. 13, 1985		PLANT VISIT TO OBSERVE "SLOW START"
MARCH 13, 1985		SUPPLEMENTAL SUBMITTAL ON T.S. CHANGE REQUEST
MARCH 15, 1985		"2J" MAJOR ENGINE FAILURE; PLANT SHUTDOWN REQ'D.
MARCH 23, 1985	ACTUAL PARTIAL LOSS OF OFFSITE POWER EVENT-EDGS PERFORMED SATISFACTORILY	
APRIL 2, 1985		FEDERAL REGISTER NOTICE ISSUED; 15-DAY COMMENT PERIOD
APRIL 19, 1985		SER COMPLETED
APRIL 25, 1985		LIC. AMMEND. ISSUED

CHANGES FOR NORTH ANNA EDG TESTING

GENERAL CATEGORIES

A. HOW EACH TEST IS CONDUCTED

B. HOW OFTEN TESTS ARE CONDUCTED

C. ACTION STATEMENT TESTS

D. RELIABILITY IMPROVEMENT PROGRAM

A. HOW EACH TEST IS CONDUCTED

- WARMUP, PRELUBE PRIOR TO EVERY PLANNED EDG START
- DELETE "FAST START" (10-SECONDS) FROM MONTHLY TEST
- DELETE "FAST LOAD" (60-SECONDS) FROM MONTHLY TEST
- COMBINE 1-HOUR LOAD RUN WITH TEST START
- CHANGE MONTHLY LOAD TEST FROM $\geq$ 2750 KW TO (2500-2600 KW)
- FAST START, FAST LOAD TEST EVERY 6 MONTHS
- CHANGE 18-MONTH LOAD TEST FROM $\geq$ 3025 KW TO TARGET OF 2950 KW (2900-3000 KW) FOR FIRST 2 HOURS.

B. HOW OFTEN TESTS ARE CONDUCTED

- CHANGE RELIABILITY BASIS FROM 0.99/UNIT TO 0.95/EDG
- DELETE 14-DAY AND 3-DAY TEST FREQUENCIES
- INCREASE TESTING (MONTHLY TO WEEKLY) IF:
  $\geq$ 5 FAILURES IN 100 TESTS
  $\geq$ 2 FAILURES IN 20 TESTS
- INCENTIVE FOR COMPLETE OVERHAUL
  14-TEST RELIABILITY CRITERION

C. ACTION STATEMENT TESTS

- FOR LOSS OF ONE OFFSITE CIRCUIT, EDG TEST ONLY IF NOT TESTED RECENTLY.
- CHANGE INITIAL EDG TEST FROM $\leq$ 1 HOUR TO $\leq$ 24 HOURS.
- TEST FOR COMMON FAILURE MODE MADE MANDATORY
- DELETE FOLLOWUP EDG TESTS (FOR $\leq$ 72-HOUR ACTION STATEMENTS)

D. RELIABILITY IMPROVEMENT PROGRAM

- PERFORMANCE MONITORING (TRENDING)
- DISCRETE FREQUENCY SPECTRA ANALYSIS
- EVALUATION OF PAST/PRESENT PRACTICES
- "SLOW START" TEST TRAINING
- JAPANESE EXPERIENCE EXCHANGE
- NUCLEAR GUIDELINES FOR EDG OPERATIONS
- MAINTENANCE TRAINING

SUPPLEMENTAL INFO

ROUTINE EDG TESTS

BEFORE:

4. Verifying the diesel starts from ambient condition and accelerates to at least 900 rpm in less than or equal to 10 seconds. The generator voltage and frequency shall be 4160 ± 420 volts and 60 ± 1.2 Hz within 10 seconds after the start signal. The diesel generator shall be started for this test by using one of the following signals with startup on each signal verified at least once per 124 days.

   a) Manual
   b) Simulated loss of offsite power by itself
   c) Simulated loss of offsite power in conjunction with an ESF actuation test signal
   d) An ESF actuation test signal by itself.

5. Verifying the generator is synchronized, loaded to greater than or equal to 2750 kw in less than or equal to 60 seconds, and operates for greater than or equal to 60 minutes.

AFTER:

4. Verifying the diesel generator can start** and gradually accelerate to synchronous speed (900 rpm) with generator voltage and frequency at 4160±420 volts and 60±1.2 Hz. Subsequently, verifying the generator is synchronized, gradually loaded** to an indicated 2500-2600 kw*** and operates for at least 60 minutes.

**This test shall be conducted in accordance with the manufacturers recommendations regarding engine prelube and warmup procedures, and as applicable regarding loading recommendations.

***This band is meant as guidance to avoid routine overloading of the engine. Loads in excess of this band for special testing under direct monitoring of the manufacturer or momentary variations due to changing bus loads shall not invalidate the test.

6-MONTH TEST (NEW)

c. At least once per 184 days the generator shall be started** and accelerated to at least 900 rpm in less than or equal to 10 seconds. The generator voltage and frequency shall be 4160±420 volts and 60±1.2 Hz within 10 seconds after the start signal.

The generator shall be manually sychronized to its appropriate emergency bus, loaded to an indicated 2500-2600 kw*** in less than or equal to 60 seconds, and operate for at least 60 minutes. The diesel generator shall be started for this test by using one of the following signals on a staggered test basis.

a) Simulated loss of offsite power by itself.
b) Simulated loss of offsite power in conjunction with an ESF actuation test signal.
c) An ESF actuation test signal by itself.

This test, if it is performed so it coincides with the testing required by Surveillance Requirement 4.8.1.1.2.a.4, may also serve to concurrently meet those requirements as well.

18-MONTH TEST (24-HOUR LOAD RUN)

BEFORE:

8. Verifying the diesel generator operates for at least 24 hours. During the first 2 hours of this test, the diesel generator shall be loaded to greater than or equal to 3025 kw and during the remaining 22 hours of this test, the diesel generator shall be loaded to greater than or equal to 2750 kw. Within 5 minutes after completing this 24-hour test, perform Specification 4.8.1.1.2.c.4.

AFTER:

7. Verifying the diesel generator operates** for at least 24 hours. During the first 2 hours of this test, the diesel generator shall be loaded to an indicated target value of 2950 kw (between 2900-3000 kw)*** and during the remaining 22 hours of this test, the diesel generator shall be loaded to an indicated 2500-2600 kw***. Within 5 minutes after completing this 24-hour test, perform Specification 4.8.1.1.2.d.4.

SCHEDULE FOR ROUTINE EDG TESTS

BEFORE:

Number of Failures In Last 100 Valid Tests*	Test Frequency
≤ 1	At least once per 31 days
2	At least once per 14 days
3	At least once per 7 days
≥ 4	At least once per 3 days

*Criteria for determining number of failures and number of valid tests shall be in accordance with Regulatory Position C.2.e of Regulatory Guide 1.108, Revision 1, August 1977, where the last 100 tests are determined on a per nuclear unit basis. For the purposes of this test schedule, only valid tests conducted after the OL issuance date shall be included in the computation of the "last 100 valid tests." Entry into this schedule shall be made at the 31 day test frequency.

AFTER:

Number of Failures in Last 20 Valid Tests*	Number of Failures in Last 100 Valid Tests*	Test Frequency
≤ 1	≤ 4	Once per 31 days
≥ 2**	≥ 5	Once per 7 days

*Criteria for determining number of failures and number of valid test shall be in accordance with Regulatory Position C.2.e of Regulatory Guide 1.108, but determined on a per diesel generator basis.

For the purposes of determining the required test frequency, the previous test failure count may be reduced to zero if a complete diesel overhaul to like-new conditions is completed, provided that the overhaul including appropriate post-maintenance operation and testing, is specifically approved by the manufacturer and if acceptable reliability has been demonstrated. The reliability criterion shall be the successful completion of 14 consecutive tests in a single series. Ten of these tests shall be in accordance with Specification 4.8.1.1.2.a.4; four tests, in accordance with Specification 4.8.1.1.2.c. If this criterion is not satisfied during the first series of tests, any alternate criterion to be used to transvalue the failure count to zero requires NRC approval.

**The associated test frequency shall be maintained until seven consecutive failure free demands have been performed and the number of failures in the last 20 valid demands has been reduced to one.

ACTION STATEMENT TESTING (1 EDG INOP.)

BEFORE:

a. With either an offsite circuit or diesel generator of the above required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirements 4.8.1.1.1.a and 4.8.1.1.2.a.4 within one hour and at least once per 8 hours thereafter; restore at least two offsite circuits and two diesel generators to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

AFTER:

b. With one diesel generator of 3.8.1.1.b inoperable, demonstrate the OPERABILITY of the A.C. offsite sources by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter; and if the EDG became inoperable due to any cause other than preplanned preventative maintenance or testing, by performing Surveillance Requirement 4.8.1.1.2.a.4 within 24 hours*; restore the diesel generator to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN with the following 30 hours.

*This test is required to be completed regardless of when the inoperable EDG is restored to operability.